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Registered with the Registrar of Newspapers for India under Reg. No. 498/2007 Bioscience Biotechnology Research Communications SPECIAL ISSUE VOLUME 14 No (5) 2021	
Employee Engagement in Times of Crisis Manali Rohan Patil and Pranali Rana	01-06
An Emperical Study on Promoters Shares Pledging and its Effect on Stock Returns Natika Poddar	07-17
A Theoretical Study of E-Loyalty Manjari Lal and Hemant Katole	18-20
A Review of Internet Protocol Version 6 (IPv6) Security Network Rama Bansode and Anup Girdhar	21-26
Consumer Behaviour Towards Best Bus in Mumbai City Post Lockdown Rahul N Wadekar, K Y Shinde and Kanwalpreet Kaur Puri	27-31
Drinking Water Analysis of Household Water and its Safe Storage Patterns by Linear Regression Technique in Mumbai, India Swapnali D Mahadik and Anup Girdhar	32-35
Early Detection of Prone to Failure Student Using Machine Learning Techniques Prabha Siddhesh Kadam and Vinod Moreshwar Vaze	36-39
Early-Stage Apple Leaf Disease Prediction Using Deep Learning Amit Gawade, Subodh Deolekar and Vaishali Patil	40-43
Evaluation of Huffman Algorithm for Compression Standards Swati D Ghule and Anup Girdhar	44-46
Facial Expression Recognition Using CNN with Keras Apeksha Khopkar and Ashish Adholiya Saxena	47-50
Marine Fish Marketing Problems at Satpati Landing Center in Palghar District Girish Jadhav and Sachin Borgave	51-55
Understanding Consumers Online Impulse Grocery Shopping: A Stimulus Organism Response Framework Approach Abhishek S Deokule and Hemant Katole	56-60
Stress Faced by Homemakers Due to Online Mode of Education and Work from Home by Family Members During Covid-19 Pandemic Harish Kumar S Purohit, Tejashree Deshmukh and Jigar Patel	61-66



Registered with the Registrar of Newspapers for India under Reg. No. 498/2007 Bioscience Biotechnology Research Communications SPECIAL ISSUE VOLUME 14 No (5) 2021

Perspectives of Fishers on Impact of Pandemic Covid'19 on Fisheries Business Operating in Coastal Maharashtra Bhavesh B Vaity and K Y Shinde	67-70
Internet of Medical Things (IoMT) Ecosystem for Secured Woman Health Monitoring System (WHMS) Rasika Mallya	71-79
Epidemiology of Bronchopulmonary Dysplasia Among Preterm Infants in Saudi Arabia Saleh Algarni	80-83
Study of the Jumping Phenomenon in a Cam and Follower Mechanism Ali Hasan	84-88
A Comparative Analysis of Public Education System of Indonesia and Uzbekistan Jakhongir Shaturaev	89-92
A Secure and Efficient Authentication in E-Commerce Dulal Kumbhakar, Kanchan Sanyal and Sunil Karforma	93-99
Enhancement of Assamese Speech Signals Using Learning Based Techniques Mridusmita Sharma and Kandarpa Kumar Sarma	100-104
Exploratory Analysis of Factors Influencing AI-Enabled Customer Experience for E-Commerce Industry Amisha Gupta, Rupanshi Toteja and Yajas Gupta	105-112
An Empirical Study of Online Consumer Behavior for Apparel & Electronics Segment Harish Kumar S Purohit and Abhishek S Deokule	113-117
Optimization Hydro-Thermal-Wind-PV Solar Using MOPSO Algorithm Applied to Economic/ Environmental Dispatch Ismail Marouani, Chefai Dhifaoui and Hsan Hadj Abdallah	118-125
On Non - Homogeneous Cubic Equation With Four Unknowns x²+ y² + 4 (35z²- 4 - 35w²) = 6 xyz E Premalatha, J Shanthi and M A Gopalan	126-129
E-Commerce Shopping Gets Real: The Rise of Interactive Virtual Reality Satish R Billewar, Karuna Jadhav, D Henry Babu and Sunil Ghane	130-132
Team Convergence in Prevention and Reduction of Stunting Rate in Malang District, East Java, Indonesia Wardani Diadjeng S	133-140
Social Taboos and Existing Practices Concerning Menstruation in the Nepalikhuti Area of Sivasagar District Swastika Dutta and Jyoti Prasad Saikia	141-144
Kyasanur Forest Disease: A Tropical Disease of the Southwest India Mythreyi R, Geethanjali B, Kanthesh M Basalingappa, Gopenath TS, Parthiban R and S Raviraja	145-153
A Review on Facial Emotion Recognition and Classification Analysis with Deep Learning Asha Jaison and C Deepa	154-161

Registered with the Registrar of Newspapers for India under Reg. No. 498/2007 Bioscience Biotechnology Research Communications SPECIAL ISSUE VOLUME 14 No (5) 2021

Sustainable Development Coal Mining Management (Case Study of Coal Mining	162-170
Muhammad Hadin Muhjad, Ahmad Fikri Hadin and Fakhruddin Razy	
Interactive Teaching Methods as Pedagogical Innovation	171-175
Abykanova Bakytyul, Sadirbekova Dinara, Sardarova Zhannat, Khairzhanova	
Akhmaral Kh. Mustaraliyana Gulnara S. Tahuldiana Ommani Duasanhaanna	
Akimatar Kir, Mistaganyeva Gumara S, Tabyinteva Gryngur Dyyschbaevna, Abdol Eleonora D and Bainazarova Tursynay	
Finaly Grained Real Time Facial Emotion Recognition Towards Neural Network	176-181
Vijav Kumar Sharma. Swati Sharma. Umang Arora and Anant Gupta	170-101
Fusion of Medical Images Using Adaptive Pulse Coupled Neural Networks Based on QCSA Optimization	182-189
Pydi Kavita and Daisy Rani Ali and Annepu Bhujanga Rao	
The Empirical Study of Association of Capital Structure and Profitability of Telecommunication Firms	190-193
Avani Raval and Ashvin Dave	
	104 107
The Association Among Working Capital Managementand Profit Ability of Telecommunication Firms	194-197
An Empirical Study Unfolding the Hiatus in Creating Awareness Regarding Green	198-201
Products Among Retailers of Gujarat	
Anjali Manglani and Tejas Dave	
Information Seeking Rehaviour of Library Users of Mother Teresa Women's University Kodaikanal - A Study	202-205
Kavitha R and Aravind S	202 203
Impact of Green E-Advertisements Upon FMCG Consumers of Gujarat	206-210
Anjali Manglani and Tejas Dave	
Identification of FFI Disorder Using Dragon Fly Optimization Technique	211-217
Sudha Ramya Karri, Daisy Rani Ali and Annepu Bhujanga Rao	
Predictive Diagnosis of Breast Cancer Using Deep Neural Network	218-224
i Suona, N Susiia, K Kanjana, K Anusnya and S Amritha	
Utilization of ICT by the Users of Arts and Science Colleges in Thiruvarur District - A Study	225-230
Aravind S and Kavitha R	
Achievement of Quality Education of Primary School Students: A Micro Level Study	231-241
At Kalvani Community Block in West Bengal	231-241
Mukhlesur Rahaman Gain, Subrata Biswas and Prasenjit Deb	
Abundance of Hetrocystous Blue Green Algae of Rice Field of Mangaldoi	242-244
Sub Division, Darrang District Assam	
Matur Kanman, Milu Kani Das and Kanee Das	
Implementing a Non-Invasive Brain Temperature Monitoring System with Two-Type RF Switches Antenna	245-247
Syed Jamalullah R and L Mary Gladence	
A New Eangled and Alternative Synthesis of Anticoogulant Drug Substance Anivolan	240 252
T Suresh and K Rambabu	240-232
Innovative Practices in Preventive Health Care Services in Covid-19 and Disease Management K Anusha, V Praveen Kumar and D Praveenadevi	253-257
a manual a manual manual and b	

Registered with the Registrar of Newspapers for India under Reg. No. 498/2007 Bioscience Biotechnology Research Communications SPECIAL ISSUE VOLUME 14 No (5) 2021

Modification of the Projection from Anterior-Posterior to Posterior-Anterior for Abdominal Radiographic Examinations Ghassan Abdullah Almaziad, Abdullah Al Shahrani, Oinam Gokulchandra Singh,	258-264
Ali Asghar Ayaz, Fatema Ibrahim Abudiab and Sulaiman O Balogun	
Partnerships and Extension: Evidence from India K Narendran	265-269
Power Sector of Assam: A Study on Financial Viability of State Power Utilities Amit Saha and Martin Saha	270-276
Climate Change in Urban Areas: A Case Study of Mysuru City Geethalakshmi S and K C Manjunath	277-282
Cov-19 Incidence Detection Using Efficient Intelligent Multi Agent System Based on Dynamic Unsupervised Feed-Forward Neural Network S. Raviraja, Roya Asadi, Negin Kourosdari, Kanthesh M. Basalingappa, and Hemashree L	283-293
S Kaviraja, Koya Asaui, Negii Kourosuari, Kartitesi M Dasaniigappa anu remasiree E	
Test and Experiment of Bio-Medical Image Restoration Using Enhanced Image DCT Fusion Techniques Tushar and Abhijit Nayak	294-300
Prediction of Physicochemical Properties, Bioactivity, Pharmacokinetics, Drug-Likeness and Synthetic Accessibility of Phenyl and Isoxazole AZO Dyes Madhavi Kuchana and Kavya Kaparthi	301-305
Early-Stage Lung Cancer Detection Using Machine Learning J Sreedevi, M Rama Bai, G Naga Sujini, Muthyala Mahesh and B Satyanarayana	306-313
Exploration and Prediction of Crime Data Through Supervised Machine Learning Algorithms Shruti and Rajesh Kumar Singh	314-323
Linking System Quality, Information Quality and Intention of Use to Student Satisfaction of Student Information System in China Samar Zaineldeen, Li Hongbo, Masud Ibrahim and Sohail Ibrahim	324-332
To Assess the Factor Responsible for Episiotomy Wound Healing Among Post Natal Mother Shalini Moon, Priyanka Timande, Sneha Gedam, Poonam Golhar, Ashish Lokhande, and Ashwini Hude	333-342
Suspension Model of Fluid Particle for Blood Flow Through Balloon Catheterized Elliptic Shaped Stenosed Artery Madan Lal and Yantish Dev Jha	343-348
Ligaplants: A New Era in Dental Engineering Lipika Gopal, Anchal Varshney, Ashim Aggarwal and Shivani Aggarwal	349-351
Graphics in History: An Examination of Visuals in Counter-Reformation Art Somanand Saraswati and Urmi Satyan	352-354
Intelligent Number Plate Detection System Madhu Nakerikanti, Y Chakrapani, Raja Murali Prasad and R Hemalatha	355-358
Brain Mri Image Segmentation Using Simple Linear Iterative Clustering (SLIC) Segmentation With Superpixel Fusion Snehalatha and Siddarama R Patil	358-364
Low Probability of Intercept (LPI) Radar Signal Identification Techniques M Rajani Devi, K Ramanjaneyulu and B T Krishna	365-373

Editorial Communication

The objective of the **Special issue of Bioscience Biotechnology Research Communications Vol 14 No** (5) **2021 on "Innovative Research on Management, Sciences and Technology**" is to provide a platform to researchers to publish original research work in different avid areas related to Management, Commerce, Social Science, Applied Sciences and Technology.

We are happy to share that quality research work addressing important issues in the field of data science Machine learning techniques, Consumer behaviour, Security network, Deep learning, Health monitoring system, Employee engagement, Engineering Properties, Biology and Medical Science related topic, Topic related to Women Empowerment, artificial intelligence, software applications, energy management and COVID-19 etc. are published in this special issue.

This special issue aims to foster the growth of a new research community, acting as an international forum for researchers and practitioners in academia and industry to present research that will definitely play a very important role in changing the landscape of our near future.

The published research articles have been aimed to motivate the next generation researchers working in various emerging research areas. The articles published in this issue will be helpful for the researchers working in these new emerging areas. We express our heartfelt gratitude to all the contributors from different colleges and universities of India and Abroad for giving us an opportunity to publish their research work in this Special Issue on Innovative Research on Management, Sciences and Technology.

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CONTENTS



VOLUME 14 • NUMBER (5) • SPECIAL ISSUE 2021 INNOVATIVE RESEARCH ON MANAGEMENT, SCIENCES AND TEC	CHNOLOGY
Employee Engagement in Times of Crisis Manali Rohan Patil and Pranali Rana	01-06
A Emperical Study on Promoters Shares Pledging and its Effect on Stock Returns Natika Poddar	07-17
A Theoretical Study of E-Loyalty Manjari Lal and Hemant Katole	18-20
A Review of Internet Protocol Version 6 (IPv6) Security Network Rama Bansode and Anup Girdhar	21-26
Consumer Behaviour Towards Best Bus in Mumbai City Post Lockdown Rahul N Wadekar, K Y Shinde and Kanwalpreet Kaur Puri	27-31
Drinking Water Analysis of Household Water and their Safe Storage Patterns by Linear Regression Technique in Mumbai, India Swapnali D Mahadik and Anup Girdhar	32-35
Early Detection of Prone to Failure Student Using Machine Learning Techniques Prabha Siddhesh Kadam and Vinod Moreshwar Vaze	36-39
Early-Stage Apple Leaf Disease Prediction Using Deep Learning Amit Gawade, Subodh Deolekar and Vaishali Patil	40-43
Evaluation of Huffman Algorithm for Compression Standards Swati D Ghule and Anup Girdhar	44-46
Facial Expression Recognition Using CNN with Keras Apeksha Khopkar and Ashish Adholiya Saxena	47-50
Marine Fish Marketing Problems at Satpati Landing Center in Palghar District Girish Jadhav and Sachin Borgave	51-55
Understanding Consumers Online Impulse Grocery Shopping: A Stimulus Organism Response Framework Approach Abhishek S Deokule and Hemant Katole	56-60
Stress Faced by Homemakers Due to Online Mode of Education and Work from Home by Family Members During Covid-19 Pandemic Harish Kumar S Purohit, Tejashree Deshmukh and Jigar Patel	61-66
Perspectives of Fishers on Impact of Pandemic Covid'19 on Fisheries Business Operating in Coastal Maharashtra Bhavesh B Vaity and K Y Shinde	67-70
Internet of Medical Things (IoMT) Ecosystem for Secured Woman Health Monitoring System (WHMS) Rasika Mallya	71-79

Epidemiology of Bronchopulmonary Dysplasia Among Preterm Infants in Saudi Arabia Saleh Algarni	80-83
Study of the Jumping Phenomenon in a Cam and Follower Mechanism Ali Hasan	84-88
A Comparative Analysis of Public Education System of Indonesia and Uzbekistan Jakhongir Shaturaev	89-92
A Secure and Efficient Authentication in E-Commerce Dulal Kumbhakar, Kanchan Sanyal and Sunil Karforma	93-99
Enhancement of Assamese Speech Signals Using Learning Based Techniques Mridusmita Sharma and Kandarpa Kumar Sarma	100-104
Exploratory Analysis of Factors Influencing AI-Enabled Customer Experience for E-Commerce Industry Amisha Gupta, Rupanshi Toteja and Yajas Gupta	105-112
An Empirical Study of Online Consumer Behavior for Apparel & Electronics Segment Harish Kumar S Purohit and Abhishek S Deokule	113-117
Optimization Hydro-Thermal-Wind-PV Solar Using MOPSO Algorithm Applied to Economic/ Environmental Dispatch Ismail Marouani, Chefai Dhifaoui and Hsan Hadj Abdallah	118-125
On Non - Homogeneous Cubic Equation With Four Unknowns $x^2 + y^2 + 4 (35z^2 - 4 - 35w^2) = 6 xyz$ E Premalatha, J Shanthi and M A Gopalan	126-129
E-Commerce Shopping Gets Real: The Rise of Interactive Virtual Reality Satish R Billewar, Karuna Jadhav, D Henry Babu and Sunil Ghane	130-132
Team Convergence in Prevention and Reduction of Stunting Rate in Malang District, East Java, Indonesia Wardani Diadjeng S	133-140
Social Taboos and Existing Practices Concerning Menstruation in the Nepalikhuti Area of Sivasagar District Swastika Dutta and Jyoti Prasad Saikia	141-144
Kyasanur Forest Disease: A Tropical Disease of the Southwest India Mythreyi R, Geethanjali B, Kanthesh M Basalingappa, Gopenath TS, Parthiban R and S Raviraja	145-153
A Review on Facial Emotion Recognition and Classification Analysis with Deep Learning Asha Jaison and C Deepa	154-161
Sustainable Development Coal Mining Management (Case Study of Coal Mining Licensing Problem in South Kalimantan, Indonesia) Muhammad Hadin Muhjad, Ahmad Fikri Hadin and Fakhruddin Razy	162-170
Interactive Teaching Methods as Pedagogical Innovation Abykanova Bakytgul, Sadirbekova Dinara, Sardarova Zhannat, Khairzhanova Akhmaral Kh, Mustagaliyeva Gulnara S, Tabyldieva Oryngul Dyysenbaevna, Abdol Eleonora D and Bainazarova Tursynay	171-175
Finely-Grained Real-Time Facial Emotion Recognition Towards Neural Network Vijay Kumar Sharma, Swati Sharma, Umang Arora and Anant Gupta	176-181

Fusion of Medical Images Using Adaptive Pulse Coupled Neural Networks Based on QCSA Optimization Pydi Kavita and Daisy Rani Ali and Annepu Bhujanga Rao	182-189
The Empirical Study of Association of Capital Structure and Profitability of Telecommunication Firms Avani Raval and Ashvin Dave	190-193
The Association Among Working Capital Managementand Profit Ability of Telecommunication Firms Avani Raval and Ashvin Dave	194-197
An Empirical Study Unfolding the Hiatus in Creating Awareness Regarding Green Products Among Retailers of Gujarat Anjali Manglani and Tejas Dave	198–201
Information Seeking Behaviour of Library Users of Mother Teresa Women's University, Kodaikanal – A Study Kavitha R and Aravind S	202-205
Impact of Green E-Advertisements Upon FMCG Consumers of Gujarat Anjali Manglani and Tejas Dave	206-210
Identification of FFI Disorder Using Dragon Fly Optimization Technique Sudha Ramya Karri, Daisy Rani Ali and Annepu Bhujanga Rao	211-217
Predictive Diagnosis of Breast Cancer Using Deep Neural Network T Subha, N Susila, R Ranjana, R Anushya and S Amritha	218-224
Utilization of ICT by the Users of Arts and Science Colleges in Thiruvarur District - A Study Aravind S and Kavitha R	225-230
Achievement of Quality Education of Primary School Students: A Micro Level Study At Kalyani Community Block in West Bengal Mukhlesur Rahaman Gain, Subrata Biswas and Prasenjit Deb	231-241
Abundance of Hetrocystous Blue Green Algae of Rice Field of <i>Mangaldoi</i> Sub Division, Darrang District Assam Matiur Rahman, Milu Rani Das and Ranee Das	242-244
Implementing a Non-Invasive Brain Temperature Monitoring System with Two-Type RF Switches Antenna Syed Jamalullah R and L Mary Gladence	245-247
A New-Fangled and Alternative Synthesis of Anticoagulant Drug Substance, Apixaban T Suresh and K Rambabu	248-252
Innovative Practices in Preventive Health Care Services in Covid-19 and Disease Management K Anusha, V Praveen Kumar and D Praveenadevi	253-257
Modification of the Projection from Anterior-Posterior to Posterior-Anterior for Abdominal Radiographic Examinations Ghassan Abdullah Almaziad, Abdullah Al Shahrani, Oinam Gokulchandra Singh, Ali Asghar Ayaz, Fatema Ibrahim Abudiab and Sulaiman O Balogun	258-264
Partnerships and Extension: Evidence from India K Narendran	265-269
Power Sector of Assam: A Study on Financial Viability of State Power Utilities Amit Saha and Martin Saha	270-276
Climate Change in Urban Areas: A Case Study of Mysuru City Geethalakshmi S and K C Manjunath	277-282

Cov-19 Incidence Detection Using Efficient Intelligent Multi Agent System Based on Dynamic Unsupervised Feed-Forward Neural Network	283-293
S Raviraja, Roya Asadi, Negin Kourosdari, Kanthesh M Basalingappa and Hemashree L	
Test and Experiment of Bio-Medical Image Restoration Using Enhanced Image DCT Fusion Techniques Tushar and Abhijit Nayak	294-300
Prediction of Physicochemical Properties, Bioactivity, Pharmacokinetics, Drug-Likeness and Synthetic Accessibility of Phenyl and Isoxazole AZO Dyes Madhavi Kuchana and Kavya Kaparthi	301-305
Early-Stage Lung Cancer Detection Using Machine Learning J Sreedevi, M Rama Bai, G Naga Sujini, Muthyala Mahesh and B Satyanarayana	306-313
Exploration and Prediction of Crime Data Through Supervised Machine Learning Algorithms Shruti and Rajesh Kumar Singh	314-323
Linking System Quality, Information Quality and Intention of Use to Student Satisfaction of Student Information System in China Samar Zaineldeen, Li Hongbo, Masud Ibrahim and Sohail Ibrahim	324-332
To Assess the Factor Responsible for Episiotomy Wound Healing Among Post Natal Mother Shalini Moon, Priyanka Timande, Sneha Gedam, Poonam Golhar, Ashish Lokhande, and Ashwini Hude	333-342
Suspension Model of Fluid Particle for Blood Flow Through Balloon Catheterized Elliptic Shaped Stenosed Artery Madan Lal and Yantish Dev Jha	343-348
Ligaplants: A New Era in Dental Engineering Lipika Gopal, Anchal Varshney, Ashim Aggarwal and Shivani Aggarwal	349-351
Graphics in History: An Examination of Visuals in Counter-Reformation Art Somanand Saraswati and Urmi Satyan	352-354
Intelligent Number Plate Detection System Madhu Nakerikanti, Y Chakrapani, Raja Murali Prasad and R Hemalatha	355-358
Brain Mri Image Segmentation Using Simple Linear Iterative Clustering (SLIC) Segmentation With Superpixel Fusion Snehalatha and Siddarama R Patil	358-364
Low Probability of Intercept (LPI) Radar Signal Identification Techniques M Rajani Devi, K Ramanjaneyulu and B T Krishna	365-373



Employee Engagement in Times of Crisis

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ABSTRACT

limited to employee productivity then on we graduated to shifting our focus to correlating performance with employee satisfaction. Higher the levels of employee satisfaction, greater the performance. Of late with the changes in nature of businesses we have started realizing and talking about the most critical and neglected aspect known as "employee engagement". Engagement is often said as a capture of an employee's head and heart. Today the world is different than it used to be nearly a year ago. The global pandemic has caused an atmosphere of uncertainties and confusion creating communication gaps and lead to complete disruption in our lives. In such a scenario, keeping employees engaged and passionate about work is a challenge ahead of organizations worldwide. This paper attempts to focus on studying the impact the global pandemic has on various employee engagement practices and strategies of the firms. The primary purpose of this research is to understand how such periods of crisis impacts the employee engagement practices and to be more specific which areas of employee engagement has changed drastically during this crisis. Employee engagement in such trying times assumes a paramount importance. Though a lot of organizations have encountered a plethora of challenges due to Covid -19 crisis in adjusting their management styles and working practices it is a question unanswered as to how the lessons learned about the employee engagement will be brought to practice in their working model. It will surely bring scope for positive improvements and shift in area of focus in employee engagement practices in the organizations in years to come.

KEY WORDS: EMPLOYEE ENGAGEMENT, CRISIS, UNCERTAINTIES, CORPORATE CULTURE.

INTRODUCTION

Let us try and understand the mindset of an engaged employee – a highly engaged employee right in the morning would be energetic, enthusiastic, more willing to work, would be passionate about his work, one who knows what he/she is supposed to do, someone who really looks beyond the daily tasks, these are not mere adjectives but the reality of what really happens with an



engaged employee each day, it isn't something he or she has received from a training nor anybody has asked him/ her to feel in this manner, these feelings and emotional wellbeing is achieved when an organization invests in an employee engaged culture, it isn't forced upon him or her but it comes naturally to such an employee. Having said that, lets also find out what a disengaged employee would feel like before heading to office each morning. They feel lethargy, apathy, most of the days they don't even feel like going to work, feels low on energy and lacks enthusiasm. These are like certain signs of a disengaged employee (Chanana & Sangeeta 2020).

These negative flaws reflect on other people and if you don't address it swiftly, things could get worsen. That's the reason organizations today are investing in building engaged culture within an organization. Employees are, at their worst engulfed in ambiguity and chances are that this chaos can affect their mental well-being



during this uncertain times. These unengaged employees feel detached and are distracted due to a lot of things happening around which surely affects their efficiency and performance.

The crux for engaging your employees lies in developing this understanding that whatever circumstances your organization or your team is going through there are chances that employees are likely to feel disengaged and lost, so how swiftly your organization develops this ability to connect and communicate to team members to leverage the effect of peer motivation on efficiency is more critical than it has ever been.

Literature Review: Chanana N. and Sangeeta (2020) attempted to determine the engagement practices adopted by various companies during the global pandemic times. During the time of crisis, employee engagement has become one of the important human resource activity concern as almost everyone was working from home, it was becoming extremely difficult to monitor employees output their concerns and also their productivity during such times.

Kaushik M. & Guleria N. (2020) has mentioned that during this tough times it becomes of an immense importance to maintain harmony and understanding in organizational relationship in order to businesses to sustain and grow further. It is time to develop positive approach and attitude towards everything in life not just at professional front. To lay emphasis on reskilling and upskilling. To accepting technological interventions and adapt to the change.

Kumar. & Kapoor. (2020) tries to outline various engagement measures/practices to increase the levels of employee engagement and also summarized that organizations must value mindful engagement. It studied the impact of two critical factors namely emotional wellbeing of the employees and the other one as using digital technology in use for engaging employees. On the final node, author proposes that when employer would be able to evaluate the emotional pattern and well-being levels of an employee and demonstrate empathy towards their concern it will led to a win-win situation to both the parties and help increase productivity even in such an uncertain times (Kaushik & Guleria 2020).

Saji (2014) has explained that by engaging employees' organization can reduce attrition of its employees. It describes as to how having an engaged and committed staff can save companies during the times of crisis with the help of Taj hotel, Mumbai, case study. It also laid emphasis on having learning and development system and through timely L&D sessions, employees can be engaged even more.. Various HR practices from hiring, l&d, reward and recognition together leads to higher levels of employee engagement.

Setyo Riyanto (2020) proposes to examine the effect of pandemic on employees personal and work life and that

managing their concerns and emotions becomes critical else it may go on to result in poor quality of work, lower levels of productivity, mistakes and in all impacting business at large. These emotions if left unattended will surely influence employee performance and engagement levels. The researcher concluded by laying importance on the fact that employers needs to understand and empathize with concerns of the employees in such turbulent times is the best practice or simple way of keeping employees engaged.

3. Objectives of the Study

- 1. To determine employee engagement practices and strategies adopted during Covid-19 crisis by organizations.
- 2. To study which areas of employee engagement has changed due to pandemic .
- 3. To study the role of employee engagement in developing a strong corporate culture.

RESEARCH METHODOLOGY

For the purpose of this research, primary data was collected through a well-structured questionnaire and review of secondary data about the current crisis situation and employee engagement was done.

5.Data Collection: Questionnaire was administered via sharing the google form to randomly select regular office going employees (currently working from home). The questions in the engagement survey are directed towards an organization's employee to understand their level of engagement with the organization at large. These employees/professionals are working for leading organizations. Filling the complete responses was done through the Google forms circulated. The questionnaire was served to full time employees selected randomly from Mumbai.

6. Strategies Adopted By Companies During Crisis

• Work from Home model adopted: Even from WFH model, through virtual space leaders and team members can still ensure that they celebrate on achievements of its employees. Even if this present situation has prompted a downturn and stagnation in your business affecting your profits and lead to restricted allocations on budgets. Appreciation and recognition factor doesn't have to be costly, complex, or even for that matter expensive.

It cannot be ignored for any reasons there's always a way out to it. It is free and very efficient to say "thank you" but do it in a significant manner like by acknowledging them by emailing or announcing it in a group meeting so that everyone else also comes to know about the same, and the one receiving such appreciation feels happy and motivated at the same time. By giving them extra time off can be also another good idea generally in case if your teams are one that normally hits deadlines and meets targets. Employees in such conditions feel motivated and involved and this further awakens in them a sense of belonging and oneness. • Covid effect and how firms reacted to this change: Due to this global pandemic scenario, there is a lot of things that are out of control. Now, organizations need to be adaptive and resilient to the changes in order to sustain the business in times of crisis like these. There are a lot of skills and technology know-how that has become all the more imperative then it use to be before the Covid times. We are being used to working in an "all touch" environment before, where we had to be physically present but now due to pandemic everything moves on technology be it meetings, communications, collaborations, celebrations almost everything.

This is not the time of just performance but high performance now that will matter and make a differentiating factor to those firms. Today we need to understand about having work life balance and achieve harmony in both personal and professional lives by increasing productivity and efficiency, and that can be achieved by having focus on the sense of belongingness and integration of tasks and activities at workplace. In order to have a highly engaged workforce, employers need to understand the changed expectation of the employees in regards to feedback, recognitions, appreciation in this changing era Let's try to focus on how Covid -19 has affected employee engagement today.

Employee engagement is therefore core for organizations who are actually looking for ways to get out of this crisis. That said, employees are going to remember as to how you treated them at this time. Organization needs to be attentive about employees concerns and their mental well-being in such an uncertain time, which clearly depicts that organization is watchful, empathetic for its employees even in such tough times. The global pandemic has act as a catalyst in accelerating entire technological transformation that has taken place.

Having a culture of recognition also drives employee engagement. It is important for the organization to have a supportive management approach. During the lockdown scenario when employees where working from home various organizations adopted online methods such as daily team meetings, frequent check ins in order to monitor and keep track of employee's productivity and measure their progress and output. Organizations resorted to giving its employees small tasks and procedure and this approach of micro goal setting enabled them to receive constant feedback and helps in evading communication gap during turbulent times. When communication gap reduces it automatically facilitates resolving issues and concerns in no time, allowing time to anticipate things.

It requires strong effort and commitment from top management to adopt such an approach or model of supportive management in such trying times to foster and engage its employees to achieve results. In order for engaging employees during this tough times another critical aspect adopted by firms was to focus on to praise and recognition of employees at work. Praising employees and appreciating their efforts and their work goes a long way in keeping them engaged, regardless of the size of the company.

• Approaches adopted in engagement: Those leaders who invest in Learning & Development (L&D) activities of its employees clearly shows an indication that they are encouraging engagement. L&D is a critical element of employee engagement. L&D activity itself is incomplete if it doesn't include constructive feedback in it and again not to forget two-way communication element, only then in true sense such an L&D can be said engaging. Having said that, these practices facilitate continuous communication and makes room for transparency within the organization, which helps develop a strong employee engagement model, that can help keep employees engaged and increase their retention to a great extent.

Various organizations across the world had adopted to stay connected using virtual platforms at all levels. There has been emphasis on two-way communication between leaders and employees. It not just leads to monitor employees' performance and productivity but also gives a sneak peek into employees' emotional state of mind. HR professionals needs to understand that due to work from home working model, employees might feel isolated and lonely, they should engage employees in virtual social activities to build camaraderie and offer some sort of mental relief to its employees and take care of their emotional well-being. HR team must work on developing a system for attending work related queries of its employees as simple as using computers camera and running an online meet. There should be FAQs document updated from time to time. Keeping employees updated about not just professional stuffs but also related to health care guidelines, mental well -being, etc.

• Drivers of employee engagement: At first we need to take another look at what are the drivers and motivations in order to better understand what approaches will prove to be active in convincing and influencing employee engagement. In their jobs, often employees can't seem to find any purpose any sense or even see the contribution their jobs makes. Think of the duties or tasks you carry out on a regular basis. It is important to see meaning in their work. Meaning is the first key that builds in employee engagement that lasts for long time.

It creates joy and happiness in an individual. In words of Daniel Pink, "Control leads to compliance; Autonomy leads to engagement." Autonomy isn't about leaving people alone. Typically, employees don't want to be left alone. It is not generally recommended to tell people about how to do things. To empower them and ask them about what to do and you will be surprise by the results. Autonomy does really allows an employee to practice a degree of self –governance. Coming to another driver, growth – for about a decades ago, it use to be so that an employee possessed and maintained a particular skillset and education these factors use to form base for his career and even so that it use to carry further throughout his professional life, leaving less or almost no scope of growth.

Patil & Rana

Another important driver is impact – imagine a scenario wherein your employees give in their best efforts and in return they get a dismal report of their business performance, the plight and mindset of such an employee is sad and demotivated one. It becomes difficult in such a scenario to cultivate the engaged employee environment Connection – that feeling of oneness, belongingness often are included in various employee engagement survey questions. Because unless and until your employees don't really feel that connection, the spark in their work and output is surely going to suffer then. Connection does really makes an employee involved, included and part of the organization. Recognition and appreciation -Recognition and appreciation goes a long way to keep employees engaged. Each and every employee is unique in itself we need to understand this fact and accordingly design and frame reward recognition policies that makes that individual employee feel better is of paramount importance.

• Building a strong corporate culture: Perks are becoming increasingly famous in corporate world. Perks, at least initially, are beneficial for recruitment and retention. All of these advantages, especially for the recent college graduate looking for a quick transition from school to work and bragging rights, look extremely attractive. Companies are becoming creative and extremely competitive day in and day out in introducing these perks for their employees such as allowing pets, free food, the onsite dentist, free medical check-ups policies, oil changes and this is going to be never ending for sure.

All these perks and such policies might seem like a fairly decent life to live like, isn't it? It's like everything that you would ever need can be taken care by your organization. The issue is the elevated cost of your entire life for this form of treatment. Let's try and understand the companies perspective also perhaps feels that why else would you really ought to leave? Employee may feel stuck and detached. So, the whole alignment of his efforts and output disturbs. Here, is where your employee engagement program goes for a toss, because despite of giving your employees those perks and amenities he feels disengaged and performances poor.

That's where your culture and internal management leader and management comes to picture. And here, let's dive into understanding the importance of building a strong corporate culture. Firms needs to understand this that, Perks are really not going to prove enough to help you with your engagement activities that is for sure. They can really help your employees feel satisfied but surely not engaged. You must be wondering how? Often, do firms forget to acknowledge the fact that there is something beyond those perks too. Instead they should look for broader picture rather beyond the picture and invest in cultivating such an environment which is rich with opportunities for ample growth of the employees, showing individuals how they have an impact, their actions and efforts matters to the organization, their works and their jobs have meanings, you as an organization needs to understand your employee, this

aspects and then these efforts will indeed lead to real employee engagement and will help your organizations manifolds.

Often leaders feel that, doing engagement survey alone is sufficient and can help organizations improve, however it is partially correct. Improving overall culture is way more important and effective way to increase business profits and achieve success. Employee engagement is directly proportional to strong company culture. Having a strong corporate culture implies how well employees are aligned with the company's vision, mission, goals, strategies, etc. They better know what is expected of them, he or she is intrinsically motivated and has that positive approach and attitude towards working, etc. Employees today are expecting and visualizing such a corporate culture that in reality treats its employees as humans first, and this further promotes a work-life balance indeed! Today they demand and look forward to working in such a workplace that has this touch of personalization in it.

Each employee is a different being and so they should be treated that way. A short term substitute for an engaged purpose and Covid-19 has united us against a common enemy. I do believe that we are very much in a situation business wise that it is the calm before the storm as we move towards what people are talking about the new normal or for businesses the normal is never coming back. Talking about the crisis response so what the business does in response to the pressure of the crisis and how the leaders actually contribute to creating temporary engagement that characterizes the Covid trap.

7. Data Analysis And Interpretation



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8. Findings

- 1. It was found that around 82% of respondents agreed that they love their work.
- 2. 78% of them agreed that they have positive and happy work environment.
- 3. 75% of them believed that they are satisfied with managed business and people and they know where to go when unexpected work comes our way.
- 4. 87% of them agreed to flexibility and understanding informal structures of organization.
- 5. 72% of them were satisfied with rewards and recognition policies.
- 6. 81% of them agreed that organization supports in adapting to changes.
- 7. 77% of them had this idea that they know whom to communicate an idea
- 8. 80% of them agreed with internal communication model during crisis
- 9. 59% of them said that they will chose WFH over WFO model.
- 10. 69% of them said their organization supports healthy work life balance.
- 11. 79% of the respondents said they emotional wellbeing has a positive impact on a job engagement during the crisis times.

9. Suggestions and Recommendations

- Empathize with your employees
- Engagement is for everyone Organizations needs to capture the head, heart and souls of employees and instill in them this desire and passion towards work for excellence needs to strongly present in them
- Localize in order for organizations to withstand and come out strong from this pandemic, they need to understand that employee engagement cannot be done from the corporate headquarters itself, because the time has changed and so has the demand. Companies from their end needs to ensure that they must engage locally by that it means local managers of the offices, of the divisions, departments, etc. will play a significant role and important factor in engaging employees from grass root level.
- Give autonomy, liberate employees Companies in these turbulent times needs to give their employees liberty and autonomy to allow them to choose how to go about working further. Assign them tasks, but don't legislate, don't ask them how to do that, give them autonomy to choose to work according to their convenience and then see the results. It will surely, improve productivity and help in achieving success.
- Redefine Communication strategy– In a crisis situation, internal communication system model has an immense role to play and needs to reinforced again and again without forgetting the importance of feedback. Those organisations that have invested and paid more attention to internal PR than external PR has passed the test!
- Involve and include It becomes important to involve your employees in decision making during crisis situation wherein, every small decision and discussion matters. Through regular Zoom calls and

Google hangouts, companies can ensure that their employees are involved in discussions and so they feel included too, this instills in them the feeling of oneness and engages them even more.

- Learning and development is the master key to success during this crisis times -enable learning as a journey not as a program, with the entire dynamics of working has been changing, learning –forgetting curve is expected to further increase and so attention span of learners /trainees is going to decrease. To increase their attention and retention capacity, organization must design learning models in small parts and multiple touchpoints should be included in the same in stipulated time frame.
- Leverage virtual learning With increased use of virtual technology, the emergence of virtual learning and e learning is here to stay and is going to be an unavoidable parts of our lives. With the help of industry experts organizations can ensure having webinars, classroom trainings, virtual coaching for reskilling and upskilling its employees.
- Flexibility Work from home and hot desking is going to be the new normal.
- Policies and facilities management frame policies, redesign HR policies handbook, be resilient to changes and adapt it.
- Reward and recognize –In the post Covid world, rewards and recognition needs to become an integral component of employee engagement tailor made R&R program needs attention at this times.

CONCLUSION

With the help of literature review, various articles has been analyzed and through the present study it can conclude by suggesting some effective ways to boost employee engagement for organization's in these trying times. Research paper also concludes that employees wants to be listened and heard. Organization needs to understand this thing as employees are experiencing a range of concerns about their well-beings and a lot other thing during this grievous times, when management takes effort and listen to its employees concerns it shows that they care about them, pay special attention towards introducing upskilling programs and initiatives that helps them stay productive and feel energetic else they might feel lost and lethargic.

This is the time when organizations can actually take such initiatives because employees will remember how their organization supported them and was there by their side during this crucial time phase. It will reduce attrition rate and helps in creating employer branding too. All the dealing and discussion needed to be revolved around empathy as empathy is going to be the new guiding principle during this unprecedented times. At this very time, HR leaders have an golden opportunity to support their organization with IT solutions, software i.e. Digital technologies. Focus should be laid upon developing effective platforms to configure engagement programs. Building an effective and strong culture helps especially during these times. Sustaining engagement is more important than ever!

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An Emperical Study on Promoters Shares Pledging and its Effect on Stock Returns

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ABSTRACT

Pledging of shares works in a similar manner, i.e., instead of a house, shares of a listed company are pledged. Anybody who owns shares of a public company can pledge the same and obtain a loan. However, investors need to take notice of the same when promoters of the company are pledging their holdings. Pledging of shares is one of the options that the promoters of companies use to secure loans to meet working capital requirement, personal needs and fund other ventures or acquisitions. In case promoters fail to make up for the difference, lenders can sell the shares in the open market to recover the money. Hence, to understand effect of promoters shares pledging on share price Study is being undertaken.

KEY WORDS: PROMOTERS, PLEDGING, SHARE PRICES, RETURNS.

INTRODUCTION

A promoter is a "person who acting alone or in conjunction with other persons directly or indirectly, takes the initiative in founding or organizing the business enterprise." (SEBI, Substantial Acquisition of shares (Takeover Regulation 1997). Promoters are the shareholders who holds majority stake of the entities. "A promoter is the one, who undertakes to form a company with reference to a given object and sets it going and takes the necessary steps to accomplish that purpose."(Justice C.J. Cokburn). Promoters as a majority stakeholders and has control over the affairs of the company to manage the funds for business operations. A company may needs funds for its regular operations as well as other activities like venturing new business or even for meeting personal requirement of the promoters.



There are various reasons for which share can be pledged. When the shares are pledged to a bank or with any institution as a collateral, the value of debt is depends on its prevailing share price in the market. As per the RBI regulations, a loan to value (LTV) ratio of 50% is to be maintained at all times when lending based on the stock pledge. In any situation this ratio has to be maintained by the company. Since the loan is being extended against the value of block of the shares, and the market value of the shares keep fluctuating, therefore, in case the market value of these pledged shares came down below the minimum collateral value agreed upon share pledge agreement can trigger a margin call.

Margin call occurs when share pledged with the lender falls below the collateral value. Under such situation, the company would need to furnish more collateral, cash or more shares as collateral. If company fails to cover up short fall, the lenders could be forced to invoke the pledged shares. Pledged invocation is a process where lenders have right to sell the shares which are pledged with them in the open market. Invocation of pledged shares can be due to violation of any other provision of share Pledge Agreement. Any type of invocation, in turn can put a risk on the prices of shares as there is more supply than demand for invoked shares and the



share prices starts falling. Such action can worsen the situation in the bear market.

In recent past years, the Indian capital markets have experienced these situations where lender off load the pledged shares to meet margin requirement. In 2019, out of 4,092 companies, promoters of 705 pledged their shares to raise loans. Of these, promoters of about 286 listed companies have pledged more than 50 per cent of their shares. Of these, 44 companies have already seen more than 50 per cent erosion in value.

Procedure for promoters share pledging

- 1. Initiate a pledge request When promoters wants to pledge their share as a collateral, they have to initiate a request for pledging shares using the trading terminal.
- 2. Confirmation by NSDL/CDSL Once the request is received from the trading terminal, the trading terminal sends the request to NSDL/CDSL for confirmation.
- 3. Authentication by NSDL/CDSL NSDL/CDSL authenticates the request using email/mobile authentication for PAN/BOID. Once approved, the collateral margin is available for trading to the promoters. Promoters can also submit Margin Pledge Request Form signed by all holders.

Motives Behind Promoter's Pledge: In the current environment, Banks are going for largely collateral backed lending and while it is getting tough to raise funds without any collateral. Therefore, a lot of promoters are resorting to pledging of shares to raise funds, as shares are treated as asset. It is inevitable to understand the underlying motives of promoters pledging. As it describes the intention of the promoters for raising money. From the empirical study, it is found that the promoters generally pledge their shares for the following purposes. Shares treated as a security by the lenders to provide loan. The Promoters of company pledge their shares as a collateral for debt and raise fund for various purpose.

Such raised money by pledging of the shares are used when company wants to convert their share warrants of the company into its shares. A stock warrant, issued directly by the company, grants the holder the right to purchase a company's shares at a specific price and a specific date. A promoter interested in buying the shares by exercising warrants might decide to pledge the existing shares to raise funds.

To create a security for promoters personal loans or loans taken by their other business ventures. Also to pay the third party liabilities or to float new businesses not related to the existing ones. When company needs funds for purchasing further shares of the same company from the secondary market. When the promoter feels that the share price of the company is undervalued and is confident about the prospects of the company, he might decide to buy more shares from the secondary market. The promoter might then decide to raise necessary funds by pledging his holdings. However, pledging of shares for the purpose of buying shares from secondary market looks to be totally unreasonable and gives a smelling of the bad intentions of the promoters (Palepu, A. R. 2019).

Investor must know the reasons behind the pledging. If the share pledge is for the purpose of strengthening the position of the company or consolidation of the holding of such promoters then pledging of such shares is not a big concern for the investors. But if the motives behind share pledge to buy own shares in the secondary market and for personal need then it may imply an ulterior motive or speculative intentions of the promoters to jack up the price artificially (Singh 2018).

Pledging of shares has many implications. As long as the share prices of the company are increasing, a high promoter pledge does not pose any risk to the investor. However in a falling market, if the lender resorts to invoking (selling) the shares, the excess supply will further push down the stock price, accelerating the investor's loss. Funds raised by share pledging usually tend to carry higher interest rates and indicates the promoter's inability to raise funds at cheaper rates. Servicing the interest will eat into the margins of the company and might affect future financial performance (Vasudevan 2019).

Research indicates that companies whose promoters have pledged for the first time tend to manipulate earnings upward, at least during the first year of the pledge. In extreme situations, promoters might also lose control of their company when pledged shares are sold in the open market. As per recent SEBI circular, promoters of all listed companies to disclose reasons for pledging of shares. If the number of shares pledged 50% or more than that of their holding in the company. Also, to make disclosure if the total shares pledged by promoters exceed 20% of the company's equity capital Vyas 2013).

Also, in order to bring more transparency regarding reasons for encumbrance, particularly when significant shareholding by promoters along with persons acting in concert (PACs) is encumbered, it has been decided to prescribe additional disclosure requirement.

Risks Involved In Promoters Share Pledging

- 1. Higher volatility in Stock Prices: If a company has a high percentage of promoter's shares, then it usually witnesses high volatility in the market price of its shares. When a company availed a loan by offering promoters shares as collateral, and for any external situation forces the market to crash and stock price falls, the lender immediately initiate margin call to make up for the difference in price. While this would help the bank recover its losses, it might trigger a selling spree due to panic. Hence, the stock price would be highly volatile, and calculating its valuation can be difficult.
- 2. Skewed Management Decisions: If a company has a high percentage of promoter's shares, then it might find it difficult to sustain profits since the borrowed

funds are at a high cost. Hence, the companies may experiences pressure on future earnings. This is because at the time of default, lenders have a right of selling stocks, which results in a drop in ownership stake of controlling owners and more likely to affect firms' decision making.

- **3.** Possible Loss of Control of the Company: There can be cases where the promoters lose the management control of the company. Let's say that the promoters owned a 65% stake in the company and pledged half of it for a loan. If the company fails to repay and the lender decides to sell the pledged shares in the open market, then the promoters will be left with only a 35% stake in the company. Risking losing control over the company.
- 4. Possible Value Trap for Value Investors: Value investors try to look for stocks that are undervalued as compared to their intrinsic value. Many companies with a high percentage of promoter's shares being pledged trade lower making them attractive to value investors. However, as an investor, it is important to understand that such stocks don't add a lot of value. While the interest outgo is usually in double-digits, the growth rates are much lower, and hence, even if the share prices seem undervalued, these stocks don't add much value to the portfolio.

Need for Study: The study is being undertaken to understand prevalence of pledging of shares by promoters and its impact thereof on the stock prices over a period of few years as compared to the performance of Indian stock market. Also, to understand the promoter's motives behind and risk involved with share pledging.

Review of Literature: Wang Y.C., 2015, under stock pledging, promoters give their stake of shares as collateral to avail loan. Commercial banks and nonbanking financial institutions are generally act as a lender. When promoters pledged their shares, regulators are concerned with situations where share pledging is on high stock prices and then engage in riskier operations for higher returns to boost security prices which are given as collateral. On disparity, when the promoters do not pay loan and exit, situation become more severe and lead to company's bad performance. This accelerates to fall in stock prices and minority shareholders would suffer.

Paradhasaradhi Madasu, 2019, in Journal of Management, "promoters Share Pledging: An Emerging Concern for Indian Stock Market Regulator," The paper focused on a topic which looks very simple on the face of it but has a lot of implications for both retail and institutional investors. The paper aimed to bring out the conceptual framework and risks involved in share pledges by insiders (especially promoters). In the present day scenario, the article gains currency by the fact that high degree of promoters shares being offered as collateral and the consequent fall in market prices would lead to fatal consequences.

Prasanjit Paul, 2017, in his book titled, "How to avoid loss and earn consistently in the stock market" mentioned

that pledging of shares put the unnecessary risk on the stock prices. Pledging of shares is the last option to raise the fund. It means that no else is ready to provide loan because either the company is in a bad business whose future prospect is not bright or the company has high debt and might be under financial constraint, hence pledging remains the only option left. It is always better to avoid stocks with high promoter pledging as it may impact on companies earning and thus affect the share prices.

Yogesh Chauhan, 2014, in his doctoral study titled as "Stock pledging and firm risk- Evidence from India," concludes that, stock pledging exacerbates firm-risk and fosters lower-risk capital investments, and consequently, favours lower-risk capital investments and adversely impacts firm value and longer-term performance. Results substantially support all three hypotheses, finding that controlling owner share pledging not only increases basic business risk, but also, margin call risk and combined personal leverage and corporate risk, negatively impact subsequent firm performance.

Increasing levels of share pledging are associated with under investment in more risky, but potentially more profitable capital project that, in turn, reduces firm future performance. Pledged shares must maintain margin requirement, where initial debt proceeds are generally between 50 to 70 percent of share value, and the remainder serves as excess lender collateral. Thus, adverse market or individual firm situations, margin calls are possible.

The promoter pledges data of 2019 is further interesting and provides lot of insights. Kant (2019) in his news article, quotes that the promoters have raised the number of shares pledged with their lenders as collateral for borrowing by 23 percent on a year-on-year (YoY) basis. At the end of the December 2018 quarter, promoters of BSE 500 companies had pledged 15.7 billion equity shares, against around 12.8 billion equity shares at the end of the December 2017 quarter. In rupee terms, promoter-owned shares worth nearly Rs 2 trillion were pledged at the end of the December 2018 quarter, up 2.6 percent on a YOY basis.

(Keerthi Sanagasetti, Business Line, March 23, 2020). The selling has been broad-based but companies with high levels of shares pledged by promoters become especially vulnerable when share prices plunge. It is routine for promoters to raise a loan against the shares owned by them for personal needs or to infuse funds into the business. During steep market declines, as the value of the pledged shares drops, the lenders may be forced to sell these shares to maintain the loan to value (LTV). This drags these stocks still lower, with knock-on effects on the market. Most investors try to avoid stocks where the company's promoters have pledged shares significantly (Wang 2015).

This is because investors mostly view high proportion of pledged promoter shares as indicative of the company's

Poddar

debt position, even though the shares may have been pledged for various other reasons, including for personal loans of promoters," (Chandan Taparia, Technical and Derivatives Analyst, Motilal Oswal Financial Services). Similarly, when markets crash, these shares bear the brunt of selling and, hence, suffer deeper losses. Many times recovery in share prices for such stocks would be slow, unless the percentage of shares pledged is drastically lowered by the promoter. Due diligence to be done by investors when there is increasing trend in shares pledged by the promoter. Else investors will have to face rude shocks, during sell-offs.

Singh, 2018, Promoters pledging of shares even though legal, has its share of risk involved. If promoters of debt- burdened listed entities also go in for creating equity-backed bonds than the risk would increase. On January 27, 2006, Securities and Exchange Commission (SEC) published a document recognizing that the share pledges of the CEO of WorldCom may have led to the fall of the company and solicited public feedback on regulating share pledges by promoters.

RBI Annual Report, The Purchase of stocks with low price earnings multiples results in greater appreciation along with higher income Nicholson, which was also supported by R.French , Studies of Brief ,and Block ,] states that price to book ratio is the price paid for book value. Peasnell [37] states that financial indicators based on accounting information are sufficient in order to determine the value for shareholders According to the RBI Annual Report, 1995-1996, it is very clear that Mumbai Stock Exchange sensitive Index and the lagged net investment by Foreign Institutional Investors are significant and positively correlated.

Objective of the Study

- To Understand motives behind the share pledging by promoters.
- To evaluate the risks involved in promoters share pledging.
- To study, if highest percentage of promoters share pledging impact the stock prices.

RESEARCH METHODLOGY

Research Design: The study is based on secondary data. The relevant data are collected from different books, newspaper articles, management journals and also the data collected from Moneycontrol, CNBC, NSE India, BSE India, Trendlyne, and Screener sites and also the disclosures made by the companies as per legal compliance. The referred period of study is 3 years from January 2017 till December 2019 taking 2016 as a base year. The study covers three sectors where share pledging is high. The referred sectors are Electronic utilities sector, Iron & steel sector and construction & engineering. The data are presented in a tabular form along with column and bar charts to facilitate the study. Column charts are used in study to show the data change over a period of time and illustrating the comparison. Percentage wise pledged shares and stock price on annual (2019) and

average basis (2017 – 2019) is also used to evaluate the performance with stock market.

Scope of the study: The study deals with analyzing and comparing the stock performance with sensex over a period of three year and companies' promoters pledged data. It is the share value performance of the listed Companies. The study has outlined the areas that are to be covered in-order to bring out the actual share value performance of given sectors. For this purpose, three sectors with five companies which are listed in the BSE have been selected to find out the actual share value performance. These companies were selected due to its presence in the BSE for a prolonged period. Also the sectors selected for the study where promoters share pledging is high.

Sample Selection: Electronic utilities, iron & steel and construction & engineering sectors from listed BSE companies has been chosen for the study keeping in mind higher percentage of promoter shares pledged data and companies' shares prices with Sensex return. The study covers companies stock prices in comparison with sensex for the period of three years starting from 2017 to 2019. It is based on secondary data collected from the various financial websites such as BSE, NSE, Trendlyne, Moneycontrol, etc and the company's website.

Data Collection and Analysis: For data collection and analysis, five companies in each sector have been identified and detailed analysis is done below in two tables and four charts for each sector. The tables capture share prices over the years, promoters share pledged percentage data and YOY percentage share price return along with sensex return. The charts capture increase or decrease in percentage pledged data, recent year & three years average return in comparison with sensex return.

Electric Utility Sector

Rattan India Power Ltd. Jaiprakash Power Ventures Ltd. KSK Energy Ventures Ltd. Reliance Infrastructure Reliance Power

Table 1 exhibits details shares price of each company at the beginning of each year. Year 2016 share price is taken as base for calculation of year on year percentage return of stock prices.

Table 2 exhibits details of increase / decrease in promoters share pledged of each company at the beginning of each year. Year 2016 pledged percentage is taken as base for calculation of year on year percentage return of stock prices.

The above chart exhibits the companies return with Sensex performance for year 2019–20. In the comparison of companies share price with sensex it is observed that, all companies showing negative return as compare to sensex. Despite sensex was positive, the companies return was negative.

The above chart exhibits the average three yeas stock return for all five companies. Only Jaiprakash power gave positive return with sensex. Though it underperformed the sensex. All other companies gave average negative return as compare to average sensex return. Ksk energy venture showed highest negative return (56.25%) as compare to other companies.

Table 1. Share Prices and YUY F	keturn in P	ercentage						
	Electric Utilities							
	S	hare Price	s			YOY Share	Price Retu	ırn
Company Name	2016-17	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	3 Yr Avg
Sensex					27.90%	5.90%	14.38%	16.06%
Rattan India Power Ltd.	6.90	8.05	3.45	1.85	16.67%	-57.14%	-46.38%	-28.95%
Jaiprakash Power Ventures Ltd.	3.85	9.20	2.05	1.55	138.96%	-77.72%	-24.39%	12.28%
KSK Energy Ventures Ltd.	15.35	12.85	1.55	0.55	-16.29%	-87.94%	-64.52%	-56.25%
Reliance Infrastructure	467.20	553.00	305.00	29.48	18.36%	-44.85%	-90.33%	-38.94%
Relaince Power	40.40	50.25	28.65	3.50	24.38%	-42.99%	-87.78%	-35.46%

(Sources BSE, NSE and Trendlyne reports)

			Electr	nic Utilities				
		Pledge	d Data		Y			
Company Name	Pledged % 2016- 17	Pledged % 2017- 18	Pledged % 2018- 19	Pledged % 2019- 20	Stock Return % 2017- 18	Stock Return % 2018- 19	Stock Return % 2019- 20	Average Return YoY % - 3 Years
Sensex		1		1	27.90%	5.90%	14.38%	16.06%
Rattan India Power Ltd.	98.72%	96.15%	96.08%	82.87%	16.67%	-57.14%	-46.38%	-28.95%
Jaiprakash Power Ventures Ltd.	83.30%	83.30%	86.87%	87.30%	138.96%	-77.72%	-24.39%	12.28%
KSK Energy Ventures Ltd.	95.21%	92.45%	90.27%	90.27%	-16.29%	-87.94%	-64.52%	-56.25%
Reliance Infrastructure	63.35%	66.06%	83.59%	85.69%	18.36%	-44.85%	-90.33%	-38.94%
Reliance Power	64.40%	70.13%	82.84%	76.83%	24.38%	-42.99%	-87.78%	-35.46%

(Sources: BSE/ NSE and Trendlyne websites)







Poddar

Construction & engineering sector Patel Engineering Ltd.

Gayatri Projects Ltd. RPP Infra Projects Ltd. Hindustan Construction Co. Ltd. Gammon Infra Ltd.

Table 3 exhibits details shares price of each company at the beginning of each year. Year 2016 share price is taken as base for calculation of year on year percentage return of stock prices.

Table 4 exhibits details of increase / decrease in promoters share pledged of each company at the beginning of each

year. Year 2016 pledged percentage is taken as base for calculation of year on year percentage return of stock prices.

The above chart exhibits the companies return with Sensex performance for year 2019-20. In the comparison of companies share price with sensex it is observed that, all companies showing negative return as compare to sensex. Despite sensex was positive, the companies return was negative.

The above chart exhibits the average three yeas stock return for all five companies. All other companies gave average negative return as compare to average sensex return.

Table 3. Share Prices and YOY Return in Percentage										
		Construction and Engineering								
	S	Share Prices YOY Share Price Return								
Company Name	2016-17	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	3 Yr Avg		
Sensex					27.90%	5.90%	14.38%	16.06%		
Patel Engineering Ltd.	61.73	59.30	28.73	14.40	-3.94%	-51.55%	49.88%	-35.12%		
Gayatri Projects Ltd.	134.29	226.15	178.35	79.75	68.40%	-21.14%	-55.28%	-2.67%		
RPP Infra Projects Ltd.	231.45	297.00	128.45	69.30	28.32%	-56.75%	-46.05%	-24.83%		
Hindustan Construction Co. Ltd	39.70	41.00	13.10	10.05	3.27%	-68.05%	-23.28%	-29.35%		
Gammon Infra Ltd.	3.70	3.85	0.65	0.40	4.05%	-83.12%	-38.46%	-39.17%		

(Sources: Bse/Nse and Trendlyne reports)

Construction and I	Engineering							
	Pledged D	ata		YOY % R	-			
Company Name	Pledged % 2016- 17	Pledged % 2017-18	Pledged % 2018- 19	Pledged % 2019-20	Stock Return % 2017- 18	Stock Return % 2018- 19	Stock Return % 2019- 20	Average Return YoY % 3 Years
Sensex		P			27.90%	5.90%	14.38%	16.06%
Patel Engineering Ltd.	0.00%	93,90%	93.29%	99.41%	-3.94%	-51.55%	-49.88%	-35.12%
Gayatri Projects Ltd.	94.53%	93.64%	93.64%	99.90%	68.40%	-21.14%	-55.28%	-2.67%
RPP Infra Projects Ltd.	51.47%	70.99%	79.70%	69.84%	28.32%	-56.75%	-46.05%	-24.83%
Hindustan Construction Co. Ltd.	71.42%	85.38%	91.76%	92.14%	3.27%	-68.05%	-23.28%	-29.35%
Gammon Infra Ltd.	95.93%	100.00%	100.00%	100.00%	4.05%	-83.12%	-38.46%	-39.17%

Iron & steel sector

Rope & wire Ltd Visa Steel Ltd. Jindal Stainless Ltd. Jindal Steel (Hisar) ISMT Ltd. Table 5 exhibits details shares price of each company at the beginning of each year. Year 2016 share price is taken as base for calculation of year on year percentage return of stock prices.

Table 6 exhibits details of increase / decrease in promoters share pledged of each company at the beginning of each

year. Year 2016 pledged percentage is taken as base for calculation of year on year percentage return of stock prices.

The above chart exhibits the companies return with Sensex performance for year 2019-20. In the comparison of companies share price with sensex it is observed that, all companies showing negative return as compare to sensex. Despite sensex was positive, the companies return was negative except for Jindal stainless ltd.



The above chart exhibits the average three yeas stock return for all five companies. All other companies gave average negative return as compare to average sensex return except Jindal stainless steel and Jindal steel (Hisar).

Findings and Interpretations: In the selected sectors, companies with the highest and increased pledging of promoter's shares, underperformed and gave negative returns to retail investors over the three years period despite sensex showed positive and upward trend.



Table 5. Share Prices and YOY Return in Percentage									
		Iron & Steel							
	S	Share Prices				YOY Share Price Return			
Company Name	2016-17	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	3 Yr Avg	
Sensex					27.90%	5.90%	14.38%	16.06%	
Bharat Wire Ropes Ltd	75.10	30.45	29.00	28.00	-59.45%	-4.76%	-3.45%	-22.55%	
Visa Steel Ltd.	16.85	19.90	8.85	4.90	18.10%	-55.53%	-44.63%	-27.35%	
Jindal Stainless Ltd.	37.65	104.30	34.20	38.65	177.03%	-67.21%	13.01%	40.94%	
Jindal Hisar	89.55	225.80	92.30	75.65	152.15%	-59.12%	-18.04%	25.00%	
ISMT LTD.	8.60	15.75	8.30	4.45	83.14%	-47.30%	-46.39%	-3.52%	
(Sources Bse, Nse, Trendlyne Reports)									

- 1. Findings in electric utilities sector For the year 2019-20, all the companies under this sector underperformed the market and gave negative return compared to the market. Over the period of three years except Jaiprakash Power Ltd, all other companies' average stock prices gave negative return. However, Jaiprakash Power Ltd. gave lesser positive return than the sensex return.
- 2. Finding in construction and engineering sector For the year 2019-20, all the companies under this sector underperformed and gave negative return compared to the market. Over the period of period of three years all the companies underperformed the market and gave negative share price return.
- 3. Finding in iron and steel sector For the year 2019-20,

all the companies under this sector underperformed the market and gave negative return except Jindal stainless steel Ltd, which gave positive return but underperformed the sensex return. Over the three periods of time except Jindal stainless steel Ltd and Jindal steel (Hisar) Ltd, outperformed the market and all other companies underperformed the market.

- 4. Interpretations
- 5. Companies where promoters has pledged more than 50% of their total share holdings as of December 2020 has underperformed and gave negative share price return despite of positive return in Sensex.
- 6. The negative pattern is observed in three year average share prices despite positive return in

Sensex. So it's clear that irrespective of the market condition stock prices with higher promoter stock pledging underperform over the years.

7. In some cases despite high and increasing promoter share pledging, it is observed that share prices have gone up and given positive share price returns to retail investor.

Limitations of the Study: The study is based on secondary data obtained from the published reports, articles and business websites and as such its finding depends entirely on the accuracy of such data, covers a period of three years based on availability of data. The present study

has taken electric utilities, construction and engineering and iron and steel sector. In each sector, five companies with highest pledging of shares by promoters is selected for three years (2017-18 and 19-20). The remaining Companies are excluded from the present study. So, it is very difficult to give complete picture about the impact of pledging on stock prices.

The analysis of financial statement of business enterprise gives diagnostic indicators. Researcher being outside, external analyst obviously has no access to internal data. Therefore, inside view of the organization cannot be characterized in the study.

			Ir	on & Steel		10		
	Pledged Data				Y			
Company Name	Pledged % 2016-17	Pledged % 2017-18	Pledged % 2018-19	Pledged % 2019-20	Stock Return % 2017-18	Stock Return % 2018- 19	Stock Return % 2019- 20	Average Return YoY % - 3 Years
Sensex	1				27.90%	5.90%	14.38%	16.06%
Bharat Wire Ropes Ltd.	0.00%	0.00%	41.47%	70.22%	-59.45%	-4.76%	-3.45%	-22.55%
Visa Steel Ltd.	100.00%	100.00%	100.00%	100.00%	18.10%	-55.53%	-44.63%	-27.35%
Jindal Stainless Ltd.	37.27%	91.35%	85.77%	82.48%	177.03%	-67.21%	13.01%	40.94%
Jindal Hisar	66.09%	87.70%	87.70%	87.70%	152.15%	-59.12%	-18.04%	25.00%
ISMT Ltd.	72.77%	72.77%	72.77%	90.94%	83.14%	-47.30%	-46.39%	-3.52%



Future Scope: The limitations of the present study give scope for the future research. Future research can be carried out by considering more sectors and companies. if data collection is of more study period and companies' conclusion may differs. Future research can be carried out to find share price by considering the revocation of pledged shares to evaluate the impact of the promoters pledging on their stock prices. However going forward due to change in nature of companies and changes in government regulations for more transparency, promoter share pledging may not have that much of negative impact on share price.



CONCLUSION

Promoter uses share pledging as method capital raising which can be used for expansion, working capital or personal requirements. Pledging of promoters share become extremely risky with highest percentage. It may erode earning of company which in turn will result in negative performance of the company. Market analyst view of highest promoter share pledging as negative attribute of the company and stay away from buying/ selling of company share. Companies share prices underperform in stock market where promoter share pledging is very high even though the sensex shows upward trend and share prices of the other companies in the same sector perform better. For a retail shareholder, a high amount of promoter share pledging with bad financials could lead to the banks or financial institutions to dump company shares in open market to recover its dues. This would result in very negative effect on the stock price resulting in a huge loss to the retail shareholder.

Recommendation

- 1. The first objective explains the motives behind the share pledging. In many cases promoters motive is not clear and create ambiguity about the company. The companies with strong management teams can use the funds raised by pledging of the shares to expand the company's operations and boost its revenue. There is no rule of the thumb that a fundamentally strong company with less of promoter's shares pledging shouldn't be considered as a problem. However, retail investor must assess company's cash flow before making any investment decisions.
- 2. The second objective give understanding about the risk associated with promoter share pledging. Apart from negative impact on share prices it increases volatility in the market, skewed management decisions and a value trap for investors.
- 3. The final objective on the analysis is that highest promoter share pledging impact the share prices of the company. For all the three sectors chosen for study, companies underperformed the market and gave negative share price return. However, in two cases, the highest promoter pledging of shares gave positive share price return. Retail investor must do detailed study of the company financials along with promoter share pledging.
- 4. The Indian economy is setting to rise up. The pledging of promoter's shares is not necessarily bad. Even if a company has a high percentage of promoter's shares being pledged, if its operating cash flow is constantly increasing and the company has good prospects, it can be worth investing in for retail investors.
- 5. It is advised that retail investor must be watchful and need to regularly track increase & decrease in promoter share pledging year on yes and promoters motive behind share pledging. As in most of the cases companies gave negative year on year return and underperform though market trend was positive.

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A Theoretical Study of E-Loyalty

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ABSTRACT

Indian consumers have predominantly been dependent on the small neighborhood store (the unorganized sector). Inspite of the development of the organized sector (the organized brick and mortar stores and e commerce websites), it constitutes only 10 percent of the complete retail market. The experience for most consumers during the initial phase of the pandemic was not very good with some essential good websites, when they tried to make purchases online (ERetail.com, Mar 25, 2020). Later there was a change and the websites were better equipped to handle the rush for online purchases. Post the Covid 19 Pandemic, there is a shift in the way consumers make their purchases. The E-Commerce market had a sudden shift – the change that would have happened in 3 to 5 years time in the future (as was predicted), but was being seen in a few months. In a global consumer survey, there is an increase in the proportion of online purchases (1 in 5 grocery online purchasers were first timers and 1 in 3 for people who were more than 56 years of age) (Accenture 2020). Considering the shift in consumer behaviour, e loyalty is an important aspect of study for the e retailer.

KEY WORDS: E-LOYALTY, RETAIL, ONLINE, CONSUMER.

INTRODUCTION

(Reichheld & Schefter, 2000) in the article "E-Loyalty: Your Secret Weapon on the Web" in Harvard Business Review have stated that there is a perception in people's mind that e loyalty does not exist but that is not true. Contrary to belief, loyalty online is very much prevalent. But if sellers online fail to get the loyalty of their online existing and profitable customers then they will be selling to buyers who purchase online from sites that sell at a comparatively lower price. According to them, trust is the most essential element dominating the online market and not price (Chincholkar & Sonwaney 2017)



As per the ibef report for November 2020, the Indian online retail market in 2017 was 17.8 billion USD and was estimated to cross 60 billion USD in 2020. The Indian Retail Market in India is 25% of the total organized market and the estimation is 37% by 2030. Besides 15 to 20 thousand pin-codes in India are already covered by online retailers (the total pin codes is approximately one hundred thousand).

According to a December 2020 report "Ecommerce in India" by ecommerceDB, 40% of the population shop online and net online sales in Indian E Commerce market were 33 billion USD in 2019. All these figures speak of the growth of the online market and so e loyalty is an important factor of study (Giao, Vuong, & Quan 2020).

Literature Review: The research papers on e loyalty have been written with reference to technological products, books, travel and banking services. These studies have been done majorly in the United States (Jamaludin & Ahmad 2015). The definition of e loyalty as has been proposed by (Toufaily et al., 2013) "the customer's willingness to maintain a stable relationship in the future and to engage in a repeat behavior of visits and/or purchases of online products/service, using the company's website as the first choice among alternatives, supported by favorable beliefs and positive emotions toward the online company, despite situational influences and marketing efforts that lead to transfer behavior" (Joe ilsever 2007).

Table 1. Consumer E loyalty references:				
Author	Important characteristics of e loyalty	Remarks		
(Nagvadia & Bhatt, 2020)	The authors of the research have done an exploratory factor analysis and identified the following : ease in searching, in usage, flexibility, secure transactions, honesty, privacy, enjoyment, good experience, as important for online loyalty.	The study was done in Ahmedabad only. As suggested by the authors, a comparative study between urban and rural areas could be done.		
(Giao et al., 2020)	This research confirmed the role of e-satisfaction in predicting customers' e-loyalty and that it makes the customer have positivity about sellers online.	The study was done in Vietnam. The study suggested that the research can be done to study the impact on the basis of demographics of the consumers.		
(Rachbini, 2018)	The results of this study say that on the Internet, trust, perception of risk, and perception of benefit have a great impact on customer's intention to purchase.	The study was carried out in Indonesia only with a limited sample.		
(Chincholkar et al., 2017)	Product quality, price, discounts and offers, less time to deliver the product are important factors that impact on online buyer and women are more loyal to websites.	The data for the study was from Mumbai only and without consideration for any product /category		
(Jamaludin & Ahmad, 2015)	The study states that if people visit the website again then there are higher chances of trust, loyalty to and purchase from the website.	The target group for the study was undergraduate students in Kuala Lumpur.		
(Tontini et al., 2015)	Service speed, accessibility has an enforcing effect on satisfaction for the customer leading to e loyalty. The paper also speaks of importance of recovery in case of fault for loyalty.	The study is exploratory in nature and as suggested a study should be done to study the relationship between dimensions of online retail stores quality.		
(Toufaily et al., 2013)	The paper makes a mention of various online customer loyalty definitions. The variables of customer characteristics that are important for e loyalty have been grouped as: Relational (trust, satisfaction, commitment) Perceptional (risk, value, switching cost) Psychological (aggressiveness, motivations, attitude, repeat purchase intention) Relationship with technologies (user experience, information of the website, preferences) The variables of service/ product characteristics	A theoretical study that states that research needs to focus on the concept of e loyalty from the angle of commitment, building strong relationships, and not only satisfaction		

	that are important for e loyalty are stated as: Quality, price perception, discounts Et rewards, volume of purchase. The retailer characteristics are: strategy, reliability, competency, IT policies, support service. The website characteristics under consideration are: design, security, ease of use, content, trustworthiness, empathy, credibility, customization.	
(Kassim & Abdullah, 2008)	This paper speaks of satisfaction and secure feeling leading to trust and reliability in the online market.	The study was on a small sample. Cultural influences can be studied in the case of online retailers.
(Joe ilsever, 2007)	A model presented by the authors makes a mention of visibility of content, quality of internet system, quality of design, satisfied user, user concentration leading to flow and to e-loyalty. The authors have mentioned flow as a state of the mind when an individual is engrossed in an activity.	The paper has conceptualized hypotheses for testing in the future.
(Koufaris & Hampton- Sosa, 2004)	Good interface, and navigation are equally important for customer retention besides customer service, price and enjoyment. Most web based companies are providing features that facilitate the customers experience.	Most researchers study loyalty of customers on the basis of return visits, but in this paper the authors have studied the customer's return intentions.
(Gummerus et al., 2004)	The paper speaks of factors prime for e loyalty as User interface, Responsiveness, Security, Need fulfillment which leads to trust and as an after effect to satisfaction and loyalty	The study was done on healthcare industry websites. The authors felt that website usability factors should be studied by researchers.
(Srinivasan et al., 2002)	The paper mentions factors that have an impact of e loyalty customization, contact interactivity, care, community, convenience, cultivation, choice, and character. It also makes a mention on the customers as word of mouth promotion and being ready to pay more	The paper claims to have not studied variables at customer level and business level.
(Palmer, 2002)	Download speed, Navigability, interactivity, responsive, content- associated with greater perceived success by site users	The research was carried out on undergraduate, graduate and management students.

Online Customer Loyalty has been classified by various thinkers as intentional, behavioural, cognitive, affective, conative. Intentional or attitudinal loyalty has been measured on the basis of intention to continue with the website, positive word of mouth. Behavioural loyalty is measured by the number of times the customer makes purchases in a year from the same site, the time spent on the site, number of referrals to the site. Cognitive, affective, conative and action loyalty is judged on the basis of preference vis-à-vis other sites, offers, services offered, performance (Palmer 2002). Other factors that impact online loyalty are switching costs, the website value to the consumer, psychological factors like lethargy, mindset of the customers, determination. Basically the factors have been placed under different brackets as consumer characteristics, product or service characteristics, retailer characteristics, website characteristics and environmental characteristics. The researchers have also studied the effect of e loyalty that include increase in cross sales, share of wallet, promotes customers online word of mouth, reduction in sensitivity to price- ready to pay more, and re-purchase from the site (Kassim & Abdullah 2008).

CONCLUSION

From the research papers / literature review, the common factors that impact e-loyalty or are important elements of online loyalty are security, convenience, personalization, discounts, offers, rewards, and trust. It has also been suggested by researchers that the angle of commitment, building strong relationships, cultural influences should also be studied. The studies undertaken by the researchers in the references were with limited target groups (for example- students) with convenience sampling, limited product/ service categories, specific areas/ cities. The future {Bibliography}research on online loyalty can be carried out such that it covers a more representative population.

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A Review of Internet Protocol Version 6 (IPv6) Security Network

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ABSTRACT

This paper is about IPV6 security. The current version followed is Internet Protocol IPv4 that is used to send data over the Internet. It makes interaction between different services possible. As we know, this protocol has significant limitations, mainly the maximum addressing space and some known security issues. The security problems are in many ways, dependent upon the original development project, which certainly did not consider "security" as a determining factor, and the whole final environment was considered to be friendly. However, over many years, as response to these deficiencies and in consideration of a global network in rapid growth, new technologies such as SSL/TLS and IPSec, have been introduced for remedying these issues. Despite these enhancements, however, the whole architecture is still missing the level of security and flexibility that was expected. As result of these known limitations, a new project for a new Internet Protocol has been designed by the Internet Engineering Task Force(IETF) in the early 90', having in mind "ease-of-configuration", performance and security. In this paper we are going to analyze the security features of the new internet protocols IPv6 its advantages and disadvantages, as well as the possible implications from a security point of view.

KEY WORDS: PROTOCOL, PERFORMANCE, ENGINEERING TASK, SSL/TLS.

INTRODUCTION

1.1 What is IPv6?: An Internet Protocol Version 6 (IPv6) address is a 128-bit alphanumeric string to identify an endpoint device in the IPv6 addressing scheme arranged in eight blocks, each of which is 16 bits. Each block is expressed as four hexadecimal digits and these blocks are separated by colons.

1.2 History:

• IPv6 is the latest version of the Internet Protocol used to identify devices across the internet in order to locate them. Every device over the internet is



identified through its own IP address in order for internet communication to work. In that respect, it's just similar to the street addresses and zip codes we need to know in order to mail a letter.

Bioscience Biotechnology

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- The previous version that is IPv4, uses a 32-bit addressing scheme and supports over 4 billion devices, which was initially thought to be enough. However, the growth of the internet, personal computers, smartphones and various other devices and now Internet of Things devices proves that the world needed more addresses.
- Fortunately, the Internet Engineering Task Force (IETF) recognized this about20 years ago. In 1998 it created IPv6, which instead of 32-bit uses 128-bit addressing to support approximately 340 undecillions. Instead of the IPv4 address method of four sets of one- to three-digit numbers, IPv6 uses eight groups of four hexadecimal digits, separated by colons known as hextets.

1.3 IPv4 vs IPv6: To overcome IPv4 security issues, new technologies, like SSL/TLS and IPSec, have been introduced to remedy these issues. SSL (Secure Sockets



Bansode & Girdhar

Layer) is the technology that keeps an internet connection safe and secure carrying sensitive data being sent between two systems and preventing attackers from reading or modifying any information transferred, that includes potential personal details. It makes use of encryption algorithms that scrambles the data in transit, preventing hackers from reading it as it is sent over the connection. This information could be anything sensitive or personal which can include credit card numbers and other financial or transaction information, names and addresses.

Figure 1.1 IPV6 Address	Figure 1.2 IPV6 Example
IPv6 addresses	Example of the IPV6 address format
 128-bits (four times as large) 8 fields of 16 bits each (4 hex digits) separated by colons (i) [Hex digits are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, c, f) 2¹²⁴ possible addresses (an incomprehensibly large number) 	rDEC : eAres : 72551 : 3210 : ADEF : 88FF : 2922 : FFFF Global Prefix Subnet Interface ID
2001:0db8:3902:00c2:0000:0000:0000:fe04	Here each block is denoted in hexadecimal digits and each block is separated by a colon.

Transport Layer Security (TLS) is an advance, updated and more secure version of SSL. Despite these enhancements, however, the whole architecture is still missing the security and flexibility level expected. As result of these certain known limitations, by the IETF, a new project for a new Internet Protocol has been developed in the early 90', having in mind "ease-of-configuration", performance and security.

II. IP Addresses Security

2.1 IPv4 Security Issues: The following are the security issues of IPv4 some of which are common in both IPv4 and IPv6 address protocols:



- 1. Reconnaissance Attacks: This kind of attack takes place because of the relatively small size of IPv4 addressing, because a whole network can be scanned to find open or unpatched services. It is pretty easy to perform a reconnaissance scan of a class C network in a few minutes. We can add methods such as "Ping Sweep" "Port Scan" and "Application Vulnerability Scan" in this category.
- 2. Denial of Service Attacks: In this kind of attack, a service is rendered unavailable through a flood of large amounts of illegitimate requests. We can to mention the smurf attack this category.
- 3. Man-in-the-middle Attacks: The lack of its own

authentication mechanism in communications lets hackers to intercept data in transit.

- **4. ARP poisoning Attacks:** In IPv4, ARP (Address Resolution Protocol) is the one responsible for mapping a host's IP address with its physical MAC address. This information is stored locally in (ARP Table) by each host which is part of the communication. The ARP Poisoning attack includes sending malicious ARP packets to some default gateway on a network in order to change the pairings in its IP to MAC address table.
- 5. Address Spoofing Attacks: The current communication protocols have one of the keys to complete cyberattacks is the ability to modify the source address of a packet. IPv4 allows this possibility since it does not provide any kind of source-to-end authentication mechanism. These types of attacks are used to spread spam, malware and also to perform DoS/DDoS attacks. IP spoofing also allows masking the true and exact origin of the malicious packets, making the tracking operations more complex.
- 6. Malware Attacks: Malware, remains one of the biggest security-related problems today. When it comes to IPv4, malware cannot just damage the host affected, but saturate (or use part of) the network resources in place as well. It's necessary to mention that, with the advent of IPv6, there was no way to eradicate these threats and issues, and the conception of the potential damage by malware infection will essentially remain the same. It's possible to assume that, however, due to the broader spectrum of addressing, its spread could be slower and time consuming.



2.2 What's New in IPv6?: IPv6, along with the basic features of an IP address protocol, it is a totally new suite of protocols. This means that the differences between the two are marked:

- **1. Address Space:** IPv4 provides as many as 2³² addresses. It provides as many as 2¹²⁸ addresses.
- 2. Hierarchical Addressing: In IPv6 there are 3 major types of addresses: Unicast, Multicast and Anycast.
- **3. QoS (Quality-of-Service) and Performances:** The IPv6 packet header provides fields that facilitate the support for QoS. In addition, the new standard is way forward in terms of performance.
- **4. Security:** The use of IPSec in IPv6 is not optional, but it is mandatory.
- **5. Extensibility:** In spite the new features and the considerable increase of addressing space, the IPv6 header is only slightly bigger than that of IPv4. The IPv6 header does not include checksum and any optional fields. Here are explanatory images of an IPv4 header and an IPv6 header for ease of comparison: In IPv4, the IPv4 header is followed by data of transport protocol (TCP, UDP), also called "payload." The IPv6 header has "Extensions Header" and thenfollowed by data of transport protocol.
- **6. Auto-Configuration:** IPv6 provides both stateful and stateless auto-configuration of IP addresses. Stateful auto-configuration utilizes DHCP whereas Stateless auto-configuration occurs without the use of DHCP.



2.3 Security Enhancements: It is fair to consider that IPv6 is not necessarily more secure than IPv4 for a correct point of view. The approach to security put in place, even though considerably implemented, is still marginal and not totally new. However, there are some considerations that, without doubt, it has increased the level of IPing reliability.

1) Mandatory use of IPSec: IPv4 also offers IPSec support. But, support for IPSec in IPv4 is optional. The RFC4301 instead makes it mandatory for IPv6 to use IPSec. IPSec consists of a set of cryptographic protocols made to provide security in data communications. IPSec has AH (Authentication Header) and ESP (Encapsulating Security Payload) in its suite. The first provides for authentication and data integrity, the second, in addition to these, also provides for confidentiality.

A fundamental concept of IPSec is "Security Association". SA is uniquely identified by some parameters like SPI (Security Parameters Index) which is a field in the AH/ ESP header, the security protocol and the destination IP address. The SA defines the security services type for a connection and usually contains the key for data encryption as well as the encryption algorithms to be used. The Internet Key Exchange (IKE) is the process that is used for negotiating parameters needed to establish a new SA. Following are details about the AH and ESP:

AH (Authentication Header): AH provides for authentication along with the data integrity for the entire IPv6 packet. The meaning of "Authentication" is that if an endpoint receives a packet with a particular source address, it assures that the IP packet did indeed come from that IP address. Assuring that if any endpoint receives data, the original content of that data has not been modified in the path from the source to the destination is called "Integrity". The format for AH is shown below:

Next Header is a field which is used to identify the type of transport, such as UDP. Payload Length helps identifying the length of Authentication Header. The SPI field provides for identifying the security parameter index which will be used to identifying the SA. The "Sequence Number Field" is a counter that is incremented by 1 when a sender or a receiver receives or transmits some data. By SNF, an anti-replay protection is provided, because when the receiver receives a packet with a duplicate Sequence Number Field, this is discarded.

The Authentication Data contains the Integrity Check Value (ICV) which provides for data integrity and authentication. The ICV is calculated by using the IP header, the IP packet payload and AH header. What happens actually is that when the receiver receives the packet, it calculates the ICV with some algorithm and the specified key in SA. As per the details mentioned and the technology that is used, AH can prevent "IP Spoofing Attack".

ESP (Encapsulating Security Payload): The ESP gives confidentiality, authentication and data integrity. Confidentiality means that nobody else, even the intended receiver, can read the content of communication in transit. ESP provides an anti-replay protection also. The format of an ESP packet:



ESP also has an SPI field that identifies the SA. The Sequence Number field, like in the AH, provides an anti-replay protection facility. Next Header field, which describes the data type contained in the Payload Data field (the entire packet if ESP is used in Tunnel Mode or only payload if is used in Transport Mode). The Authentication Data field contains the ICV (if auth service is specified by SA associated with SPI), which provides authentication and data integrity. The authentication

Bansode & Girdhar

algorithm used to calculate the ICV is also specified by the SA.

2) Large Addressing Space: As mentioned before that in IPv4, reconnaissance attacks and port scanning are simple tasks relatively. The most common network segments in the current Internet Protocol (IP) are that of class C, with 8 bits allocated for addressing. Performing this type of attacks on these network segments does not take more than a few minutes. Allocating 64 bits for addressing ,as expected in an IPv6 subnet means performing a net scan of 2⁶64 that is equal to 18446744073709551616 hosts is practically impossible.

3) Neighbour Discovery: Neighbour Discovery (ND) is the mechanism that is used for router and prefix discovery. It is a network layer protocol, like IPv4 equivalents ARP and RARP. ND works too closely with address auto-configuration, that is the mechanism used by IPv6 nodes to acquire configuration info. ND and address auto-configuration both contribute to make IPv6 more secure than its predecessor.

III. IPV6 Security

3.1 Advantages provided by IPv6: The main advantage of IPv6 is that it provides a lot more address space. IPv6, being a more recent protocol, surely, does have a few design improvements over IPv4, particularly in the areas of auto-configuration, mobility and extensibility. But increased address space is the main benefit of IPv6.

3.2 What are the key security concerns?: There are a lot many factors which make the IPv6 protocol suite challenging from a security point.

- IPv6 implementations are less mature than that of their IPv4 counterparts making it to have a number of vulnerabilities to be discovered and mitigated before their robustness matches that of the existing IPv4 implementations.
- Security products like firewalls and Network Intrusion Detection Systems have less support for the IPv6 protocols than for their IPv4 counterparts.
- A number of transition or co-existence technologies have been developed to aid in the deployment of IPv6 and the co- existence of IPv6 with the IPv4 protocol. These technologies will increase complexity of the network which may introduce new attack vectors in existing networks.
- Technical personnel have lesser confidence with the IPv6 protocols as compared to their IPv4 counterparts. This creates a likelihood that security implications are overlooked when the protocols are deployed.

IV. Security Implications

4.1 What should be done?: Risk assessment can be completed on how IPv6 and related technologies (such as transition or co-existence technologies) may affect the security of existing IPv4 networks. Develop a plan for transition; IPv6 affects every network and there is no 'do nothing' option. Ensuring that relevant staff, such as network engineers and security administrators,

are confident with IPv6 and related technologies before they are required to deploy and operate IPv6 in production networks. Working with equipment and application suppliers to improve the robustness of its implementation, such that the robustness of IPv6 implementations roughly matches that of typical IPv4 implementations can be done.

4.2 Security implications of IPv6 A brief comparison of IPv4 security and IPv6 security: The security implications of the basic IPv6 protocol are very similar to those of IPv4. Similar vulnerabilities are present in both protocols, with the differences lying in the specific attack vectors provided by each of protocol. However, IPv6 protocol suite has a number of supporting protocols that are more complex in general than their IPv4 counterparts (or that were not even present in the IPv4 protocol suite).

For example, for the host configuration, IPv6 provides not only DHCPv6 (the equivalent of DHCP for IPv4), but also a mechanism for Stateless Address Auto-Configuration (SLAAC) that introduces a lot of attack vectors which were not present in IPv4. Regardless of the similarities and differences between IPv4 and IPv6, there is a key aspect in the resulting level of security of IPv6 networks is the level of IPv6 support in security devices.

It is generally the case that there are better security features in IPv4 products compared with IPv6 products, either in terms of performance, the variety of products, the variety of features. This will probably make it difficult to enforce exactly the same policies in IPv6 networks like how they are enforced in IPv4 networks, at least for a period of time. As a result, this situation could be exploited by attackers who may leverage IPv6 for bypassing network security controls.

Transition planning: There are a variety of transition mechanisms and a variety of network scenarios in which the IPv6 protocols can be deployed that might be employed in each of those scenarios for the purpose of deploying IPv6. It is important that the appropriate scenario and mechanisms are identified at the outset before resources are expended or weaknesses are exposed. As the least, the transition plan should include:

- A requirements analysis for identifying scope;
- A sequencing plan for the implementation process;
- Development of IPv6 policies as well as mechanisms;
- Development of training for key team members;
- Development of a test plan for interoperability and compatibility;
- Maintenance along with the monitoring programmes;
- An ongoing and continuous update plan for critical architecture;
- Plan for the phased withdrawal from service of IPv4 services and equipment.

Security implications of a dual-stack approach: IPv6 is not backwards compatible with IPv4. This usually

means that at least during the transition period IPv6 will need to operate in parallel with IPv4. This has a plenty of security and operational implications. Running a dual-stack which means running IPv4 and IPv6 simultaneously, increases the complexity of a network. Dual-stack nodes need to implement two different protocols, network administrators need to configure two different set of protocols, security administrators need to enforce security policies for two different sets of protocols, and so on.

At core routers, support of both IPv4 and IPv6 protocols generally means that two instances of routing protocols and routing tables must be supported, that increases the complexity in the network and may increase the hardware requirements, and increases the available attack surface. In some of the cases, legacy devices might not provide the necessary IPv6 functionalities to match that currently provided for IPv4, and this may result in asymmetric functionality or enforced policies for IPv4 and IPv6. "CORE, 2007" is about an advisory of IPv6 vulnerability found in a highly secure operating system. This, probably is a good example that running two protocol stacks comes with a cost. Transition technologies may also add to this burden, as in usual they not only result in increased complexity, but also prevent existing security devices from enforcing the same type of policies that they can apply to native IPv4 or native IPv6 traffic.

Security implications of NAT-free network architectures:

Network Address Translators (NAT) provides many benefits in a network like reduced host exposure, host privacy/ masquerading and topology hiding. The recent internet architecture has incorporated the use of NATs originally as a stop-gap mechanism for the imminent exhaustion of the IPv4 address space. As we know, IPv6 allows the assignment of at least one 'public' address to each device connected to the internet, it is usually claimed or assumed that IPv6 network architectures will not accommodate NAT devices.

This would change the architecture of most current networks drastically, in which NATs isolate the internal nodes from the public internet until and unless communication has been initiated from the internal realm of the NAT. That is, the exposure of nodes to the public internet would tend to increase. But it should be noted that the deployment of IPv6 does not necessarily imply a return to end-to-end connectivity, nor does it preclude similar network architecture to that achieved today through the use of NATs. For e.g., it is very likely that IPv6 will be deployed in enterprises along with a perimeter firewall that only allows packets to traverse the firewall from the external realm (policy domain) to the internal realm if communication was initiated from the internal realm. A number of other technologies might be employed to achieve a similar level of host privacy or masquerading and network topology hiding to that currently achieved in IPv4 with NATs and other technologies.

Security implications of IPv6 within IPv4 networks: A number of transition technologies have been developed for the deployment of IPv6 and the co-existence of IPv6 with IPv4 deployments. Some of such technologies aid in the deployment of IPv6 by enabling communication between islands of one network protocol (e.g. IPv6) across networks that employ some other type of network protocol like, IPv4. This is achieved by the 'tunnelling' paradigm, in which one network protocol, for e.g., IPv6, is encapsulated within another network protocol, for e.g., IPv4.

While these technologies provide a valuable functionality, this comes with some cost like cost of increased complexity, with the consequent security implications. Say, for example, tunnels may introduce Denial-of-Service (DoS) attack vectors, and may prevent network security devices from enforcing the same security controls that they can readily enforce on non-tunnelled traffic. Furthermore, some transition technologies require very little or no management, and are enabled by default in some of the popular operating systems which may result in a node or site making an unintended use of IPv6 transition or co-existence technologies which could increase the exposure to attack, and/or be leveraged by attackers to bypass network security controls. As a result, IPv6 transition or co-existence technologies should be a concern not only to network engineers and security administrators operating or managing IPv6 networks, but also to network engineers and security administrators operating or managing IPv4 networks, whose security policies may be by-passed by leveraging these technologies.

IPv6 support in network devices: It is a concern when planning to deploy IPv6 should be the level of IPv6 support (if any) in each of the different network devices. It is usually the case that there is more support for security features in IPv4 products than in IPv6 products, either in terms of variety of products, variety of features, or performance. This will probably make it difficult to enforce exactly the same policies with IPv6 as that are enforced with IPv4, at least for some period of time.

Consequently, such situation could be exploited by attackers who would probably leverage IPv6 to bypass network security controls, etc. With both protocols, specific security issues are more probable to be found at the practical level than in the specifications. The practical issues include, for e.g., bugs or available security mechanisms on a given product. When deploying IPv6, it is an important aspect to ensure that the necessary security capabilities exist on the network components specifically when dealing with IPv6 traffic. For e.g., firewall capabilities have often been a challenge in IPv6 deployments.

IPv6 support in applications: Many applications currently do not support IPv6, or have only recently been updated to have support for IPv6. This means that their maturity is less as compared to their IPv4-only counterparts, and it is very likely that a number of vulnerabilities will be

Bansode & Girdhar

discovered in them before their maturity matches that of IPv4 applications. The application security is not likely to be affected by IPv6 itself, but as a result of a lack of secure software development practices (as it is still the case in IPv4).

IPv6 training: In addition to any potential shortcomings of the IPv6 protocols, it is very likely that the 'human factor' will play an important role when it comes to the resulting network security. While IPv6 provides a similar functionality to those that are provided by IPv4, there are substantial differences in how such functionality is achieved. As a simple example, compare how address resolution is performed in IPv6 and in IPv4 (i.e., Neighbour Discovery vs. Address Resolution Protocol).

Many organisations are mostly going to end up deploying the IPv6 protocols without proper training, laboratory experimentation, etc., resulting in the deployment of IPv6 in production networks without the same level of confidence and comfort with which the IPv4 protocols have been deployed and are currently operated. Even if the organisations have no concrete plans to deploy IPv6 in any near term, it is highly likely that the network will be affected by IPv6 issues beyond its immediate control, that's why it is recommended that network and security staff be trained on the IPv6 protocol suite. It would also be sensible to conduct experimentation in network labs, so that required expertise is gained before network and security teams are urged to deploy the IPv6 protocols in production networks.

CONCLUSION

There is not much difference in IPv4 and IPv6 security aspects. However, it is slower and little more difficult to attack networking dealing with IPv6 Protocol as IPv6 has larger address space, spoofing etc gets complicated. By being more aware of the security implications of IPv6, businesses can make a secure and safer transition and continue to enjoy the new possibilities offered by IP communications and they can do so securely.

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Consumer Behaviour Towards Best Bus in Mumbai City Post Lockdown

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ABSTRACT

Corona Virus, pandemic created turmoil in the entire world. The purpose of the study is to analyse the change in preference of Mumbaikar's towards BEST BUS post lockdown for commuting to various destinations. The Wilcoxon signed rank test was applied to evaluate change in the preference in pre and post lockdown towards the BEST bus. There was a significant change in preference for the bus in post lockdown towards going to the workplace, attending funerals, visiting hospitals, educational purposes and sightseeing. The study definitely fulfil the objectives and further studies can be conducted to find out the various factors that contribute to the change in preference of commuters post lockdown.

KEY WORDS: BEST BUS, COMMUTING, CONSUMER BEHAVIOUR, LOCKDOWN, PUBLIC TRANSPORT.

INTRODUCTION

Humans respond differently to different circumstances. Corona Virus, an unwelcome crisis, declared as a pandemic in March 2020, created an environment of anxiety and panic for all. To arrest the spread of the infection, a complete lockdown was imposed in major parts of the world. This led to a decline in the normal activities and thereby an extreme impact on the economies of the nation. The sudden closure had an effect on the entire world, and a remarkable change was observed in the consumer's behaviour since the virus hit the entire economy (Gutierrez, Miravet, Daniel & Domenech, 2020).



The uncertainty in the mind of individuals was obvious and a change in the behaviour was expected. There was a mixed reaction amongst the people across the globe. An increase in the purchase of the essential commodities and services was seen, whereas demand for certain goods and services was postponed. The fear of this pandemic changed the priorities and lifestyle of the majority. The situation in the Mumbai city was no different. There was a spike in the number of cases. The standard operating procedure was issued by the Ministry of Home Affairs for the functioning of the state and the cities. The government tried its best to follow the preventive guidelines so as to minimise the spread of the virus (Shen, et al., 2020).

The lockdown forced the people to work remotely. The majority of the work shifted to the virtual mode and people embraced technology like never before. This turned out to be the chief reason for the decline of the transport sector. Transport is the category which is likely to lose because of the pandemic. The state government of Mumbai allowed only the movement of essential workers in the initial days, and the services of local trains and BEST buses were operational only for them. After the partial unlock, a few people started commuting to



their work places and for regular needs, but a change in behaviour towards various travel modes was seen. Individuals started choosing a mode which they believed as safe (Sheth 2020).

Health, hygiene and safety became the priority of the people. Although the buses were in demand, but an increase in own vehicles was also reported. This generated the interest of the researcher to look into consumers (commuters) preference towards Brihanmumbai Electricity Supply and Transport (BEST) bus services for commuting to various destinations post lockdown in the city of Mumbai, which was the only available public mode for commuting during and post lockdown (Sheth 2020)..

Literature Review: Gutierrez, Aaron et al (2020) points out the prominent challenges for public transport during the times of COVID 19. The world came to a standstill with the lockdown imposed. Once the initial restrictions were lifted, people started travelling again, but the preference for public transport declined. The major reason for avoiding this mode was the fear of contracting the infection. The fear was obvious, and was bound to impact the psychology of the customer (Sheth 2020)..

Even though the services followed all the safety guidelines, still managing the public with social distancing and masks was a task. The less occupancy ratio led to reduced income of the public sector. This sudden change made individuals opt for private modes. The lower income group was the most affected as they had only this mode as an option. The study mentions that the degrading environment will further deteriorate because of this pandemic, and now the society should move towards more sustainable modes of transportation.

The already stressed public mode has now another reason to worry. Keeping in mind the previous pandemics and this virus, the planning for transport needs reforms. If travel behaviour changes of the majority, it will lead to a great environmental loss in future and create further imbalances in the society as not everyone can afford private modes.

Shen, Jin et al (2020) brings to notice the actions implemented for the public transport in China during the outbreak of Corono Virus. The fear of the spread of infection is more in a closed environment and in crowded places. The strategies adopted by the country limited the spread of the virus. The study suggested providing training to the staff members so that they can handle themselves as well as the passengers well; adequate use of sanitizers, masks and disinfectants; avoiding crowding in the vehicle by monitoring the passenger flow; regular cleaning of the surfaces and the premises; maintaining social distance and educating passengers about the safety measures to be followed. Public transport is one of the most needed modes of transport and strengthening the safety strategies will reduce the spread of the infection. The entire world will have to be extra cautious when the activities resume full-fledged. The challenges for developing countries will be more as they have a huge population using public modes, and preventive strategies require a good number of financial resources as well.

Table 1. GENDER										
		Frequency	Percent	Valid Percent	Cumulative Percent					
Valid	Female	34	55.7	55.7	55.7					
	Male	27	44.3	44.3	100.0					
	Total	61	100.0	100.0						

Table 2. Occupation									
		Frequency	Percent	Valid Percent	Cumulative Percent				
Valid	Valid Business		4.9	4.9	4.9				
	Not working	4	6.6	6.6	11.5				
	Salaried	25	41.0	41.0	52.5				
	Student	29	47.5	47.5	100.0				
	Total	61	100.0	100.0					

Sheth, Jagdish (2020) ponders about the change in the consumer's behaviour because of the COVID -19 pandemic. The paper summarises eight major effects of this pandemic on the consumption, namely hoarding of essentials, improvising and adjusting with the available resources, postponing demand of non- essentials,

accepting the digital world, online shopping, adapting to the new work-life balance, reaching to the world through video calls and utilising the available time to discover one's talents.

Table 3. Wilcoxon Signed Rank Test								
		N	Mean Rank	Sum of Ranks				
Post workplace – pre workplace	Negative Ranks	11a	16.05	176.50				
	Positive Ranks	38b	27.59	1048.50				
	Ties	12c						
	Total	61						
Post native – pre native	Negative Ranks	17d	13.44	228.50				
	Positive Ranks	16e	20.78	332.50				
	Ties	28f						
	Total	61						
Post education – pre education	Negative Ranks	47g	28.17	1324.00				
	Positive Ranks	5h	10.80	54.00				
	Ties	9i						
	Total	61						
Post funeral – pre funeral	Negative Ranks	2j	11.00	22.00				
	Positive Ranks	42k	23.05	968.00				
	Ties	171						
	Total	61						
Post hospital – pre hospital	Negative Ranks	10m	16.40	164.00				
	Positive Ranks	28n	20.61	577.00				
	Ties	230						
_	Total	61						
Post govt. – pre govt.	Negative Ranks	16p	16.34	261.50				
	Positive Ranks	18q	18.53	333.50				
	Ties	27r						
	Total	61						
Post employment – pre employment	Negative Ranks	155	17.17	257.50				
	Positive Ranks	17t	15.91	270.50				
	1ies	29u						
	Iotal	61	20.75	560.50				
Post sightseeing – pre sightseeing	Negative Ranks	27v	20.76	560.50				
	Positive Kanks	IUW	14.25	142.50				
	Tites	24X						
Dest weekshin on a weekshin	Iotal Negative Damba	61	16.44	270 50				
Post worksnip – pre worksnip	Desitive Banks	17y	16.44	279.50				
	Tion	132	14.27	185.50				
	Tetal	51aa						
Dest chapping are chapping	10tal Negativo Pombo	01 20ah	15.10	202.50				
Fost snopping – pre snopping	Desitive Ranks	ZUab	15.13	302.50				
	Tice	9ac	14.72	132.50				
	Total	61						
Post marriage pro marriago	Iuldi Negativa Panka	1200	11 50	120.00				
i ost marnage – pre marnage	Positive Ponks	12de 12of	1/ 20	197.00				
	Ties	3620	14.30	107.00				
	Total	61						
	IULdi	01						

There is acceptance of the new normal, but only time will tell how things will turn out once this scary phase is over. Humans have a tendency to go back to their old habits, but there is definitely going to be a major change in the future. The author concludes stating that the consumer behaviour will be affected mostly by accepting the regulations at public places because of social distancing, transformation due to the technology and the changing demographics. The discipline of consumer behaviour is now much more dynamic and needs constant monitoring.

Objectives of the Study

1. To evaluate the change in preference of BEST Bus

N. Wadekar et al.,

services post lockdown.

2. To find influence of population strata on preference of BEST Bus post lockdown.

Hypotheses of the Study

- 1. There is no change in preference of BEST Bus services post lockdown.
- 2. There is no difference in preference of BEST Bus services and demographic profile.

Table 4. Test Statistics								
Particulars	Z value	P value						
Post workplace-pre workplace	-4.396	.000						
Post native-pre native	-0.957	.339						
Post education-pre education	-5.832	.000						
Post funeral-pre funeral	-5.569	.000						
Post hospital-pre hospital	-3.051	.002						
Post govtpre govt.	-0.641	.521						
Post employment-pre employment	-0,128	.898						
Post sightseeing-pre sightseeing	-3.219	.001						
Post workship-pre workship	-0.997	.319						
Post shopping-pre shopping	-1.89	0.59						
Post marriage-pre marriage	-0.703	.482						

RESEARCH METHODOLOGY

Sources: Primary data is collected through online questionnaire and secondary data is collected from online material.

Sampling method: Non -random convenience sampling.

Sample size: 61

Sample design: Residents of Mumbai City.

Statistical tools: The data was analysed using SPSS (Statistical Package for Social Science), mean, frequencies, percentages, t-test, wilcoxon signed rank test.

Limitation of the Study: The study is restricted to a small sample size and analyses only the change in preference of Mumbaikar's post lockdown towards BEST BUS for commuting to various destinations.

RESULTS AND DISCUSSION

Data Collection and Respondent Profile: Data has been collected from total 61 respondents out of which 34 are female respondents and 27 are male respondents.

Table 5. Tests of Normality										
	Kolm	ogorov-	Shapiro-Wilk							
	Statistic	df	Sig.	Statistic	df	Sig.				
Total post preference	.090	61	.200*	.974	61	.211				



As per Table No.2 out of total 61 respondents; 29 respondents are students, 25 respondents are salaried people, 3 respondents have their own business and 4 respondents are not working.

Difference of post and pre scores was computed for each indicator to access normality in the data set. Kolmogorov-Smirnov P-value was less than .050 in all the cases indicating data not normally distributed. The researcher tried correcting the data problem through square root transformation, log transformation and reciprocal transformation, but fails to solve the problem of converting the data into normal distribution and thus applied non-parametric Wilcoxon Signed Rank Test.

Table 7. Group Statistics									
	gender	N	Mean	Std. Deviation	Std. Error Mean				
Total preference	Male	27	41.2963	12.67892	2.44006				
	female	34	30.3235	9.66004	1.65668				

			ind	lependent S	amples Ter	st					
		Levene's Test fi Vahan	v Equality of ces	toest for Equality of Means							
							Mean	Std Error	- 95% Confidence Interval of the Difference		
		1 Pr	80	-1	104	Sig. (2-tailed)	Difference	Difference.	Lower	Upper	
lobreference	Equalitariances assumed	136	.19	3,838	59	.000	10,97277	2,85919	5,25134	15,69419	
	Equal variances not assumed			3.720	47:537	.001	10.97277	2:34992	5.04127	16.90438	

As per table no.3 and table no.4 it can be clearly seen that there is a significant increase of mean rank in preference of using BEST BUS for workplace, attending funeral & visiting hospital post lockdown as p value is less than the level of significance .05. Also, it can be seen that there is a significant decrease of mean rank in preference of using BEST BUS for education and sightseeing post lockdown as p value is less than the level of significance .05.

As per table No.5 Kolmogorov-Smirnov P-value=.200 which is greater than .05 which indicates data is normally distributed. Also, as per figure No.6 as all the values are close to the principal diagonal indicating normality in the data set. Since the assumption of parametric test has been fulfilled independence t-test is applied to examine the difference in preference of BEST BUS in male and female respondents.

CONCLUSION

It is concluded that the preference for the BEST bus post lockdown has increased for going to work, attending funerals and visiting hospitals. This can be mainly because of the easy availability of buses, the absence of local trains and the buses being cost effective in comparison to other available modes. This is a positive aspect for BEST, and in case the people are satisfied, they might opt for the service in the coming days as well. The decrease in preference for services was seen towards educational purpose and sight- seeing. The only reason for this is the shutdown of the educational institutions and the fear of contracting the virus. The demographics revealed an increase in the usage of services by males, which can be attributed to non- availability of local trains for them.

Direction For Future Studies: Further, researches can be conducted to find out the various factors that contribute to the change in commuting preferences post lockdown and the satisfaction level of commuters towards public transport.

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31



Drinking Water Analysis of Household Water and its Safe Storage Patterns by Linear Regression Technique in Mumbai, India

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ABSTRACT

This research paper deals with various safe storage patterns of water like Stainless steel, Earthen Pot (Matka), Copper vessels ,Plastic and direct use i.e. Tap water. In this storage patterns not all are hygienic and healthy for human body. In this research the linear regression technique is being used to classify the dataset. By implementing this technique it can be analyze that certainparameters fit to this specific model and fewparameters may not fit. The variation of the properties of water samples directly influence the primary productivity of the water.So the main motive of this research is to evaluate the contamination potentials of water to train the new data in future of different house water and storage patterns available in Mumbai, India.

KEY WORDS: LINEAR REGRESSION, CONSUMPTION, CONTAMINATION, STAINLESS STEEL, COPPER.

INTRODUCTION

Access to clean and safe water, good sanitation, and hygiene practices are necessary for a healthy population. Now a day's waterborne disease constitute a major health issues to the people due to poor water quality. The water must meet the required (chemical, biological and physical) quality standards at the point of supply to the users.[3] Consumption of contaminated water causes a high health risk especially to rural areas where common people can't afford the Water Purifiers /Filters. Through this it can be shows that from various storage patterns which storage can be healthy for human body even after 12 hours of storage of a water in a same vessel (Alexander et al.,



2020.).

Secure water may not necessarily be knowingly contaminated to pose a public health risk, but the handling from the source to many homes and the pattern of storage before water is finally consumed pose the main challenge for all including water consumers, water resource managers, and water storage facilities at communities and household levels. The trained data set is used to classify the parameters based on their values which can be easily map and predict the type of water either steel, copper, plastic, etc. in the future also.

Literature Review: Author Parker et al. with similar studies shows that household water quality is compromised by storage methods after collection, thus increasing the proportion of people drinking unsafe water. In a study by Raju et al.household water showed progressive contamination during storage, and in this study, almost three forth stored household water samples were contaminated with enteric bacteria. As stated by MegersaOlumanaDinka, different countries regulate drinking water differently depending on the quality of their water source. Stainless steel is a very popular metal



for making water storage ware and drinkware. Pitchers, glasses and water bottle made of stainless steel are very popular among people who are looking for a long-lasting and sustainable option.

The earth is rich in various vitamins and minerals. The earthen pots have the similar properties the earth consists of. Using earthen pot (matka) for water storage is not just a traditional or old fashioned alternative to the steel container, but it is a very well healthy alternative as well. This clay water pots are having amazing benefits like alkaline , Improves Metabolism , natural cooling , good for throat, prevention of sunstroke head stroke and may other things. According to Ayurveda it is stated that water stored in a copper vessel for a longer time has the ability to maintain all the three doshasof human body i.e. vata, kapha , pitta and it happens may be because of copper positively charge the water. Copper containers are one of the oldest types of vessels after clay vessels. Because of the positive antibacterial properties of copper, it is still generally used nowadays in many medical implements, kits, and water-storing containers worldwide.Apart from the antibacterial and alkalizing effects of copper on water, the copper ions present in water serve aexceptional role in the healthy functioning of the body. Human need copper as one of the important trace minerals which plays vital role in a number of functions all over.

Table 1.1 Safe Storage Water Samples and their Parametric Values									
Parameters Type	Sr. No.	Parameters	Plastic (polyethylene terephthalate) Sample 1	Stainless Steel Sample 2	Mud Matka (Earthen Pot) Sample 3	Copper Vessels Sample 4	Tap water Sample 5		
Essential									
Parameters	1	Color	5	5	6	6	5		
	2	Odur	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable		
	3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable		
	4	PH	7.8	7.7	7.7	7.8	7.9		
	5	Turbidity	1	1	1	1	1		
	6	TDS	52	45	46	45	58		
General									
Parameter	7	Aluminum (as Al),	0.03	0.03	0.03	0.03	0.03		
		mg/l, Max							
	8	Ammonia							
		(as total ammonia-N),	0.4	0.5	0.8	0.8	0.5		
		mg/l, Max							
	9	Calcium (as Ca), mg/l, Max	70	80	95	101	80		
	10	Chlorides	210	240	260	250	260		
	11	Copper (as Cu),	0.9	0.8	0.7	1.2	0.9		
		mg/l, Max							
	12	Iron (as Fe), mg/l,max	0.2	0.3	0.2	0.3	0.3		
	13	Free residual chlorine, mg/l, Min	0.2	0.3	0.1	0.2	0.1		
	14	Fluoride (as F) mg/l, Max	1	1.2	1.1	1.2	1		
	15	Manganese (as Mn), mg/l, Max	0.1	0.1	0.1	0.1	0.1		
	16	Mineral oil, mg/l, Max	0.1	0.1	0.1	0.2	0.3		
	17	Selenium (as Se), mg/l, Max	0.01	0.01	0.01	0.01	0.01		
	18	Silver (as Ag), mg/l, Max	0.1	0.1	0.1	0.1	0.1		
	19	Zinc (as Zn), mg/l, Max	4	10	4	12	2		
Toxic									
Substances	20	Cadmium (as Cd), mg/l, Max	0.004	0.004	0.002	0.003	0.002		
	21	Lead (as Pb), mg/l, Max	0	0	0	0.01	0		
	22	Mercury (as Hg), mg/l, Max	0.005	0.006	0.006	0.005	0.006		
	23	Total arsenic (as As), mg/l, Max	0.02	0.02	0.01	0.02	0.04		
	24	Total chromium (as Cr), mg/l, Max	0.01	0.02	0.02	0.02	0.02		

Sample Collection, Material and Methodology

Area of the Study: The study area is of Mumbai's urban and rural area. This study are was selected based on dense population and mix crowd. Water Sources: A total 20 samples of home storage water sample collection were collected from safe storage patterns. Here in table 1.1 only 5 samples are shown for reference. Which includes five types of storage patterns i.e. Plastic (polyethylene terephthalate), Stainless Steel, Mud Matka, Copper Vessels and Tap water which is shown in Table 1.1. From the time of sample collection and to the time of actual analysis, many physical and chemical reactions would change the quality of water sample and what changes can be possible because of storage patterns that is the main part of the study (Devangeeshukla et al., 2013).

Therefore to analyze that water samples are preserved for 12 hours in safe storage and then only it is being tested to check variations for parametric values. Analysis is done on 24 different parameters as shown in table 1.1 parameters categories are of Essential, General and Toxic Substances as per the guidelines of Indian Standard Bureau and World Health Organization. Physical parameters like Temperature, Odour, Taste & Colour was agreeable in Process and Municipal water. The study was carried out for a period of March 2020 to June 2020. Parametric values are under the standard specifies the acceptable limits and the permissible limits in the absence of alternate source. In India it is recommended that the Drinking water quality standards has to be followed as per the Indian Standard Bureau and World Health Organization(WHO). However, if the value go beyond the limits indicated under 'permissible limit in the absence of alternate source, the sources have to be rejected. In India, Central Pollution Control Board has identified requirements ofwater quality in the form of a chemical characteristics which is also called as primary water quality criteria. Further, Bureau of Indian Standards has recommended water quality parameters for different uses in the standard.

Figure 1.1: Linear Regression Implementation on Samples of Copper Vessels and Mud Matka



METHODOLOGY

Here Data were collected, and entered in Weka tool for implementing Linear Regression. The water samples were analyzed for the presence and correlation of 24 different parameters using the Standard Methods for the Examination. Such as pH, TDS, Iron, Turbidity, Copper, Iron, Mineral Oils, Manganese, Total arsenic etc.

RESULTS AND DISCUSSION

The main aim of linear regression is prediction, forecasting and error reduction. This technique is used to appropriate a predictive model to an observed data set of values of the responses.Here in this study quantitative data is analyzed using weka and implemented Linear regression on 20 samples with their 24 Essential, General and Toxic parameters for easy interpretation. Here in dataSet it Contains string variables so before implemeting regression it is being coverted first in numerical format for implementaion. This technique is implemented on a whole data set and divided into the diverse classes based on the storage patterns. Whenver with this prediction the new data set is going to be trained and it can be easily identified the storage pattern withoud knowing it. The results were reported seperately in terms of finding out the absolute error value.



Figure 1.3: Linear Regression Implementation on Samples of Tap Water

-0.	2681	· Color +		
0.1	0703	- FH +		
0.1	0134	* Turbidity +		
-0.1	0097	* TDS +		
-2.	4002	· Aluminium +		
-0.	1534	- Ammonia +		
-0.0	0112	* Calcium +		
0.1	0078	* Chlorides +		
0.	7334	* Copper +		
-0.	1470	* Iron +		
-1.1	9247	· Free residua	1 chlorine +	
-0.	3741	Manganese +		
0.1	530	 Mineral oil 		
-0.	411	· Selenium +		
1	688	* Silver +		
-0.1	9650	* Zinc +		
5.1	2678	* Cadmium +		
-2.	6179	* Lead +		
0.1	2050	· Total argeni	c +	
-0.	3707	* sources=Plas	tic +	
-0.	1322	· sources-Stal	nless Steel +	
-0.1	2422	· sources-Mud	Matka +	
-0.	1599	* sources-Copp	er Vessels +	
0	4791			
Time tak	en to	build model:	0 seconds	
Eval	atio	n on training	met	
Time tak	en to	test model on	training data:	o seconda
Summ	ary -			
Correlat	ion c	oefficient	1	
Mean abs	plute	error	0	
Root mean	n aqui	ared error	0	
Relative	abso	lute error	0	
Root rel	ative	squared error	0	
Town 1 Store	and the second second	OF TRAFFARMAN	20	

Figure 1.1 shows the relative error value 0.0004% of Copper vessels and 0% value in other four types of storage vessels. But the classification shows predictive analysis for all the storage patterns which can be easily

Mahadik & Girdhar

used to identify water is stored from which storage vessels.

After developing this type of a model, if additional values of the explanatory variables are collected the fitted model can be easily used to make a prediction of the response. And that can be further analyzed for its quality using Machine learning algorithms.

CONCLUSION

The result obtained from the linear regression technique shows that after 12 hours of storage water in any particular type of vessel affect the quality of the water depends on the storage pattern but here the analysis does not show that much of variations in the sample of water. But copper vessels gives some change in parametric values which may affect the quality either in positive or negative way. So using this linear regression model, prediction classes made easier for more data set to identify the type of pattern by training them in the same model in future.

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Early Detection of Prone to Failure Student Using Machine Learning Techniques

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ABSTRACT

Machine learning techniques works on experience uses historical data and process them. The algorithms help to reveal facts and shows the path to move towards success. This study, uses for early detection of prone to failure using machine learning techniques. Supervised approach of machine learning used to analysis data in python colab environment. The Sample size 300 records used to evaluate data. Outcomes shows 82% accuracy with Naive Bayes classifiers. The study classifies records among three classes good, average and poor students.

KEY WORDS: MACHINE LEARNING, EARLY DETECTION, NAIVE BAYES CLASSIFIERS, LOGISTIC REGRESSION, SUPERVISED LEARNING.

INTRODUCTION

Machine learning in educational sector already marked his footprints. Adaptive learning, predictive analysis, increasing efficiency, personalized learning, learning analytics and accurately grading assignments are the few areas in the education sectors covered by this next generation technology. Every day new research and findings are coming ahead in the machine learning and deep learning, the subgroups of AI (Artificial Intelligence).

Now a day's graduation is the minimum criteria to get a good job, but the same time few students facing a big problem of drop out. The rainbow of education remains uncomplete, if the education gets stopped in-between due



to failure. Preschool, primary, middle school, secondary, junior college and then the senior college, these are steps students climb to get a graduation degree. Many times, student selects a course for graduation because job openings in that domain are high or it's a boom, but not able to survive a long. Lack of interest or poor skills and background of the subject makes students fail in those weak subjects. Allowed to keep terms is the tag get attached with those who fails in the performance during the examination.

This term introduced to the students when they entered the first year of their undergraduate program. To avoid it only way is to take preventive measures. Educational institutes never prefer drop outs, which occurs due to more than three ATKT in one academic year. In this COVIDE-19 pandemic, mobile learning helped learners a lot to go through their lesions and continue their study. ICT (Information Communication Technology) plays a crucial role here; multimedia base learning and online platforms helps such slow learners to learn at their own speed and place.

This study for early detection of prone to failure using machine learning techniques, which helps the student to check his performance using the first semester



performance which enable them to prepare well in the study if get classified as a poor student. The paper organized in 7 sections. Section 2 gives literature review. This section gives base for further study in this topic. Section 3 clears the objective of the study. Section 4 talks about research methods used in study. Section 5 presents outcomes as results and conclusion Section 6 stands for future scope. Section 7 gives references (Ahmed et al., 2016).

Literature Review: S. B. Kotsiantis (2003) applied six machine learning algorithms namely Naive Bayes, C4.5, Back Propagation, Sequential Minimal Optimization, 3NN, Maximum Likelihood Estimation on data to predict drop out student and performed a comparative study of those algorithm found that Naive Bayes prove the best option. But, in 2018 V. L. Miguéisa proposes a model for classification using data mining techniques, that predicts students' overall academic performance based on the information available at the end of the first year of the students' academic path at the University. The results show that the information available at the end of the first year was sufficient to develop a solid model for a student's performance prediction, the study shows poor performance of Naive Bayes.

It shows a contradiction among the two studies with same algorithms. It's possible, since data uses for these two studies came from two different domains and variables considered also different. Lucas D Ferreira (2018) compare different Machine Learning algorithms for the detection of students' Learning Styles according to the Felder-Silverman Learning Styles model. A dataset of 105 students used here with 252 learning objects during 12 months was extracted from Moodle learning platform. Classification techniques like Naive Bayes, Multilayer Perceptron, Instance-based Learning, and Decision Tree J48 were used. Multiple algorithms required for prediction due to multi-dimensionalities of data. To handle unbalanced datasets Weka's "Class Balancer" algorithm for data preparation and pre-processing was used.

The results demonstrated that the Bayesian learning paradigm has the best performance in the dimensions of processing and organization, whereas the instancebased learning paradigm had the best performance in dimensions of input and perception. Pre-processing technique of class balancing selection & the instance filtering process help to improve the results. In the same path, Ahmed Mueen (2016) designed an Educational Data Mining model to predict academic performance based on their academic record and forum participation. Naïve Bayes, Neural Network, and Decision Tree data mining classification algorithms were used on the dataset. It was observed that Naïve Bayes classifier outperforms other two classifiers by achieving overall prediction accuracy of 86%.

Present study helps to find prone to failure student's using classification techniques from machine learning environment. Multiclass classification classifies students into three classes academic success on an undergraduate programme using machine-learning techniques. The study addresses a gap in the literature by applying machine-learning techniques which can capture nonlinear relationships present in real life data. Also, the estimated relationship is used for prediction.

Objective: To perform early detection of prone to failure using machine learning techniques.

METHODOLOGY

Primary data collect from educational institute base in Mumbai, Kirti M. Doongursee College. Total samples used under study size 300. Missing values and imbalance data set are the two major problems normally faced in real time data. Less number of failure students can create input bias. Imbalance-learn library from python takes care of it. Features considered for the study was seven subject students learn in the first semester of academic year in Bachelor of Computer Science Course, internal assessment records also considered under this study to evaluate the final outcome, programming skill of the students judged with three practical components. Total 17 input variable used under the study. The three output classes represent poor performing students who achieves less than 40 percentage at the end of semester one, another class belongs to those who secure more than 40 but less than 60 percentage known as average students, third class represents good students indicates marks more than 60 percentage.

F	Figure 1: Interface of Dataset																		
		: F	Python		fI lython- L_I	FI F055	11 F055_1	FI Dutabase Systems	FI Database System_I	FI	FI PPL1	FI Descriptive Statistics	FI Descriptive Statistics_I	FI Soft Skill	FI Soft Skill_I	F1 PRACTICAL USCSP101	FI PRACTICAL USCSP102	FI PRACTICAL USCSPIRE	Target
																			1
																			ø
																			0
																			2
																			0
																			-
																			Ø
296																			1
																			Ó
298																			-1
299																			1

Classification algorithms Naive Bayes classifiers, Logistic Regression used to study the proposed work and come up with multilevel classification using supervised machine learning approach. This approach divides the data into two parts training set and testing set. Since the records considered for this study are less in number so 33 percent data used for testing. The experiment performed with machine learning techniques using colab environment and python libraries for data analysis Vaishali et al., 2014).

• Gaussian Naïve Bayes: It is one of the three variants based on the Bayes theorem, where probability plays crucial role for classification of data. Conditional probability helps to predict unseen data into the appropriate class. It's proved as a fast algorithm for small set of variables. Its performance well for multiclass classification compared to logistic regression for small size of training sets with categorical data. Gaussian Naïve Bayes assumes that features used for study always follows normal distribution. Only two options for parameter tunning considered smoothing values to avoid zero frequency problem and for prior probability, which was set as None indicates no prior probability values considered. $P(c|X) = (x1|c) \times (x2|c) \times (xn|c) \times P(c)$ GaussianNB(priors=None, var_smoothing=1e-09)

Logistic Regression: Its an algorithm best suited for the categorical data and belongs to the family of supervised learning algorithms. Three classes considered for the target thus, logistic regression preferred. If need is to classify the data in more than three classes logistic regression proves better choice. Thresholding is the key behind this algorithm which classifies the data by mapping with probability. Overfitting handled with L2 regularization and solver used for fitting the model is lbfgs. LogisticRegression(C=1.0, class weight=None, dual=False, fit_intercept=True, intercept_scaling=1, l1_ratio=None, max_iter=100,multi_class='ovr', n_jobs=None, penalty='l2', random_state=None, solver='lbfgs', tol=0.0001, verbose=0, warm_ start=False)

Table 1. Confusion Matrix of Logistic Regression							
10	1	0					
19	35	5					
0	0	29					

Table 2. Confusion Matrix of Naïve Bayes							
10	1	0					
15	43	1					
0	1	28					

Table 3. Confusion Matrix and classification report of						
Logistic Regressi	on					
Logistic Regression	precision	recall	f1-score	support		
Poor-0	0.34	0.91	0.5	11		
Averge_1	0.07 0.59 0.74 59					

Poor-0	0.34	0.91	0.5	11	
Averge-1	0.97	0.59	0.74	59	
Good-2	0.85	1	0.92	29	
accuracy			0.75	99	
macro avg	0.72	0.83	0.72	99	
weighted avg	0.87	0.75	0.76	99	_

RESULTS AND CONCLUSION

The total instances considered for the study was 300. Distinctly selected attributes 17. Target classes three namely Poor Performer, Average Student, Excellent

Naïve Bayes				-
Naïve Bayes	precision	recall	f1-score	support
Poor-0	0.4	0.91	0.56	11
Average-1	0.96	0.73	0.83	59
Good-2	0.97	0.97	0.97	29
accuracy			0.82	99
macro avg	0.77	0.87	0.78	99
weighted avg	0.9	0.82	0.84	99

Table 4. Confusion Matrix and classification report of

Candidates. Data split into two parts training set and testing set. The training set contains 201 records while testing was done on remaining 99 records.

As per table 1 logistic regression and table2 naïve bayes out of 11 poor learner 10 were correctly classified but one record was misclassified by the both classifiers. This gives recall 91%. Precision was calculated for Naïve Bayes for poor performer where total 25 records detected as poor learner but out of 25 only 10 was actually belong to the class poor learner, which takes precision value to 4%.

Results indicates Logistic regression gives results 75% while the Naïve Bayes algorithms shows 82% of accuracy, which is comparatively better (Lucas et al., 2018).

Further Scope: Though the Naïve Bayes algorithms shows 82 percent of accuracy. This analysis accepts the fact that the only first semester grades are not sufficient to analyse student performance. The study can be extended to classify student performance not only on basis of his academic performance but considering his demographics details as well. Which may give significant contribution towards early prediction of prone to failure students.

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Early-Stage Apple Leaf Disease Prediction Using Deep Learning

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ABSTRACT

Premature leaf fall, scab, Alternaria leaf spot, brown spot, mosaic, grey spot, and rust are common types of apple leaf diseases. Due to the arrival of monsoon, there is excess moisture in the air because of an outbreak of diseases in plants that is being witnessed in the hilly region. Farmers from these regions are always worried about the health of Apple plants. The scientists working in various departments, KrishiVigyanKendra's, and regional research stations have given the required inputs to control the problems but that is not useful to identify the problem in the early stage. Also, the current disease diagnosis based on human scouting is time-consuming and expensive. Our proposed system identifies various apple leaf diseases in an early stage that will alert the farmers and nearby research institutes to take appropriate action to control it. The dataset contains 1821 images of apple leaves which has normal leaves, scab, rust, and other disease infected leaves. The proposed regional convolutional neural network-based approach is capable of localizing and classifying the disease with 90% accuracy.

KEY WORDS: MASK RCNN, OBJECT DETECTION, LEAF DISEASE DETECTION, DEEP LEARNING, CNN.

INTRODUCTION

Agriculture plays an important role in the economy of every country. Produce produced by farmers must be in a proper condition to achieve expected profit. Advancements in technology must be used in this domain to save and make products market ready. But due to continuous change in weather and lack of technology access in this field, farmers are facing a huge challenge



to protect their produce from different diseases that are unexpected and occurred at any time (Liu et al., 2018).

Traditional way of disease detection is based on observation and time consuming which requires experts to be present on the field. Sometimes misdiagnosis of many diseases may cause harm to crops, products and consumers who are consuming the product. Artificial Intelligence (AI) plays a significant role in every vertical like agriculture. AI can be useful to solve most common issues in agriculture. It can be used to identify various leaf diseases in an early stage. Using automatic plant leaf disease detection methods farmers will get help to reduce their losses and to improve the productivity. Various researchers have been working on this problem. Most of them tried machine learning, image processing techniques and various deep learning algorithms to diagnose the plant diseases. We have used Deep Learning technique which is a subset of AI to detect the apple leaf disease in an early stage. The proposed methodology generates



masks around the affected area of the leaf and detects disease in an efficient way. We have used a confusion matrix as a performance measure for the CNN model and bounding boxes have been drawn closest to the affected region of the plant that shows the proposed model performs well (Kingma et al., 2015).

Literature Review: Agriculture is the primary occupation not only in India but many countries depend on it. Researchers throughout the globe are trying to solve different problems faced by farmers with the help of the latest technology. Zhong and Zhao have proposed three methods, namely multi-label classification, focus loss function and regression. These are based on DenseNet-121 architecture. Total 2462 images of apple leaf were used that contained six apple leaf diseases. The proposed method achieved 93.5% accuracy which is better than traditional multi classification techniques (Singh 2018).

To check without using CNN can we extract features using Shallow CNN with Kernel SVM and Shallow CNN with Random Forest, Li et al. had compared these two methods with other pre-trained deep learning models on three different datasets maize, grape and apple. They had found that the above mentioned two algorithms performed well in terms of precision, recall and F1 score. Bin Tahirused a plant village dataset to re-train the Inception V3 model using transfer learning and extracted features required for classification. These features were down sampled using a novel variancecontrolled approach that finds how each pixel varies from other nearest pixels. It reduces redundancy from the features. The proposed method achieved 97% of accuracy (Girshick 2020).

Many researchers are working on detection of leaf diseases by using different datasets based on deep learning techniques. Hu et al.proposed deep CNN with multiscale feature extraction methods for tea leaf disease detection. Experimental results show that the proposed method gave 92.5% accurate results. Iteration time required for the proposed model is less in comparison to VGG16 and AlexNet models. Detection of leaf disease, manually is a very big challenge for farmers those who are new to farming. Subetha et al. compared the performance of two algorithms ResNet50 and VGG19. Dataset was publicly available on Kaggle that contains 3651 real time images having four classes namely scab, healthy, multiple diseases and rust. As per results both architectures gave 87% accuracy. Singh and Misraproposed an algorithm to segment the image that can be used further for classification of multiple leaf diseases. They had used a genetic algorithm to detect the leaf disease in an early stage.

PROPOSED METHODOLOGY

The proposed method is based on Mask-RCNN (Regional Convolutional Neural Network). Mask RCNN is an extension of faster RCNN. RCNN is an object detection algorithm which is also used for image segmentation and masking. It is a pixel level classification that determines which all pixels belong to which object. The Mask-RCNN architecture is divided into three parts. First pretrained model of CNN, second Region Proposal Network(RPN) and last is fully connected layer and output. Backbone to this algorithm is ResNet50 which is used to extract the features of images. Detailed pipeline of proposed method is shown in figure 1, below.



Normal Leaf Scab Rust Multiple disease

Initially we have used weights of pre trained model trained on plant pathology 2020 dataset. Last layer of this pretrained model architecture is a fully connected layer that has a softmax activation function. Feature maps from this model is used as an input to the Region Proposal network.



Region Proposal network: Region proposal is anarea where objects can possibly be found. It uses CNN to find regions of interest using binary classifiers. CNN layers of Regressor plot bounding boxaround possible objects and later by finding Intersection over Union we can decide which boxes possibly contain regions of interest. Region of Interest (ROI) can be calculated by dividing area of intersection by area of union.Once regions of interest get finalized, the next step is to have ROI Pooling. This step gets input from CNN as a feature map and Region of interests from regressor. ROI pooling is used to extract fixed size windows from feature maps that is helpful to extract labels as a final output. It will produce fixed size feature map from different size regions using max pooling and the size of max pool window will be of 7*7*512.

Experimental Setup

Dataset: The Plant Pathology 2020 dataset is publicly available sponsored by The Cornell Initiative for Digital Agriculture and FGVC7.It has 1821 leaf images. It contains 4 classes: healthy (516 images), multiple_diseases (91 images), rust (622 images), scab (592 images). Figure 2 shows sample images from Plant Pathology 2020 dataset.

Image Annotation: We have used VGG image Annotator to annotate each image manually. Using this tool, we obtained annotation in .json file for train and test dataset. We have kept this file in the train and test folder respectively.

Train the ResNet50 CNN for feature maps: We have trained ResNet50 CNN algorithms on The Plant Pathology 2020 dataset. We have considered feature maps of the images. Images have been resized to 224x224x3 and then divided into two parts: train and test. Train data contains 80% of overall images and the rest all are in test data. To fit the data properly we normalized the image pixel values. To reduce overfitting and to improve the overall performance of the model image augmentationhas been used which will help to generalize the model. During the training phase we have used Adam optimizer with 0.001 learning rate, categorical cross entropy loss function and batch size as 10. After training we have saved weights of the model in .h5 format so that it can be used to train Mask-RCNN.



Training of Mask-RCNN: During the training phase of Mask RCNN proposed methodology uses ResNet50 as a backbone as it takes less time than ResNet101 or ResNext101 due to less numbers of layers. Detection

minimum confidence set to 0.90. Remaining all other parameters are kept as default to train the model. The algorithm is trained on NVIDIA GetForce RTX 2060 GPU with 16 GB RAM.











Performance measure report of ResNet50: 1We evaluated the performance of our model using a confusion matrix as shown in figure 3 and calculated accuracy, precision, recall and f1 score. ResNet50 with Plant pathology lab 2020 dataset gave 90% accurate prediction with 0.95 precision, 0.94 recall and 0.96 as f1 score (Girshick et al., 2014).

Confusion Matrix Training curve and Loss curve

Results of Mask-RCNN: As the results shown in fig algorithm performs well and can predict the disease accurately. It annotates the object(disease patches) correctly with confidence (Subetha et al., 2021).

CONCLUSION

In this paper, we have implemented ResNet50 to obtain the weights that can be used as inputs to the proposed methodology. To validate the model, we have used a performance measures such as confusion matrix, accuracy, precision, recall and F1 score.The proposed model achieved 90% confidence to detect each disease class. It is able to mask the affected region of the leaf with 90% accurate labeling and can draw bounding boxes around the mask. The results indicates that our proposed model performs well with high accuracy and is able to detect apple leaf disease in an early stage in an efficient way.

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Evaluation of Huffman Algorithm for Compression Standards

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ABSTRACT

Data Compression is a technique to reduce the quantity of data without reducing the quality of the data. The transferring and storing of compressed data is much faster and more efficient than original uncompressed data. There are various techniques and standards of data compression are available. In this paper we implemented and tested Huffman algorithms. Our implementation results shows that compression ratio and the performance of the Huffman coding is higher for text and rich text format. In addition, implementation of Huffman coding is very easy.

KEY WORDS: HUFFMAN ALGORITHM, COMPRESSION RATIO, COMPRESSION TIME, LOSSLESS, LOSSY.

INTRODUCTION

In the field of computer science and information technology, Huffman coding is known as entropy encoding algorithm which is used for lossless data compression. The term entropy means the use of a variable-length code table for encoding a source symbol like character in file where the variable-length code table has been generated in a particular way based on the estimated frequency of occurrence for each possible value of the source symbol. Huffman coding is based on the frequency of occurrence of data symbols. The principle here is to use lower number of bits to encode the data that occurs more frequently. The average length of a Huffman code depends on the frequency with which the source produces each symbol from its alphabet (Ryabko 2019).



In Huffman code dictionary, each data symbol is associated with code word, has the property that no codeword in the dictionary is a prefix of any other code word in the dictionary. The basis for this coding is a code tree according to Huffman, which assigns short code words to the symbols which are frequently used and long code words to the symbols which are rarely used. Note that the form in which Huffman tables are represented in the data stream is an indirect specification which can be used by the decoder to construct the tables themselves before the decompression. The Huffman algorithm for building the encoding follows this algorithm each symbol is a leaf and a root. The flowchart of the Huffman algorithm is depicted in figure (Deloula et al., 2020).

We have studied, implemented, and tested Huffman coding on different file formats. Our experimental results show that performance of the Huffman coding is higher for text and rich text format. In addition, implementation complexity of Huffman coding is less. The remaining paper is organized as follows. Section 2 the need / Importance, Section 3 is Statement of Problem and 4 is Hypothesis. Section 5 is Research Methodology which discusses implementation of the algorithm and standard. Experimental results are explained in Section 6 followed by findings in Section 7. Finally, conclusions are drawn in Section 8 and Future scope for further research in section 9.



II. Need / Importance of Study: Data compression is an effective technique to lessen the amount of data needs to be communicated before transmission or stored in memory. The basic idea behind data compression is the process of eliminating redundant and irrelevant data. It represents the data in its compact form without compromising the data quality to a certain extent. Since textual data is highly available everywhere, the loss of information is not desirable and lossless compression technique is preferable. For instance, the numerals and characters in the temperature and humidity measurements, alphabets in the seismic and real time data are highly sensitive to the loss of information. The need of efficient and robust lossless compression technique motivated us to perform this study. To compress something means that you have a piece of data and you want decrease its size (Uthayakumar J. 2019).



Statement of Problem: Now a days there are number of compression algorithms are available. Among them the study try to evaluate Huffman algorithm on parameters like compression ratio, compression time, and various types of file. Compression ratio: It is defined as the ratio of size of the compressed file to the size of the source file (Rozenberg 2019).

Compression ratio = C2 / C1 * 100%

Compression Time: It is the time taken by the algorithm to compress the file. Calculated in milliseconds (ms). (Mansouri 2020)

Hypothesis: A survey was conducted on different types of data formats and Huffman algorithms. This survey was

conducted in order to check the efficiency of algorithm with respect to its corresponding data types. The data used in this work included .DOC, .TXT, .DOCX, .MDB and .XLS files. Experiments including various types of data with Huffman compression for compressing data were conducted. The purpose of these experiments was to conclude that the Huffman algorithm best suited to text data (Khairi 2018).

Table 1. Specification of the platform system used for execution of program DESKTOP ThinkCenter Lenovo RAM DD3 - 4 GB Inter core2 Due E 7500 Processor Type No. of Cores of Processor 2 Clock speed of Processor 2.93 GHz Cache of Processor 3 MB Windows 8 64 - bit **Operating System**

RESEARCH METHODOLOGY

Huffman coding is used for lossless data compression. The term entropy refers to the use of a variable length code for encoding a source symbol like character in file. The variable-length code table has been derived in a particular way, based on the estimated probability of occurrence for each possible value of the source symbol. In Huffman coding table is created incorporating the no of occurrences of an individual symbol, this table is known as frequency table. This table is arranged in particular order and then tree is generated from that table, in this tree high frequency symbols are assigned codes which have fewer bits, and less frequent symbols are assigned codes with many bits. In this way the code table is generated. We implemented Huffman algorithm in python on system with specification mentioned in table 1 (Isamu & Kida 2019).

RESULTS AND DISCUSSION

The experimental results of the implemented Huffman algorithm for compression ratio and Compression time are depicted in Table2.

Findings: Huffman in 1952 proposed an sophisticated sequential algorithm which generates optimal prefix codes in O(nlogn) time. In fact the algorithm needs only linear time provided that the frequencies of appearances are sorted in advance. There have been widespread researches on analysis, implementation issues and improvements of the Huffman coding theory in a variety of applications (Rani et al., 2020).

Texts are always compressed with lossless compression algorithms. This is because a loss in a text will change its original meaning. Repeated data is important in text compression. If a text contains repeated data, it can be compressed to a high ratio. This is due to the fact that compression algorithms generally remove repeated data. In order to evaluate the compression algorithms on the text data, a comparison between Huffman coding algorithms for different types of text files with different capacities has been performed. Experimental results showed that the compression ratio of the Huffman coding, and the performance of the Huffman coding is better (Uthayakumar et al., 2020)

Table 2.	Table 2. Compression Result on Test File					
Sr. No.	Type of File	Extension	Size of File (in Bytes)	Compression Ratio	Compression Time	
1	Rich text document	.doc	96256	0.56383	180	
2	Spreadsheet document	.xls	51200	0.52	90	
3	Rich text document	.doc	34816	0.382353	60	
4	Database file	.mdb	528384	0.263566	250	
5	Database file	.mdb	212992	0.206731	160	
6	Text document	.txt	7168	0.714286	20	
7	Spreadsheet document	.xls	102400	0.6	260	
8	Rich text document	.doc	45056	0.454545	100	
9	Rich text document	.docx	139264	0.580882	320	
10	Text document	.txt	47104	0.630435	130	

CONCLUSION

Compression is an important technique in the computing field. With the help of it we can reduce the size of data and transmitting and storing the reduced data on the Internet and storage devices are faster and cheaper than uncompressed data. In this paper we have focused on Huffman algorithms in order to make clear their differences from various points of view such as implementation, compression ratio, and performance. We have explained these algorithms in detail, implemented, and tested using different file types. From implementation point of view, Huffman algorithm is easier, while Huffman algorithm needs less compression time. This means that for some applications that time is important such as real-time applications, Huffman algorithm can be used. It can also be concluded that as per the content of the original file, the performance of the algorithm varies.

Future Scope For Further Research: In order to achieve much more performance compared to software implementation, algorithms can be implemented on hardware platform such as FPGAs using parallel processing techniques. This is our future work. In future, more compression algorithms both lossy and lossless can be implemented on a larger test bed which includes audio, video and image data. And then a system can be implemented which will detect the file type and then depending on file type it will choose the appropriate compression technique for the file.

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Facial Expression Recognition Using CNN with Keras

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ABSTRACT

Facial Expressions are an essential feature of non- verbal communication, as we move towards the digitization the human computer interactions plays a vital role. The emotional changes results change in the expressions. This paper elaborates development of Deep Convolutional Neural Network Model using tf.keras for building and training Deep Learning Model. The aim is to classify facial image into one of the seven face detection classifiers using open CV and one of its classifiers for drawing the boundary box around the face to detect the correct expression. For training the CNN models we have used 48x48 grey–scale images from Kaggle's ICMP 2013-Fecial Expression Recognition (FER) dataset The FER dataset is divided into two folders called test and train, further divided into separate folder each containing one of the seven types of FER dataset. To understand the spread of the distribution of the class data augmentation method is used to generate minority classes. To reduce over fitting of the models, dropout and batch normalization is used. We are using atom optimizer and softmax activation function as it is a multiclass classification problem. It is a categorical cross entropy and matrix that we are training this for accuracy based on the parameters to evaluate the performance of the developed CNN model by looking at the training epoch history.

KEY WORDS: FACIAL EXPRESSION RECOGNITION (FER), CONVOLUTIONAL NEURAL NETWORK (CNN), DEEP LEARNING.

INTRODUCTION

Facial Expression Recognition (FER) can be seen as a second step to face detection mechanism. Humans can express emotions through facial expressions which is a part of nonverbal communication. When a machine communicates with people, FER can give more affinities and personalized service to people depending on their emotions, which eventually increase the confidence and trust in people. Various ways in which we can



express the emotions, such as facial expressions, voices, physiological signals, and text('1.https://www.kaggle.com/c/challenges-in-representation-learning-facial-expression-recognition-challenge/data'). Machines capture the expressions through camera, videos. Facial Expressions can be classified as: surprise, happy, neutral, angry, sad, disgust, and fear.

For same emotions, expressions of same or different people may vary because emotions are highly situation dependent (K. M. Rajesh and M. Naveenkumar, 2016) (Padgett and Cottrell, 1996). This model focuses only on the facial area specifically around mouth and eyes. Over the period various techniques are used for facial expression recognition: Bayesian Networks, Neural Networks and the multilevel Hidden Markov Model (HMM) (Cohen, Ira and et al., 2003).

This paper build and train CNN in Keras to recognize facial expressions. For training the CNN models we have used 48x48 grey–scale images from Kaggle's ICMP 2013-



FER dataset ('https://www.kaggle.com/c/challenges-in-representation-learning-facial-expression-recognition-challenge/data').

We will accomplish it by completing following tasks:

Task 1: Explore the Dataset

Task 2: Generate Training and Validation Batches

Task 3: Create a CNN Model

Task 4: Train and Evaluate Model

We focus on the face detection technique and expression detection based on the extracted features.

Literature Review: In recent years, researchers have made considerable progress in developing automatic expression classifiers(Shima Alizadeh and Azar Fazel, no date). In 19th century, Charles Darwin has contributed important aspect in facial expression analysis which is directly linked with current science of automatic facial expression recognition. Charles Darwin's worked on the general principals of expressions in humans and animals (SRIMANI P.K. and HEGDE R., 2012). In his work he has grouped several kinds of expressions in groups like: shame, shyness, modesty, anxiety, grief, low spirits, dejection, despair joy, tender feelings, high spirits, love, devotion, reflection, meditation, ill-temper, anger disdain, contempt, sulkiness, determination, hatred, disgust, astonishment, fear, guilt, pride, surprise, horror, self-attention. The observation of the study says the enlargement of the muscles around eyes and mouth varies as per the changes in the emotions e.g.: depression, surprise, happiness, etc. (Darwin 1904).

Various range of CNN, modelled and trained for facial emotion recognition are evaluated in (A. M. Badshaah, J. Ahmed and S. W. Baek, 2017). Facial emotion Recognition is drawing its own importance in the research field. Facial emotion recognition is inspected and analyzed on all research areas (A. Routrey, M. Swaen and P Kabisetpathy, 2018). Emotion is recognized from facial images using filter banks and Deep CNN (K.-Y. Hueng et al., 2016), this leads to high accuracy rate which implies that deep learning can also be used for facial expression detection.

Two important objectives of Facial Expression Recognition and Analysis (FERA) are feature extraction and expression classification. Ming et. al. defined three phases of FER: facial image registration, feature extraction, and FER (Nithya Roopa. S, 2019). The facial expression recognition has two methods: classification and regression methods. Deep learning is showing promising results, including in FER (Nithya Roopa. S, 2019). This paper contributes a Deep Learning and CNN approaches with multiclass classification problem so it is categorical cross entropy loss function to track highest accuracy.

Convolutional Neural Networks (CNN) are neural network architecture which has multilayers (D Y Liliana, 2018). CNN input and output are array vectors known as feature map. The type of input decides the array dimension value. As an example, audio input has one dimensional array as well as text input; image has 2D array. The output feature map describes the feature extracted from the input. CNN has three key layers: convolutional filter layer, pooling/subsampling layer, and classification layer (Nithya Roopa. S, 2019).

RESEARCH METHODOLOGY

Facial Expression and Emotions: According to the basic definition of emotion by Ekman and Friesen, emotions are divided into six classes, namely happy, sad, surprise, fear, disgust, angry [18]. In this paper talks about seven face detection classifiers using open CV and one of its classifiers for drawing the boundary box around the face to detect the correct expression. For training the CNN models we have used 48x48 grey–scale images from Kaggle's ICMP 2013-Fecial Expression Recognition (FER) dataset (https://www.kaggle.com/c/challenges-in-representation-learning-facial-expression-recognition-challenge/data'). The FER dataset is divided into two folders called test and train, further divided into separate folder each containing one of the seven types of FER dataset.

Figure 1: Importing the library
import numpy as np
import mathlotlih.ovplot as plt
import utils
import os
Xmatplotlib inline
<pre>from tensorflow.keras.preprocessing.image import ImageDataGenerator from tensorflow.keras.layers import Dense, Input, Dropout,Flatten, Conv2D from tensorflow.keras.layers import BatchNormalization, Activation, MaxPooling2D from tensorflow.keras.models import Model, Sequential</pre>
from tensorflow.keras.optimizers import Adam
<pre>from tensorflow.keras.callbacks import ModelCheckpoint, ReduceLROnPlateau</pre>
<pre>from tensorflow.keras.utils import plot_model</pre>
from IPython.display import SVG, Image
<pre>from livelossplot import PlotLossesKerasTF</pre>
import tensorflow as tf
print("Tensorflow version:", tfversion_)

Figure 2: Plotting the sample images



Figure 3: Train folder each containing one of the seven types of FER dataset

for expression in os.listdir("train/"):
 print(str(len(os.listdir("train/" + expression))) + " " + expression + " images")
3171 surprise images
7214 happy images
4965 neutral images
3995 angry images
4830 sad images
4830 sad images
4846 disgust images
4097 fear images

To build the training model, training and validation batches are generated with the FER dataset image size 48x48 and batch size as 64 as per the memory size of CPU/GPU to speed up the training process. ImageDataGenerator() class is used to accept values or images to treat camera captured image as a horizontal mirror image. These images are used to generate the training set. Test and training sets are generated by keeping the various parameters same.





Figure 6: Four Convolution Layer

1 - Convolution
model.add(Conv2D(64,(3,3), padding='same', input_shape=(48, 48,1)))
model.add(Activation('relu'))
model.add(Activation('relu'))
model.add(Conv2D(s2,(5,3), padding='same'))
model.add(Conv2D(s2,(5,3), padding='same'))
model.add(Conv2D(s2,(5,3), padding='same'))
model.add(Conv2D(s12,(5,3), padding='same'))



Designing the CNN Model: By following the above CNN architecture six activation layers are designed. Four convolution layer and 2 fully controlled layers.

The ReLu function is used to increase the non-linearity in the images, maxpooling is used for dimensions reduction of the image, dropout function to avoid over fitting of the training data. Flatten to convert image to 1- dimensional array. 1- dimensional array becomes the input to the fully controlled layers. Output layer has two techniques dense and softmax.

To study the accuracy of the model, the metrics is set to accuracy. The loss is set to categorical_crossentropy as the data has to be classified into only the 7 defined categories and each image can belong to one classification type only.

Layer (type)	Output	Shape	Param #
conv2d (Conv2D)	(None,	48, 48, 64)	640
batch_normalization (BatchNo	(None,	48, 48, 64)	256
activation (Activation)	(None,	48, 48, 64)	0
max_pooling2d (MaxPooling2D)	(None,	24, 24, 64)	0
dropout (Dropout)	(None,	24, 24, 64)	0
conv2d_1 (Conv2D)	(None,	24, 24, 128)	204928
batch_normalization_1 (Batch	(None,	24, 24, 128)	512
activation_1 (Activation)	(None,	24, 24, 128)	0
max_pooling2d_1 (MaxPooling2	(None,	12, 12, 128)	0
dropout_1 (Dropout)	(None,	12, 12, 128)	0
conv2d_2 (Conv2D)	(None,	12, 12, 512)	590336
batch_normalization_2 (Batch	(None,	12, 12, 512)	2048
activation_2 (Activation)	(None,	12, 12, 512)	0
max_pooling2d_2 (MaxPooling2	(None,	6, 6, 512)	0
dropout_2 (Dropout)	(None,	6, 6, 512)	0
conv2d 3 (Conv2D)	(None,	6, 6, 512)	2359808
batch_normalization_3 (Batch	(None,	6, 6, 512)	2048
activation 3 (Activation)	(None,	6, 6, 512)	0
max_pooling2d_3 (MaxPooling2	(None,	3, 3, 512)	0
dropout 3 (Dropout)	(None,	3, 3, 512)	0
flatten (Flatten)	(None,	4608)	0
dense (Dense)	(None,	256)	1179904
batch_normalization_4 (Batch	(None,	256)	1024
activation 4 (Activation)	(None,	256)	0
dropout_4 (Dropout)	(None,	256)	0
dense 1 (Dense)	(None,	512)	131584
batch normalization 5 (Batch	(None,	512)	2048
activation 5 (Activation)	(None,	512)	0
dropout 5 (Dropout)	(None,	512)	Ó
dense 2 (Dense)	(None,	7)	3591
Total params: 4,478,727			
Trainable params: 4,474,759			
Non-trainable params: 3,968			

Figure 8: Accuracy for 15 epochs



RESULTS AND DISCUSSION

CNN model is set to 15 epochs when trained gives accuracy 66.7%

It is been observed that the designed CNN model can flawlessly detect facial expressions such as: Happy, Sad, Surprise subject to 48x48 gray scale images only. Figure 9: Kathak Facial Expressions Recognition (Navras)



CONCLUSION AND FUTURE SCOPE

Using 48x48 grey–scale images from Kaggle's ICMP 2013-Fecial Expression Recognition (FER) dataset, test accuracy is 66.7% with the above designed CNN model. The same CNN model will be used for recognizing the classical Kathak dancer's Facial Expressions. These expressions are called Navras. Trained the same model on few converted grey scale 48x48 images and the results are satisfactory. The same model can be trained and tested for KathakNavras facial expressions dataset and checked for its accuracy.

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Marine Fish Marketing Problems at Satpati Landing Center in Palghar District

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ABSTRACT

Fishing assumes a significant part in supporting livelihoods worldwide and furthermore frames a significant source of diet for more than one billion individuals. Fisheries area assumes a significant part in the Indian economy via adding to the income of nation, jobs, and foreign exchange. The principal goals of the study are to investigate the issues of fish promoting in Palghar Market. The current investigation has been founded on primary information gathered from the fishermen. The information has been gathered with the assistance of the questionnaires and survey and the respondents are chosen by convenience sampling. The sample size for the investigation is 75 fishermen. It is discovered that the significant issues of fish marketing of fishermen are storage, transportation, and quality. The issues of fish marketing could be tackled effectively with the assistance of co-operative societies and Government.

KEY WORDS: FISHERMEN PROBLEMS, FISH MARKETING, FISH QUALITY, COLD STORAGE, TRANSPORTATION.

INTRODUCTION

Marketing assumes a significant role in advancing the production of any commodity. The creation of food items like fish, vegetables, organic products, and so forth which are perishable in nature relies altogether upon a proficient marketing framework. In this angle, fisheries are521a assumes a significant part in the Indian economy via adding to the income of nation, jobs, and foreign exchange. Fish and fishery items are traded to more than 52 nations. More than 6000 crores of rupees of foreign exchange have been procured by the fisheries



area. Fish exchange acquires significance both at national and international levels. Consequently, it gives ways and means of living and income. Along these lines, fisheries are imperative to humanity in all nations, especially in non-industrial countries like India for it focuses on creation of fish food, gives available resources of living and earning, offers job openings and assumes a crucial part in improving the economy of by far most of individuals associated with fishing profession.

Statement of the problem: Fish being an exceptionally transitory product, its showcasing accepts unique importance. It needs good infrastructure like roads, transport facilities, appropriate storage, ice, Large Refrigerators to keep fish for longer time, and cooperative societies. Such facilities are not accessible to fishermen up to their need intensity and the fishermen faces more issues. So, it is an endeavored to examine the issues of fish marketing at Satpati landing center in Palghar district.



Objectives of the study: To explore the fish marketing problems at Satpati landing center in Palghar district, to offer suggestions based on the findings of the study.

METHODOLOGY

The research methodology portrays the steps for the study. It provides clear direction to the researcher to continue with the examination. It incorporates sampling method, sample size and collection of data. The current examination has been founded on essential information gathered from the fishermen. The information has been gathered with the assistance of the survey and the respondents are chosen by convenience sampling. The sample size for the investigation is 75 fishermen.

Age	No. of Respondents	Percentage
Below 30	08	11
31-40	31	41
41-50	15	20
Above 50	21	28
Total	75	100

Source: Primary data

Table 2. Marital Status Wise Distribution of Respondents				
Marital Status	No. of Respondents	Percentage		
Married	64	85.3		
Unmarried	11	14.7		
Total	75	100		
Source: Primary data				

Source: Primary data

Table 3. Family	System	Wise	Distribution	ı of
Respondents				

Family System	No. of Respondents	Percentage	
Joint Family	31	41	
Nuclear Family	44	59	
Total	75	100	
Source: Primary data			

Limitations of the study: No significant investigations have been led on the issues of the fish marketing and promotion; so there exists a wide information gap in this regard. This examination should be basically seen as a beginning stage in endeavoring to uncover the current realities of fishermen community in local area. Non-accessibility of adequate and reliable information is one of the significant constraints of the examination. In absence of appropriate records, the examination exclusively relies upon information given by the fishermen regarding their conditions Ayyappan & Krishnan 2004)

Data Analysis and Interpretation: Table.1 reveals that 41 per cent are in the age group of 31 to 40 and 28 per cent are in the age group of above 50 years, 20 per cent are in the age group of 41 to 50 years, and 11 per cent are in the age group of below 30 years. It denotes that most of the fishermen involved in fish marketing at satpati landing center in Palghar district are 31 to 40 years of age and the persons below 30 years of age are rarely involved in marketing of fish in the study area.

Table.2 reveals that 85.3 per cent are married and 14.7 per cent are unmarried. It divulges that married individuals are highly involved in marketing of fish at satpati landing center in Palghar district. Table.3 reveals that 59 per cent belong to nuclear family and 41 per cent belong to joint family. Thus, it is concluded that most of the fishermen in the study area are living in nuclear families.

Table 4. Educational Qualification Wise Classification ofRespondents

Educational Qualification	No. of Respondents	Percentage		
Illiterate	26	35		
Up to 5th	11	15		
5th to 8	14	19		
SSLC-HSC	20	26		
Undergraduate	04	5		
Total	75	100		
Source: Primary data				

Table 5. Monthly Income Wise Distribution of Respondents				
Monthly Income	No. of Respondents	Percentage		
Below Rs.5000	22	29		
Rs.5001 – Rs.10000	33	44		
Rs.10001 – Rs.20000	17	23		
Above Rs.20000	03	4		
Total	75	100		
Source: Primary data				

Table.4 shows that 35 per cent are illiterates, 26 per cent are SSLC to HSC educational qualification, 19 per cent are 5th standard to 8th standard, 15 per cent are up to 5th standard and 5 per cent are undergraduates. It is evident from table that majority of the respondents are illiterate in the study area (Kumar 2005).

Table.5 clearly shows that 44 per cent earn a monthly income of Rs.5000 to Rs.10000, 29 per cent earn a monthly income of below Rs.5000, 23 per cent earn a monthly income of Rs.10000 to Rs.20000 and 4 per cent earn a monthly income of above Rs.20000. It is clear from table that majority of the respondents earn a monthly income of Rs.10000 (Kumar et al., 2008).

Table.6 reveals that 40 per cent have been involved in fishing for 5 to 10 years, 39 per cent have been involved in fishing for above 10 years, 14 per cent have been involved in fishing for 1 to 5 years and 7 have been involved in fishing for below 1 year.

Table 6. Number of Years Involved in Fishing					
Number of Years Involved in Fishing	No. of Respondents	Percentage			
Below 1 Year	05	7			
1 to 5 YEARS	11	14			
5 to 10 years	30	40			
Above 10 Years	29	39			
Total	75	100			
Source: Primary data					

Table.7 reveals that 61 per cent belong to mechanized type of fishing and 39 per cent belong to non- mechanized type of fishing (Madugu & Edward 2011).

Table.8 shows that majority of 64 per cent of the respondents are involved in fishing for about 200 days and above in a year. The fishing period in a year is found to be between 100 and 200 days for 24 per cent of the respondents while the remaining 12 per cent of the respondents have a fishing period of below 100 days. It reveals that most of the respondents could be engaged in fishing for a period of 200 days or more.

Table 7. Type of Fishing					
Type of Fishing	No. of Respondents	Percentage			
Mechanized	46	61			
Non-Mechanized	29	39			
Total	75	100			
Source: Primary data					

Table 8. Fishing Period in a Year

Fishing Period in a Year	No. of Respondents	Percentage
Below 100 Days	9	12
100 – 200 Days	18	24
Above 200 Days	48	64
Total	75	100
Source: Primary data		

Table 9 clearly shows that 53.3 per cent of the fishermen faced storage problems, 53.3 per cent of the fishermen faced quality issues and 41.3 per cent of the fishermen faced the problem in transportation. Fishermen of different age groups have different problems of fish marketing. To find out the significant difference in problems of fish marketing among different age group of fishermen at Satpati landing center in Palghar district, 'ANOVA' test is attempted with the null hypothesis, "there is no significant difference in problems of fish marketing among different age group of fishermen at Satpati landing center in Palghar district". The result of 'ANOVA' test is presented in the Table 10 (Ravindranath 2008).

Table 9. Problems in Fish Marketing							
Problems of Fish Marketing	SA	А	N	DA	SDA	Total	
Over exploitation by middleman	25(33.3)	29(38.7)	4(5.3)	9(12)	8(10.7)	75(100)	
Price fluctuations	28(37.3)	22(29.3)	8(10.7)	8(10.7)	9(12)	75(100)	
Inadequate demand	29(38.7)	18(24)	7(9.3)	13(17.3)	8(10.7)	75(100)	
Low price offered by the buyer	24(32)	27(36)	5(6.7)	8(10.7)	11(14.7)	75(100)	
Storage problems	40(53.3)	26(34.7)	2(2.7)	4(5.3)	3(4)	75(100)	
Quality issues	22(29.3)	40(53.3)	4(5.3)	5(6.7)	4(5.3)	75(100)	
Inadequate market knowledge	30(40)	28(37.3)	5(6.7)	6(8)	6(8)	75(100)	
Competition from other sellers	31(41.3)	24(32)	8(10.7)	5(6.7)	7(9.3)	75(100)	
Transportation problems	29(38.7)	31(41.3)	4(5.3)	6(8)	5(6.7)	75(100)	
Delay in payment	23(30.7)	28(37.3)	6(8)	9(12)	9(12)	75(100)	
Source: Primary data (SA-Strongly Agree, A-Agree, N-Neutral, DA-Disagree and SDA-Strongly Disagree)							

Jadhav & Borgave

Table 10 shows the mean score of problems of fish marketing along with its respective 'F' statistics. The important problems of fish marketing among fishermen are storage problems and price fluctuations and their respective mean scores are 4.3684 and 4.3654. Regarding

the problems of fish marketing, the significant difference among the different age group of fishermen, are identified in the case of price fluctuations and low price offered by the buyer since the respective 'F' statistics are significant at 5 per cent level, the null hypothesis is rejected.

Table 10. Problems of Fish Marketing Among Different Age Group of Fishermen – ANOVA						
Problems of Fish Marketing	Age Group of Fishermen (Mean Score)			F	p Value	
	Below 30	31-40	41-50	Above 50		
Over Exploitation by middleman	3.8333	4.0125	3.4848	3.8421	0.652	0.584
Price Fluctuations	4.3654	3.6471	4.0909	2.7895	4.981	0.003
Inadequate Demand	2.6657	3.8824	3.9394	3.1579	2.453	0.070
Low Price Offered by the Buyer	1.6325	3.5294	4.2121	3.2105	8.106	0.000
Storage problems	4.3212	4.2353	4.3124	4.3684	0.074	0.974
Quality Issues	4.1245	3.8235	3.9697	3.9467	0.101	0.959
Inadequate Market Knowledge	3.6542	4.2306	3.8485	3.8947	0.481	0.697
Competition from Other Sellers	3.8933	4.1234	3.9091	3.6316	0.532	0.662
Transportation Problems	3.3301	3.8474	3.9773	3.7895	1.383	0.255
Delay in Payment	3.6267	3.3158	3.9412	3.3158	0.633	0.596
Source: Computed data						

Suggestions

- 1. To decrease the problems of fish marketing, sufficient storage spaces must provide the fishermen. Due to perishability of fish the preservation facility like cold storage should provide.
- 2. To increase the satisfaction level, the consumer needs to purchase the fish at the landing center. The fish price ought to be fixed properly, reasonably and ought to be disbursed immediately. The consumer ought to purchase the various assortments of fish.
- 3. The secondary education and secondary income source should be provided to fishermen and their family members. The educational level could help the fishermen to identify the different selling points where the fish products could be sold, so that their market knowledge gets increased.
- 4. The government should support for cooperative societies and take steps for the export of fish. Hence, the fishermen could get more profit by exporting fish and fish products.
- 5. The Government should ensure that its official schemes will support the fishermen in financial ways also. The fishermen should be invited for meeting frequently so that they will get a chance to discuss various problems they have faced.
- 6. It is also suggested that the fishermen should be provided training for increasing their fishing ability and marketing skills. The fishermen are also to be provided with accident benefit schemes and insurance facility.
- 7. The infrastructure facility should be improved, and Government should take various steps to solve the problems faced by the fishermen in marketing their products.

CONCLUSION

Fish consumption is by all accounts increasing everywhere on the world. Fish and fish products are getting well known among the young consumers. The medicinal usage of fish products ought to be investigated to the consumers. The issues of fish marketing should be tackled by the Government and the co-operative society by expanding its nature of administrations and increasing its quality of services. It brings about the upgrade of level of fulfillment of fishermen towards the consumer. The role of co-operative fisheries society in the arrangement of different Gov. schemes and facilities administrations to the fishermen community is very important. The infrastructure facility like storage facility, transportation facility, and selling facility, etc. should be improved so that the quality of the fish and fish product can be maintained to highest level.

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Understanding Consumers Online Impulse Grocery Shopping: A Stimulus Organism Response Framework Approach

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ABSTRACT

This study lays emphasis on the theoretical S-O-R framework also known as the Stimuli-Organism-Response framework to understand the reasons as to why consumers buy grocery products impulsively in the online milieu. The research review throws light on certain environmental cues to know the motives behind impulse buying. The website stimuli being one of the prime factors that govern the attitude of the consumers towards online grocery shopping, their ability to manoeuvre and regulate their emotions and state of mind before indulging in shopping impulsively. There are certain hedonic motives which influences the consumers to shop inadvertently resulting in a positive outcome. Consumer's mood states also define the way in which they assess the buying process subconsciously which urges them to buy on impulse. The paper seeks to understand the utilitarian shopping value and its impact on consumers overall buying tendency. The researcher to better this framework conducted focus group to identify the qualitative parameters which drives impulsiveness and hence the purchase. The environmental cues act a major force and thus creates an overall positive influence toward online shopping. The study unravels startling revelations such as Mood States, Discounts on Premium Brands, Security, Offers, Time, Convenience as the means to buy impulsively.

KEY WORDS: S-O-R FRAMEWORK, HEDONIC SHOPPING, ONLINE IMPULSE, ONLINE GROCERY, URGE TO BUY, IMPULSE BUYING.

INTRODUCTION

Grocery industry is by far a wide consumer segment which needs to be explored more. An average Indian household spends nearly 50% of the monthly proceeds on buying groceries be it online or offline. The estimation of Grocery retail in India is approximately 60% of the country's total market comprising the retail segment. Market Researchers & Experts estimate it somewhere around \$500 billion at present. The likely market can



across around 800 billion by end of 2022. Online grocery is one such segment within the grocery industry that is booming faster than expected in the current times with a greater market strength. The estimation is roughly around \$550 million to a little over \$1.75 billion currently and is expected to cross \$4 or even much more in the next three to four years (Arora 1982).

The e-grocery market is all set to reach the estimated market potential of \$18.2 bn by 2024. It's not just the about the proportion of the grocery pie that is striking to many online grocery sellers but it is the product assortment and its combination which is lucrative. For every household Groceries are a mainstay and are frequently bought with a higher repurchase intention resulting in a high repeat rate. They are purchased commonly and with a high repeat rate. Customers classically buy them without thinking too much which can be organic when it comes to planned purchase and



the buying which is not planned is an area of interest to the researchers (Bitner 1992).

In online retailing perusing the effect of the online environment on human psyche has its roots instilled in Marketing, Consumer Behaviour and Psychology. Stimulus-response theory established a strong interconnectedness between the external environment and human behaviour. Kotler (1973) initially addressed the importance of atmospherics in the offline space as a means of marketing. This concept was further accentuated by Bitner wherein the termed was commonly referred as 'servicescape', which defined all those factors physical in nature that could be monitored and influenced by the organization to enrich the employeecustomer interaction. Bitner (1992, p. 65); postulated that the service encounter or interaction largely is affected by the external physical environment in which the service is delivered. Further studies by Ezeh & Harris (2007) defined servicescape which included non-physical components identified as social factors comprising of the ambience referred to as ambient factors, servicescape design.

Lazarus (1998, p. xvii) argued that the stimulus-response theory considers the person as a passive creature who reacts to the stimulation environment that nudges him or her to buy and that the influence of the person on the surrounding environment is ignored explicitly. Consumers are considered as mechanical identities who react to the stimuli and the metaphor used to explain this phenomenon is between a lamp and a power switch. Mehrabian & Russell (1974) stated that people behave differently and differ in terms of developing organismic reactions to stimuli, though the influence of external stimuli can't be denied. A person exposed to external stimuli would develop reactions which would eventually lead to behavioural responses as per the S-O-R framework. Arora (1982), Buckley (1991), Donovan Et Rossiter (1994) and Wakefield and Blodgett (1996) studied the S-O-R framework and its implications in the marketing discipline pertaining to consumer behaviour. Research has unravelled various facets of the influence of traditional store environment and its ability to influence consumers to buy on impulse with emphasis on the cognitive and emotional state of mind.

Literature Review: Mehrabian and Russell (1974) suggested an academic cum theoretical framework Stimulus-Organism-Response (S-O-R) which was later refurbished by Jacoby (2002). The foundation sets an academic & a research base to support the proposed model in our study. There are certain cues in the environment that ignite the emotional as well as cognitive state of mind of an individual which subsequently influences behavioural response or action that eventually would lead to either buying. Donovan and Rositer (1982) corroborated the phenomenon by conducting their own study of the aforesaid framework. The consumer behaviour aspect in Marketing is a very well-defined process and has some of its theory set in the framework. Eroglu et al., (2003) extended the study to

computer science, Mollen and Wilson (2010) enumerated the effect of having an engaging website experience whereas Olney et al., (1991) studied its applicability to consumer behaviour (Buckley 1991).

Rose et al., (2012) suggested recent research and academic advances in the various industries and the consumer buying and allied areas which were corroborated by the research carried out by Reitz (2012). Eroglu et al., (2001) defines three elements in the S-O-R framework which are stimulus, organism, and response. The influence that arouses or is induced within the individual is defined as the stimulus. In the virtual environment which is our prime focus of study the stimulus can be the infrastructure of the online brand community. Mollen and Wilson (2010) suggested few characteristics such as the virtual layout, interactivity, the quality of information, rewards and promotions that can possibly act as a source of trigger. Their study dealt with how online communities have an impact on customer engagement and proves that the factors studied act as significant influencers.

Loureiro and Ribeiro (2011) in their research lay emphasis on the cognitive and affective states which are intermediary customer states. The organism component of the S-O-R framework delves into these intermediary states that demonstrates the various processes a customer subconsciously encounters between the stimuli and behavioural responses of the customers. Eroglu et al., (2001) elucidate the Cognitive bent of mind that represents everything that the mind subconsciously processes such as understanding, assessment, acquisition, information retrieval, retention whereas, Affective state reproduces the emotions like mood states, pleasure, stimulation, excitement exhibited by customers subject to the external environmental stimuli. Loureiro and Ribeiro (2011) studied the effect of customers behavior once exposed to various stimuli which helps them process information in their minds and aids in making meaningful decisions.

Donovan and Rositer (1982) enumerate that cognition and affection are the significant dimensions of engaging customers, and their study claims that customer engagement is the organism element state of the S-O-R framework where the stimuli would play positively with the customers cognitive and affective state of mind making the customer responsive. Bitner (1992) and Eroglu et al., (2001) posited that the response dimension of the S-O-R framework is the consequence in the form of positive attitude exhibited by the customers' or avoidance behaviours. Approach behaviours are positive responses that are revealed by the customers on explicit settings in the form of buying, repeat purchases and constructive word of mouth communications, whereas avoidance behaviours echo the negative communications where the consumers would not like to buy and has no intentions to stay. The response in the form of behavioural outcome can be deemed as attitudinal, thus the study inspects trust and loyalty as a response of customer engagement in online communities.

Prashar, et al., (2017) studied this concept and applied the theoretical framework to the online buying space. Donovan and Rossiter empirically estimated the effect of retail atmosphere on customers buying decision. Eroglu, et al., (2003) defined the advantage of creating an atmosphere on the Internet and named it as Web atmospherics which briefly explained the positive aspects of designing a website that can attract the attention of the prospective customers while buying online. Review of various related literature postulates that web atmospherics have been conceptualized in many ways viz. on the basis of interface oriented visible cues and the high task vs. low task orientation of atmospheric signs. Prashar, et al., (2017) researched the informative, entertainment and effectiveness of the web atmospherics. The environmental cues of any retail setting can affect either the cognitive or affective states or both and may help the buyer to get a feeling of telepresence in the set-up. i.e., "the persuasive sense of being present in a virtual environment that is mediated'. Novak, et al., (2000) elucidated that online marketer need to focus their attention to make consumers feel as if they are shopping in an offline environment so as to generate positive response.

Manganari et al., (2009) and Mummalaneni (2005) enumerate the factors that is manifested by stimulus in the online shopping domain. Factors like website security, layout of the website, design, online promotions have an effect on the performance of the online stores. The organism element of the framework in the online shopping milieu is the feeling of trust that the consumers associate with the website that reflects both the states viz affective and cognitive of the potential buyer which serves as a transitional stage that results in behavioural outcomes such as trial, repeat purchases, avoidance, etc. Lately, various research scholars have pragmatically applied the SOR framework to unravel the impulsive behaviour of consumers online.

Chang and Chen (2008), Kim and Lennon (2010), Demangeot and Broderick (2016) and Manganari et al., (2009), etc. have studied and explored the phenomenon of online buying laying its foundation on the S-O-R framework. Research ranging from assessing online consumer behaviour, response of consumers, their emotional and behavioural responses to online e-retailers, potential consumers' trust and online purchase intentions, repurchase phenomenon, online web or internet atmosphere termed as webmosphirics which inadvertently affects consumers behaviour online and consumers' interaction and communication with the online retail stores and their consequences.

This study further augments the stimulus–organism– response (S–O–R) model to include impulse-buying behavior with reference to grocery shopping. The S–O-R framework plays an instrumental role in electronic shopping but has still not unearthed the attention it deserved in the academia particularly when studying about electronic commerce research. The basis of our research is in marketing, consumer behaviour, planned purchases and unplanned buying along with environmental psychology, the impact of virtual atmospheric cues on online impulse-buying behavior and spending have been identified. Their study elaborates on variables such as shopping fun, excitement and unplanned buying coined as impulsiveness thus establishing relationship between categories of atmospheric cues of an online e-tailer such as content of the website, design and layout, and navigation to transition into behavioral variables which are impulse-buying behavior and expenditure or spending. The results show evidences of the validity of the S–O–R model in the milieu of online impulse-buying behavior and show a significant positive correlation of two dimensions of virtual atmospheric cues which are design and navigation of website. Childers et al., (2001) enumerate the importance of sensory information via the interactive media and emphasise that it is sufficient enough to prove and trust that the online shoppers will enjoy web-shopping using new age media tools for webshopping. Childers et al. (2001) defined "Webmosphirics" that signifies the internet virtual environment which corresponds to the physical surroundings associated with the retail atmosphere such as graphics, text, popup windows, search engine configuration, audio, colour scheme, streaming video, product assortment displays and grouping of products that may lead to impulse buying online.

Ramus and Nielsen (2005) reckon that online shoppers perceive internet grocery shopping an advantage when compared to traditional grocery shopping in terms of convenience, product range and price. Disadvantages, which could act as psychological barriers, are, for instance, the risk of receiving mediocre quality groceries and the loss of the frivolous aspect of grocery shopping. Morganosky and Cude (2000) described convenience and saving time as the main motive for buying groceries online but referred to physical or constraint issues that made it inconvenient for grocery shoppers to shop at grocery stores.

METHODOLOGY

Qualitative Research in form of focus group discussions were conducted in Mumbai Suburban & Pune City

- a. 8 females belonging to the age group of 25-40 years
- b. 8 males belonging to the age group of 25-40 years
- c. 8 males & females belonging to the age group 40-55 years.

The qualitative research was conducted with respondents who bought groceries online at least twice a month and belonged to higher income group or Rs.50000 and more. During the discussion it emerged:

- 1. Big discount / sale days
- 2. Discount on premium brands
- 3. Combo offers with regular product
- 4. Notifications for discounts
- 5. Offers on big pack

Sasumana & Ray

- 6. A tempting recipe offline
- 7. Someone appreciates a new brand
- 8. Bored of eating regular food
- 9. In a mood to celebrate
- 10. See a rare / exotic ingredient
- 11. Traditional dishes of other states
- 12. Product not available earlier
- 13. Traditional dish elders prepared
- 14. Tempting dish on Instagram
- 15. A tempting recipe online16. Notifications for new launch
- 17. A new variant of known brand
- 18. Brand advertisement offline
- 19. Tempting display
- 20. Popup / banner on other apps





FINDINGS & DISCUSSION

The review along with the focus group conducted suggests that buying impulsively online or the urge consumers get to buy online are two elements that lead to actual buying of grocery. The parameters that entail within these elements are hedonism in terms of pleasure one derives to buy online, apart from the atmosphere of the website, its layout, the security features, privacy of the transactions, the trust factor that consumers gain after repeated purchases apart from discounts and promotional offers that need to be studied more. Online Impulse Buying of Grocery Products is a phenomenon that is yet to be explored more in terms of the factors that propel consumers to buy online. Though online grocery shopping has been rampant in the past 5 years in India, eliciting accurate information would require more detailed quantitative study. The researchers studied effects of two types of sales promotion commonly known to marketers as price discounts and bonus cartons and discount on premium brands.

Previous researchers have shown that bonus as a tool of promotion has a greater impact on offline impulse buying than price discounts. However, our findings were different in the online context dealing with grocery shopping in which price discounts were primarily the reason to buy groceries on impulse that resulted in higher impulse buying intention than bonus as promotional techniques when the product was hedonic and where pleasure seeking was one of the main reasons behind buying impulsively whereas bonus were a more effective sales promotion than price discounts when the product was practical. The utilitarian value was highlighted in search transactions. In addition, price discounts as tool garnered more impulse buying intention than bonus as a tool when the product was inexpensive, whereas bonus was a more effective marketing promotion method than were price discounts when the product was expensive.

CONCLUSION

The S-O-R framework is a unique theoretical concept which is instrumental in understanding the consumers behavior while shopping online. The review suggests that urge to buy impulsively can be propelled by various stimuli to the consumers which would inadvertently make the consumers buy impulsively online. The focus groups conducted in the suburbs of Mumbai and Pune City cite various stimuli which leads to impulse buying of grocery products. Price discounts, bonus packs, discounts on premium brands, tempting displays, traditional dishes online, pop up banners, video content, online promotion, content are some of the stimuli that can effectively work with the cognitive and affective state of minds thus propelling the consumers to indulge into a positive behavioural response and make them buy grocery impulsively online. The researchers with an ardent hope aim to explore more into this phenomenon of buying grocery impulsively online by extending the review into a more robust empirical survey amongst consumers who buy grocery online.

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Stress Faced by Homemakers Due to Online Mode of Education and Work from Home by Family Members During Covid–19 Pandemic

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ABSTRACT

COVID-19 has caused immense psychological and physical stress to almost everyone in the world. It has drastically changed the way people live and work. It has changed the way people communicate with each other and it has also changed the way people perceive different situations, relationships and things. Though a lot is talked about, discussed and researched upon the effects of COVID-19 on work-life balance, education sector, financial issues, issues arising from Work from Home for employees, health concerns about senior citizens and people with co-morbidities, the stress faced by homemakers due to online mode of education and work from home by family members during COVID-19 pandemic, is an area that remains relatively neglected. Family members being at home for most of the time of the day, is a new phenomenon for these homemakers. It is not very easy for them to deal with this new situation emotionally and physically. It means a lot of compromises are expected to be made by the homemaker in terms of time, energy and privacy, as she is most often taken for granted by our male dominated society. She has lost the only ME time that she used to get during the day while her family members were out attending their daily chores. Being at home for most of the time by family members has also increased her work at home as it is assumed by most of the family members that while they are busy attending to their professional and educational commitments, she is relatively free to take care of all their needs. This research paper tries to explore the stress faced by these homemakers due to such situations arising out of COVID-19.

KEY WORDS: STRESS, HOMEMAKER, HOUSEWIFE, ONLINE MODE OF EDUCATION, WORK FROM HOME, COVID-19 PANDEMIC

INTRODUCTION

For every family, a lady of the house is the backbone on whom the entire family relies for almost all the daily chores. This holds especially true for the homemakers



(many times referred to as "Housewife") whose contribution to the family remains unnoticed most of the times and who are taken for granted. COVID-19 has forced almost everyone to lock themselves indoors. It impacted every aspect of human life, be it social, economic, psychological or cultural. Though the lockdown and quarantine period made things really difficult for everyone, it made things worse especially for home- makers who have the most burden when it comes to light the responsibility part on the home front, from household chores to cooking different dishes and meeting the demands of the family members, to share their mobile phone, electronic gadgets, room and "MI" time with the family members who are wither working from home and/or are attending online education courses. (Manocha, 2020).

Though there is a lot discussed and researched about the adverse effects on the Work-Life balance of the working women, there is very little focus on the stress faced by the homemakers during COVID pandemic due to Work from Home and the online mode of education by the family members. The patriarchal Indian society traditionally takes the homemakers for granted and it is almost always assumed that those who are required to go outside the home for the purpose of earning money and/or education, must be given a preference over her when it comes to making things available. It is also believed that the homemaker being at home all the time, needs to tend to the needs and requirements of the family and hence, put their demands before her. This mindset continues during the COVID-19 pandemic and has resulted in additional stress for the homemakers who are required to shared their time, gadgets including mobile phones and space with other family members as per their requirement, in addition to the demands regarding preference of food and frequency of serving it as well as other demands including making all those things available to the other family members that they need for their work and/or online classes.

Need of the Study: The only time that is generally available to the homemaker for herself, is the time when her family members are away from attending their work duties and/or school/college/tuitions, etc. That is the time when she can be herself for a while and spend it for relaxation, connecting with the people close to her, pursuing some hobby, etc. This is generally the only "ME" time available to her. However, COVID 19 has led to encroachment on her "ME" time now. As almost every family member is at home throughout the day, the homemakers are busy for the entire day attending and meeting the demands of the family members. If the house is small and the monetary resources are very limited, then it is the homemaker who is required to make the compromises in terms of sharing the space and other resources including her mobile phone, other electronic gadgets, etc. The remote control of the television is constantly away from her so the shows she used to watch for her entertainment before COVID-19, can't be watched by her now to unwind herself.

All these things and many others have added to the physical and psychological stress of the homemakers. To have a better understanding about the kind of stress faced by the homemakers due to COVID 19, it is required to understand the factors that were vital to a homemaker to distress herself prior to COVID 19 and then to compare these factors in the context of Work from Home and/or online education mode adopted by the family members during the Pandemic.

Literature Review: As described in her thesis on "Identification of Young Homemakers' Management Problems Related to Resource Limitations" by Koza M. in 1974, "the homemakers appeared to place a high value on their dual roles as wife and mother and were willing to try new ideas to enhance their roles." It seems that what held true long back in 1970s, is still valid in the contemporary context. In a research study "The Happy Homemaker?: Married Women's Well-Being in Cross-National Perspective", Treas J. et al (2011) found across 28 countries, that traditionally homemakers have statistically significant and robust, happiness advantage when compared to full-time working wives. It showed that their personal satisfaction levels were better than the working women who had to juggle between their personal and professional commitments.

However, the research done during the COVID 19 pandemic by Cofey C., et al (2020) reveal that the unpaid household work is physically taxing and time consuming. Especially during the COVID-19 pandemic, such unpaid work of homemakers which is increased substantially due to lockdown and problems arising out of it, including non-availability of the maids, family members being at home for most of the time, is taking away most of their time and has resulted in these homemakers having very little or no time for themselves, restrictions on the movement in the house, very little or no place for themselves in the house, very little contact with the near and dear ones besides the family members, very little or no time to pursue a hobby, etc.

COVID-19 pandemic has affected women differently than men especially when it comes to the increased burden of unpaid work. Patriarchal Indian society always made the women work disproportionately as compared to men on the household chores which are not rewarded monetarily. The lockdown due to COVID-19 has further added to these unpaid tasks required to be carried out by women due to absence of the domestic staff to carry out washing, cleaning, cooking, etc. As the outside options with respect to getting the food, availing the services for the purpose of laundry, getting the groceries and vegetables delivered at home, etc. are not available, even these tasks are added to the daily chores expected to be done by the lady of the house.

This has resulted in additional work and though almost every family member is at home attending to his/her job duties and/or education, it is expected that the homemaker who apparently does not have any productive work to do as perceived by the traditional Indian society, must take care of all these addition unpaid domestic tasks. She is expected to cook more often and fancy cuisine in addition to serving the family members throughout the day as the outside food is less available and is not advisable to consume. The homemaker on an average is working 70 hours a week now on these unpaid domestic tasks, a good amount of part was done by the domestic helps before the pandemic. (Chauhan, 2020).

In a study on a "Qualitative Research On Homemakers For Impact Analysis Of COVID-19 On The Psychological State Throughout Lockdown In Jabalpur City" (Manocha A., et al, 2020) it was found that as homemakers are spending more time on the household chores due to
constant presence of the family members at home and no domestic help available to share their burden of these unpaid household tasks, they get very little or no time to pursue their hobbies or to get connected with the people to whom they can speak freely and ventilate, these homemakers are getting stressed both physically and psychologically more than before.

Objectives

- 1. To study whether there is any change in the family support received by housewives post implementation of COVID-19 induced lockdown
- 2. To study whether there is any change in the personal life satisfaction of housewives post implementation of COVID-19 induced lockdown
- 3. To study whether there is any change in the access to mobile phones available to the housewives post implementation of COVID-19 induced lockdown
- 4. To study whether there is any change in the access to the television available to the housewives post implementation of COVID-19 induced lockdown
- 5. To study whether there is any change in the frequency of the contact made by the housewives with their friends' post implementation of COVID-19 induced lockdown
- 6. To study whether there is any change in the frequency of the contact made by the housewives with their relatives post implementation of COVID-19 induced lockdown
- 7. To study whether there is any change in the personal life expectations of the housewives post implementation of COVID-19 induced lockdown

RESEARCH METHODOLOGY

A structured questionnaire having 25 questions was prepared for the purpose of the study. The first five questions were designed to capture the demographics of the respondents. The remaining 20 questions were divided into two parts and they were designed such that the respondents have to respond to them separately. The first part was designed to capture the experiences of the housewives before the COVID induced lockdown was implemented. The second part of the questionnaire was focused on capturing the responses of the housewives after the lockdown was implemented.

The questionnaire was sent to 200+ respondents online and 18 respondents offline of which 126 respondents answered the questionnaire online and 18 answered it offline, and all of the collected responses were usable for the statistical analysis. Though the researchers had originally planned to conduct the survey offline inperson, the COVID-19 induced lockdown and social distancing limited the feasibility of the same. The 18 responses were gathered because of easily accessibility to them near the researcher's place of residence. The researcher later adopted online distribution of the questionnaire via mediums such as e-mail and instant messaging to the contacts. The sampling method used for this study was convenience sampling. The sample size for this study is 144 housewives as respondents, all the residents of Greater Mumbai.

The characteristics of the sample are illustrated in the following tables.

Table 1. Age of the respondents & number of their children staying with them.									
			Age of the Respondents						
		18-25	26-30	31-35	36-40	41-45	46-50	Above 50	
Number of	More than three	0	0	0	0	2	0	0	2
Children	None	2	0	2	0	0	2	2	8
	One	0	4	10	26	16	8	14	78
	Two	0	0	4	16	6	26	4	56
Total	2	4	16	42	24	36	20	144	

Table 2 Age of the re	enondents and the type	of family they	are staving in
Table 2. Age of the re	sponucints and the type	UI family uncy	are staying m.

			Age of the Respondents						
		18-25	26-30	31-35	36-40	41-45	46-50	Above 50	
Family	Joint Family	2	2	8	14	8	6	2	42
Туре	Nuclear Family	0	2	8	28	16	30	18	102
Total	2	4	16	42	24	36	20	144	

The instrument prepared for this study had 20 items.

Reliability of the instrument: The reliability of the nondemographic part of the questionnaire comprising 20 items was determined using Cronbach's α .

The result of the same is as below:

Purohit et al.,

Table 3. Highest qualifications of the respondents									
			Age of the Respondents						Total
		18-25	26-30	31-35	36-40	41-45	46-50	Above 50	
Highest	Post Graduate								
Quali-	& Above	0	2	10	24	8	10	10	64
fication	Graduate	0	2	6	16	12	20	10	66
	Higher Secondary	2	0	0	2	2	2	0	8
	Pass								
	Upto Higher	0	0	0	0	2	4	0	6
	Secondary								
Total		2	4	16	42	24	36	20	144

Table 4. Annual Family Income of the Respondents

			Age of the Respondents						
		18-25	26-30	31-35	36-40	41-45	46-50	Above 50	-
Annual	Rs. 0 -								1
Family	Rs. 500,000	2	4	4	12	2	6	8	38
Income	Rs. 500,000								
	- Rs.10,00,000	0	0	2	6	12	10	6	36
	Rs. 10,00,000								
	- Rs. 15,00,000	0	0	6	0	10	10	2	28
	Above								
	Rs. 15,00,000	0	0	4	24	0	10	4	42
Total		2	4	16	42	24	36	20	144

Table 5. Factors and number of items in the questionnaire

Factor	No. of items			
	Before lockdown	Post lockdown		
Family Support	2	2		
Personal Life Satisfaction	2	2		
Access to mobile phone	1	1		
Access to television	1	1		
Contact with friends	1	1		
Contact with relatives	1	1		
Personal Life Expectations	2	2		

Table 6. Reliability of the instrument					
Cronbach's Alpha	Number of Items				
.824	20				

In order to find whether there was any significant difference in the lives of the respondent housewives before and after the COVID induced lockdown was imposed, the researchers initially considered using a paired sample t-test as the same respondent housewives were administered the questionnaire both the times. However, the use of a paired t-test mandates the assumption that the differences between the matched pair should be normally distributed. In order to test for normality of the differences between the pairs, Kolmogorov-Smirnov Test and Shapiro-Wilk Test were conducted using SPSS, and the results of which are given in the following table.

The researchers then proceeded with Wilcoxon Signed Ranks Tests to test the following hypotheses

Hypothesis 01:

H1: There is no significant change in the family support received by the housewives after the COVID-19 induced lockdown was implemented

The Wilcoxon Signed Ranks Test yielded the following result:

The Wilcoxon Signed Rank Test revealed that there is statistically significant change in the family support received by the housewives after the COVID-19 induced lockdown was implemented, z = -7.885 and p = 0.000 (<0.05). Hence we reject H1.

Hypothesis 02:

H2: There is no significant change in the personal life expectations by the housewives after the COVID-19 induced lockdown was implemented

The Wilcoxon Signed Ranks Test yielded the following result:

The Wilcoxon Signed Rank Test revealed that there is statistically significant change in the personal life expectations by the housewives after the COVID19 induced lockdown was implemented, z = -8.744 and p

= 0.000 (<0.05). Hence we reject H2.

Hypothesis 03:

H3:There is no significant change in the access to the mobile phones available to the housewives after the COVID-19 induced lockdown was implemented The Wilcoxon Signed Ranks Test yielded the following result:

Table 7. Tests for Normality										
		Tests of Normality								
	Ko	olmogo	rov-Smi	rnova		Sha	apiro-V	Vilk		
	Statistic	df	Sig.	Conclusion	Statistic df		Sig.	Conclusion		
DIFFERENCE_ FAMILY_ SUPPORT	.191	144	.000	Not normally distributed	.941	144	.000	Not normally distributed		
DIFFERENCE_ PERSONAL_LIFE _SATISFACTION	.119	144	.000	Not normally distributed	.960	144	.000	Not normally distributed		
DIFFERENCE_ MOBILE_ ACCESS	.237	144	.000	Not normally distributed	.870	144	.000	Not normally distributed		
DIFFERENCE_ TV_ACCESS	.249	144	.000	Not normally distributed	.857	144	.000	Not normally distributed		
DIFFERENCE_ FRIENDS	.218	144	.000	Not normally distributed	.909	144	.000	Not normally distributed		
DIFFERENCE_ RELATIVES	.269	144	.000	Not normally distributed	.879	144	.000	Not normally distributed		
DIFFERENCE_ PERSONAL_LIFE _EXPECTATION	.150	144	.000	Not normally distributed	.939	144	.000	Not normally distributed		

a. Lilliefors Significance Correction

- FMLY_SUPPORT_BL
-7.885ª .000

PRS - PRS	NL_LIFE_SATSFCTN_AL SNL_LIFE_SATSFCTN_BL
Z	-8.744ª
Asymp. Sig. (2-tailed)	.000
a. Based on positive ranks.	

The Wilcoxon Signed Rank Test revealed that there is statistically significant change in access to their mobile phones available to the housewives after the COVID19 induced lockdown was implemented, z = -3.544 and p = 0.000 (<0.05). Hence we reject H3.

Hypothesis 04:

H4: There is no significant change in the access to the TV available to the housewives after the COVID-19 induced lockdown was implemented

The Wilcoxon Signed Ranks Test yielded the following result:

MOBILE_ACCESS_AL - MOBILE_ACCESS_BL						
Z	-3.544ª					
Asymp. Sig. (2-tailed)	.000					
a. Based on positive ranks.						
	TV_ACCESS_AL					
	- TV_ACCESS_BL					
Z	-3.738a					
Asymp. Sig. (2-tailed)	.000					
a. Based on positive ranks.						

The Wilcoxon Signed Rank Test revealed that there is statistically significant change in access to their mobile phones available to the housewives after the COVID19 induced lockdown was implemented, z = -3.544 and p = 0.000 (<0.05). Hence we reject H4.

Hypothesis 05:

H5: There is no significant change in the frequency of the contact with friends maintained by housewives after the COVID19 induced lockdown was implemented

The Wilcoxon Signed Ranks Test yielded the following result:

	FRIENDS_AL – FRIENDS_BL
Z	-6.792a
Asymp. Sig. (2-tailed)	.000
a. Based on positive ranks.	

The Wilcoxon Signed Rank Test revealed that there is statistically significant change in the frequency of the contact with friends maintained by housewives after the COVID-19 induced lockdown was implemented, z = -6.792 and p = 0.000 (<0.05). Hence we reject H5.

Hypothesis 06:

H6: There is no significant change in the frequency of the contact with relatives maintained by housewives after the COVID19 induced lockdown was implemented The Wilcoxon Signed Ranks Test yielded the following result:

	RELATIVES_AL - RELATIVES_BL
Z	-6.110a
Asymp. Sig. (2-tailed)	.000
a. Based on positive ranks.	

The Wilcoxon Signed Rank Test revealed that there is statistically significant change in the frequency of the contact with relatives maintained by housewives after the COVID19 induced lockdown was implemented, z = -6.110 and p = 0.000 (<0.05). Hence we reject H6.

Hypothesis 07:

H7:There is no significant change in the personal life expectations of the housewives after the COVID19 induced lockdown was implemented

The Wilcoxon Signed Ranks Test yielded the following result:

PR: PF	SNL_LIFE_EXPTN_AL - RSNL_LIFE_EXPTN_BL
Z	-6.280a
Asymp. Sig. (2-tailed)	.000
a. Based on positive ranks.	

The Wilcoxon Signed Rank Test revealed that there is statistically significant change in the personal life expectations of the housewives after the COVID19 induced lockdown was implemented, z = -6.280 and p = 0.000 (<0.05). Hence we reject H7.

CONCLUSION

From the above tests it is evident that the lives of the housewives have changed significantly post implementation of the COVID-19 induced lockdown. The examination of the pre-lockdown and post-lockdown median values of the factors show significant reduction in their value. The lockdown, and the trend of work from home and online education which followed the lockdown, has significantly affected the housewives' personal life satisfaction and personal life expectations. Moreover, this lockdown has significantly affected their access to their own mobile phones and television. The frequency of meeting their friends and relatives have also reduced significantly making the housewives confined to their homes with little access to entertainment and recreation while their husband and children pursue their work and studies from home.

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Perspectives of Fishers on Impact of Pandemic Covid'19 on Fisheries Business Operating in Coastal Maharashtra

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ABSTRACT

COVID'19 Pandemic i.e. Novel Coronavirus Global Epidemic resulted in nearly shut down of overall business fraternity in both organised and unorganised segments globally. As there was no immediate relief for the illness governments all across globe had no other options than putting restrictions on movement of people which gradually forced for complete lockdown in high density regions especially the urban and semi-urban regions. As the business vis-à-vis logistics is symbiotic for remote villages / towns on urban infrastructure for all allied industries it also brought gradual business shutdown in villages and town. Furthermore certain cases were found in secluded areas as well henceWorld Health Organisation (WHO)gave guidelines to governments to take immediate steps to stop the outbreak, hence Indian Government called for complete Lockdown of the nation. India being an agrarian economy wherein majority business set-ups are still under private unorganised sector, The Fishery sector which comprises of widely artisanal and small scale occupational aboriginal communities those are furthermore disorganised. The Lockdown imposed had stopped all the activities of Fishery related business. The impact of same was on income and overall livelihood of fishers as well as fishing allied ecosystem. Once the government started gradually opening up the markets and activities the business seems to be getting back to normal. The study directed towards the lockdown and post lockdown business of Fishery Industry that is severely impacted due to Pandemic.

KEY WORDS: COVID-19PANDEMIC, FISHERIES; COASTAL COMMUNITIES; INDIAN FISHERIES, INCOME, LIVELYHOOD, COASTAL MAHARASHTRA.

INTRODUCTION

Pandemic: A pandemic is defined as the "worldwide spread of a new disease." - World Health Organisation (WHO). When a new virus emerges first, there is a lack of natural immunity in most of us to tackle it. Which can cause a swift, occasionally rapid, blow-out of the infection betweenpublic, across populations, and



everywhereglobally.Deprived of a natural resistance to fight off asickness, many people can impact and turn out to be sick as it blow-outs.

Novel Coronavirus or Covid'19: According to WHO Coronaviruses (CoV) are a large clan of viruses that cause infection ranging from the common cold to more chronicailments. A novel coronavirus (nCoV) is a new strain that has not been formerly identified in humans. The novel virus was consequently named the "COVID'19 virus". Coronavirus (COVID'19) is acommunicable disease affected by a novel or newlyrevealed coronavirus.Most people disease-ridden with the COVID'19 virus will experience slight to moderate respirational illness and recover without necessitatingdistinctive treatment as found in SARS. Older persons, and those with history of underlying medical complications like chronic respiratory disease, diabetes, cardiovascular disease, and cancer are more likely to develop gravesickness.

Fisheries: "A fishery is an actionprominent to harvesting of fish. It comprise capture of wild fish or nurturing of fish through aquaculture." It similarly means "folksinvolved,technique of fishing, class of boats/ vessels/dinghies, species or type of fish, area of water or seabed, and purpose of the activities or anamalgamation of the foregoing attributes". - Food and Agriculture Organization (FAO) - United Nations

Pandemic and its impact of Fishers: COVID'19 Pandemic i.e. Novel Coronavirus Global Epidemic resulted in nearly shut down of overall business fraternity in both organised and unorganised segments globally. According to WHO Director Generals media briefing on 23rd February, 2020 it was concluded that no immediate relief for the disease was to be discovered and the medication which is generally provided with Severe acute respiratory syndrome (SARS) was the only alternative available. The governments all across globe had no other options than putting restrictions on movement of people. Gradually governments were forced for imposing complete lockdown in high density regions especially the urban and semi-urban regions.

As the business vis-à-vis logistics is symbiotic for remote villages / towns on urban infrastructure for all allied industries it also brought gradual business shutdown in villages and town. Furthermore certain cases were found in remote areas due to contact and connect of people from village to and fro cities, the casualties were increasing which compelledWorld Health Organisation (WHO), to give guidelines to governments to take immediate steps to stop the outbreak and declared it as Global Pandemic, hence Indian Government called for complete Lockdown of the nation on 24th March 2020. Guidelines wereissued accordingly from Ministry of Health and everything came to standstill.

People can't be locked up for a long period and hence essential services wereallowed to function with specific guidelines for functioning of organisations given from time to time. India being an agrarian economy the Ministry of Agriculture gave guidelines for production and movement of Food materials. Fishery is also a part of Ministry of Agriculture is very minuscule compared to Agro-based business network and infrastructure. As majorityArgo based business set-ups are still under private unorganised sector, The Fishery sector which comprises of widely artisanal and small scale occupational aboriginal communities those are furthermore disorganised.

The Lockdown imposed had stopped all the activities of Fishery related business due to very little clarity from government on Fishery business and supply chain. The Fishers started to face the heat of the same after some time. The impact of same was on income and overall livelihood on fishers as well as fishing allied ecosystem. The Fishing activities are mostly in Coastal places which have gradually developed into important logistical points of global trade due to presence of Fishing Docks and Jetties. The Salt on wound is these coastal places like Mumbai, Navi Mumbai, Sopara, Alibaug, Dahanu, Dapoli, Murud etc. are densely populated due to concentrated urbanisation. Resulting more number of COVID'19 cases in the surrounding regions.

The Maharashtra state government declared provisions under UNLOCK gradually opening up the industry, markets and other activities the business seems to be getting back to normal. This Normal is termed as new normal in organised industrial set-up as the daily routine, work life and social contact norms have changed drastically. This new normal is looking forward for changes in understanding for more sustainable livelihoods across occupations and businesses.

Literature Review

- Impact of COVID-19 on people's livelihoods, their health and our food systems (Joint statement by ILO, FAO, IFAD and WHO-ChriscadenKimberly, Communications Officer, World Health Organization, 13 October 2020) Thereport states the COVID'19 as a global epidemic has led to a histrionic loss of human life globally and presents an unique challenge to public health, the world of work and food systems. While the digit of malnourishedpeople, currently assessed at approximately6.9 crores, may rise by up to 1.32 crores by the year end. The socioeconomic disturbance produced by the pandemic is shattering: Crores of people are at risk of sinking into punishing poverty, Lakhs of institutions and organisations face a threat of existence. Approximately half of the global labour force are at risk of mislaying their livelihoods. Unorganised economy employees are predominantlyhelpless because majority dearth social security and access to quality health care and have lost access to productive assets. With no means to earn an income during lockdowns, many are unable provide food to their families. For most, no earningsmeans no nutriment and more scare of getting infected easily.
- Economic Consequences of Coronavirus Disease (COVID-19) on Fisheries in the Eastern Mediterranean (Cyprus) (Giannakis Elias, HadjioannouLouis, Jimenez Carlos, Papageorgiou, MariosAnastasisKaronias and PetrouAntonis. Sustainability; Basel Vol. 12, Issue. 22, August 2020).Theiroutcomes areestablished on the questionnaire investigation that specifythe COVID'19 outbreak had very negative impact on fishermen's income. With 40% and more fishermen and women stated that between mid of March and mid of May fishers were not been fishing due to social distancing constraints, while all of them stated a significant decline in their income. Severe negative effects were also reported for the fisheries sector of the Southeast Asian nations. On-line study for the commercial fishing trade in the North-eastern US shownalike disruptions for the sector.
- The Impacts of Covid-19 to Small Scale Fisheries in Tun Mustapha Park, Sabah, Malaysia; What do They Know So Far? (SakirunSarmalin, Payne Adam,

JomitolJoannie, Mohd. Omar Bural WWF-Malaysia, May, 2020). They studied that plummeting demand for fish and the selling prices along the supply chain, which is beyond the fishers' control, have restricted their purchasing and resulted in potential loss of income earning opportunities. Post Covid-19 rapid study should be conducted to obtain a quick understanding of the food security and livelihood situation of all fishing communities.

- Assessing Impacts of COVID-19 on Aquatic Food System and Small-Scale Fisheries in Bangladesh (Sharif Ahmed Sazzad, AtiqurRahman Sunny, Sarker, Ashoke Kumar, Ashrafuzzaman, Datta, Gopal Chandra, Preprints; Basel, June 2020.) The paper states that the pan epidemic known as COVID'19 has had a disastrouseffects on human activities, with aquatic food sector i.e. small-scale fishers being no exclusion. Food demand and thus food security are rigorously compromised due to movement restrictions, reduced buyers and further impact on the most susceptible small-scale fisheries and concomitant communities or business. Therefore, any actproceeded by the Administrationor Government must be based on shielding the health and food security of the people particularly to the marginalised classes, while it could be unfavourable to economic growth in the short run.
- Effect of COVID-19 on Economy in India: Some Reflections for Policy and Programme (Das Shankar, Chaudhary Monika, Sodani.P. R. - Journal of Health Management, August, 2020). Thearticle states that the growth and prevalent COVID'19 pan epidemic has disturbed the thriving economy globally in impulsive and uncertain terms. The presentrecession seems primarily diverse from recessions in the past which had shaken the economic order of the country. However the nations, corporations, establishments and international business continue to understand the magnitude of the pan epidemic, it is unquestionably the need of the hour to formulate for a future that is m more sustainable, fundamental and structurally more feasible for existence and functioning. The COVID'19 global epidemic have given a clear message for the growing Indian economy must adopt more sustainable progressive models, which are based on more inclusive frameworks, self-reliance, and are based on eco-friendly approaches.
- Impact of COVID-19 Lockdown on the Fisheries . Sector: A Case Study from Three Harbors in Theystern India (Singh Deepak, Ali. Yunus, Misra Prakhar, Tonni Agustiono Kurniawan, AvtarRam, Desai Pranav N., KouserAsma, DehaAgusUmarhadi, and KBVN PhanindraRemote Sensing; Basel Vol. 13, Issue. January, 2021). Their study reveals that the fisheries activity in India was severely affected during the state of nationwide lockdown. The COVID'19 specific lockdown have left fisheries workers stranded from sailing and operational tasks. By monitoring the temporal changes in the area covered under the ships during prior-lockdown, lockdown, and after-lockdown phases in the study area using high-resolution PlanetScope imagery,

they shot the utility of remote sensing technology as a tool for tracking COVID impacts in the fisheries sector.

Objectives of Research

- Study the impact of Covid'19 Pandemic on Fisheries
- Understand perspective of Fishers community on Pandemic persuaded Lockdown.
- Understand impact of lockdown on Income and livelihood of Fisher Community
- Understand post lockdown scenario of Fishery sector.

RESEARCH METHODOLOGY

The research paper is purely exploratory and descriptive based on primary data collected by interviewing fish farmers, fish sellers, & fishery related allied business persons (focus group) from fishing communities in various coastal places of Maharashtra and Secondary sources from national and international websites, reports, circulars, journals etc.

4.1. Data Collection

The Primary Data is duly collected by interviewing and discussing with the member representatives of Fisher Community. Secondary Data is used as a base to understand fishery sector from various Governmental and Non-Governmental Publications online and offline.



4.2. Analysis of Data 4.2.1 Demographic data of people interviewed.

Vaity & Shinde

Do you believe in reports of COVID'19 which is spread from Wuhan South China Seafood Wholesale Market was because of consuming Fish during Lockdown?







Is it safe to eat Fish now as things are becoming normal?



4.2.3 Impact after Lockdown



4.2.5 Issues Faced during Lockdown

- Low Sales as people were not coming out and also wrong perception on Fish consumption was being promoted by some unknown sources.
- No Fish Catch Allowed as security forces / police were not allowing for sailing.

- Transportation, Ice Factories, and overall Logistics was stopped due to no clarity to police or security officials on whether Fish and Fishery are under essential services.
- Exports was totally stopped due to closure of all international activities.
- When lockdown was suddenly declared Tons of fish had to be thrown back into the sea, incurring heavy losses.
- No any package or support declared by government and wherever it was granted it didn't reach the community people.
- Farmers are given so many subsidiaries as well as funds under numerous schemes by the Government, then why no attention is given to one of the oldest community based artisanal fishers residing at coasts
- In guise of lockdown many infrastructure projects were started in sea or near coasts.

4.2.6 Positive impact of Lockdown

- The sewage and other pollutants released in sea reduced resulting in less pollution near coasts.
- Fish breeding and quantum of fishes increased due to less pollution and no fishing.
- Online mode of fish selling was learnt.
- Majority says nothing is positive seen yet.

4.2.7 Issues faced after government declared Unlock and gradual opening of markets and economy.

- Fish rates tumbled as delusion and false narrative of relating fish with COVID impacted sales.
- Societies and certain markets not allowing fish selling
- Transportation getting affected as faresare hiked, and limited train travel timings.
- Unsustainable and disturbing infrastructure projects like Coastal Road, Industrialisation, Port Trust Activities, Docks, Sea Bridge, ONGC rigs, Construction activities, etc. were given more boost during lockdown which is in process impacting fish catch in shallow waters.
- Pollution increasing gradually
- Oil leakage and Warm water released by heavy Mercantile Ocean liners, Cargo ships etc.
- Financial problems due to unorganised sector finance service providers badly hit by COVID.
- Many non-fishers have entered the business impacting the coastal communities business.

4.2.8 Positive impact after government declared Unlock and gradual opening of markets and economy.

- Small scale business increased
- Fuel prices increased impacting price
- Educated younger generation viewing fishing as a long term and sustainable occupation and an alternative to unstable derived industry.
- But majority people still don't see the positive yet due to overall business and economy downfall.

4.2.9. Fishers Comments/Suggestions on impact of COVID'19 and normal world after that for Fishers 71

Business.

- Fish market not working properly and fisherwoman have to face many hardships
- Government Schemes and information is not reaching to poor fisherman & women as many are still not understanding Fisheries is also a food commodity and are covered in essential commodities.
- Fisheries needs crucial attention from Legislation and Administration just like Agriculture.
- Government should take measures by playing vital role by providing subsidies,aids,moratorium for low income and unorganised yet process oriented set up like fisheries.
- Increasing pollution in Sea and Oceans due to Oil Rigs, Merchant Transports etc.
- Increasing pollution in Sea and Oceans due to massive construction proposed or starter near or on coasts like Sagarmala, Blue Economy, Coastal Roads etc.
- Government should also pay attention to the fishing community as they do for other businesses and provide good schemes along with funds as they need it for the raw material which is required for fishing i.e. big ice boxes, diesel, Gas cylinder, etc. for which they need to lend funds from banks or cooperative credit societies.
- Whereas, if government would provide them funds with low interest or by any scheme. It will really help this community.
- More Institute/ colleges for fish processing and ocean study and also on marketing, logistics, warehousing, management, etc. concerning fisheries industry.

FINDINGS AND CONCLUSION OF THE STUDY

Fishing business just like any other occupation in India is still a community/tribe based business affair. The fishermen are still artisanal and traditional with little fraction moving towards mechanised or trawler based fishing. The fishing as an business is still neglected and seen as a outcaste by predominant agrarian perceived society of India and hence based on historical inferences drawn it's also deprived and neglected by mainstream, hence community is listed as schedule tribe / backward classes based on various social studies carried. The overall fishing activity is unorganised and very few are associated with Co-operative societies whose role is still very retrograde. Due to such prevailing conditions the COVID pandemic induced lockdown further created a problem for fishers whose life is generally hand to mouth. The hardships and problems were increased where fish catch, fish logistics and fish sales were totally shut.

Entire Fishery related ecosystem collapsed making the concern of life and survival for fishers. Fishing is one of the essential food commodities based on its nutrient value is still not been fully convinced by mainly vegetarian Indian society. In 21st century also fishery is highly perishable compared to agriculture produce or livestock business due to absence of infrastructure for storing, distribution network and processing. The gradual opening after unlock measures for economy and

Vaity & Shinde

markets saw high fish catch and low sales resulting to further losses as storing and processing was big concern. The increasing pollution in seas, oil spillage by cargo vessels, and permission for coastal road during lockdown where construction started in full swing added more complications for fishers. The climate change, uneven rain, cyclones etc. are further environmental disasters which have impacted the type of fish catch and overall fishing activities.

Post Lockdown unlike previous generation, literate younger/new generation considers fishery as serious occupation activity if certain provisions made can provide alternate sustainable livelihood and second income when compared with other business ecosystem which collapsed fully during lockdown. Fishers feel they are directly dependent on nature and environment and hence climate change and global warming should be taken seriously and mechanisms to be drawn to save the coasts for further scope of business. The fishers are looking at array of hope wherein government takes fishing as a serious business activity and sanctions more budget for its development which is holistic as well as sustainable.

Limitations of the Research

- The samples for research are geographically limited to the Coastal Districts of Maharashtra; hence the sample may not be an ideal representation of the Issue.
- The information is purely based on knowledge and understanding of the convenience sample chosen for the research due to time and mobility constraints due to COVID pandemic.
- Since most of the data collected is primary, similar data might not be available from any other source for cross-checking.

Bibliography & References: Personal Interview with Active Fishermen, Fish Sellers, Fish traders and Fishery Co-operative Society members from Fishing Community representing Ratnagiri, Raigad, Navi Mumbai, Thane, Mumbai City, Mumbai Suburban and Palghar districts of Maharashtra State in India.

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Internet of Medical Things (IoMT) Ecosystem for Secured Woman Health Monitoring System (WHMS)

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ABSTRACT

An Internet of Medical Things is a system with network of medical devices and people to implement ubiquitous healthcare or assistive healthcare system. This paper applies secure MQTT communication protocol to Woman Health Monitoring System (WHMS) to ensure security of machine to machine (M2M) communication. Woman Health Monitoring System is assistive healthcare system for any woman who can take care of her health with this monitoring system. This paper represents how the secured communication occurs with integration of MQTT frames in software agents of Woman Health Monitoring System.

KEY WORDS: IOMT, WOMAN HEALTH MONITORING SYSTEM, SECURE MQTT, M2M COMMUNICATION.

INTRODUCTION

An Internet of Medical Things (IoMT) ecosystem comprises of connected medical devices, software applications, health services to generate, collect, analyze or transmit health data or images and connect to healthcare provider to streamline clinical workflow with the aim of improving patient care, both inside care facility walls and in remote locations. Remote health monitoring system with various sensors allow real-time monitoring of different body parameters including BP, sugar level, stress level, movements, fall monitoring which help for prevention of serious illness and timely treatment to remote patients or senior citizens. Such ubiquitous healthcare systems play vital role in telemonitoring, digital diagnostics as well as they create awareness among people about self-care preventing frequent visits to hospitals. This approach is extended for any age women-specially in Indian Society.



Indian women avoid to visit physicians till they face serious illness neglecting minute alarming situations of health issues (David et al., 2018).

Using the concept of remote patient monitoring, Woman Health Monitoring System has been proposed. In this system, woman of any age can use specific wearables to monitor regular body parameters like pulse rate, heart rate, blood-sugar level, body temperature, workout monitoring etc. The proposed system also covers ovulation monitoring, fetus monitoring for women who are either under the treatment of infertility or women are pregnant. This paper applies concept of Internet of Medical Things (IoMT) with MQTT protocol to build secured ecosystem for WHMS. AUMLis applied to generate agent interaction protocols to represent pattern of communication among components of MQTT protocol (Mallya & Kothari 2018).

Section 2 will define various components of IoMT along with bio-sensors and MQTT protocol. Section 3 describes IoMT ecosystem for WHMS. Section 4 represents agent interaction protocol for MQTT protocol applied for WHMS. Section 5 concludes the work.

II. Literature Review:

2.1 Internet of Medical Things (IoMT): IoMT is the complicated, interconnected structure of all devices used for health monitoring and streamlining health services.



Mallya

IoMT devices with the support of artificial intelligence techniques form intelligent system. This ubiquitous and intelligent system can monitor all body parameters for remote treatment as well as provides alert and alarm system to caregiver of patient and concerned physician. IoMT-driven systems provide right treatment to right patient at any place, at any time. IoMT ecosystem mainly comprises of three components: Data acquisition, communication gateway and Cloud storage. Figure 1 shows architecture of IoMT ecosystem.



Figure 2 shows components of IoMT. Data acquisition occurs through sensors/wearables of system. After preprocessing of data, data is sent to cloud storage through communication gateways. At cloud data is used for further analysis and specific indicators are generated for patient's health (Fadi Al-Turjman et al., 2020).

4.8cm

2.1.1 Data Acquisition in IoMT System: In IoMT ecosystem, first important task is monitoring body parameters of patient/ user, preprocess it, remove noise and send it to cloud storage. For monitoring body parameters, bio-sensors are used. The bio-sensors are electronic devices. These devices capture body parameters functioning for specific time interval, preprocess them and send to caregivers. Some bio-sensors have the capability to generate alert/ alarm if monitored data is presenting abnormal patterns. They are classified in two ways: Wearable sensors and non-wearable sensors.

2.1.2 Wearable Sensors: Wearable sensors are smart sensing devices with good sensing capability, are wore on body. They function without human intervention to capture body parameters. Some of the wearable sensors are mentioned below:

a. Bio-impedance Sensor: It can be used to measure respiration rate, heart rate and cardiovascular pressure (CVP). It consists of sensor and controllable module as shown in figure 6.6. Hardware configurations of bio-impedance sensor module is it is with microcontroller, radio with frequency 2.4 GHz and micro SD.

b. Accelerometer: Accelerometer is used to detect fall of a user. It can be also used as heart and activity monitor. An accelerometer branded by Alive Technologies is shown in fig 4.This device is used to monitor exact position of the user, speed of activity performed by the user, ECG and heart rate in real time along with fall detection. This device is famous for cardiac rehabilitation programs and monitoring performance of athletes.



Figure 5: Photoplethysmograph Device



c. Photoplethysmograph: The Photoplethysmograph is used to measure heart rate variability (HRV) calculations, pulse rate, breathing rate, and perfusion measurements. It is optical health monitoring sensor. Hardware configuration: rechargeable Li-Ion accumulator with voltage stabilizers, connected to central processor, Bluetooth module and analogue circuit, infrared LED, works on USART (Universal Synchronous Asynchronous Receiver/Transmitter) protocol (Aziz 2014).

d. Pulse Oximeter: Pulse oximetry sensors or SpO2 monitor is a wearable device used to determine person's blood oxygen saturation. It is an important tool to monitor respiratory functions of any individual. A wearable SpO2 monitor is shown in Fig. 6. There are two factors in human blood such as oxygenated hemoglobin (Hb) and deoxygenated hemoglobin (deoxy-Hb), which are used to measure human blood oxygen level. Important components of oximeter are optical transmitter, receiver, microcontroller, PCB, Bluetooth communication. Heart rate algorithm is used to calculate heart rate after specific interval. Similar to oximeter, the other wearable, named as pulse rate monitor is used to monitor ECG signals, blood pressure, body heat, and respiration. It uses arduino as interface between pulse sensor and computer.



2.1.1.1 Non-Wearable Sensors: Non-wearable sensors are also smart sensing devices but cannot be worn on human body and work without human intervnetion. They are fixed in surrounding of human body to monitor activities of patient/user. Some of the non-wearable sensors are mentioned below:

a. Smart Beds: These sensors permit monitoring of patient remotely without touching the patient. Smart beds have sensors imbibed with them to monitor respiration, temperature, sleep pattern etc. The beds have alarm functionality also. These smart beds are useful in special cases of pandemic where touching patient can be dangerous for caregivers/ health practitioners.

b. Human Activity Detection: This function is implemented with different WSNs and CCTVs encorporated in home where the patient stays. The caregiver can watch these activities remotely for further analysis or safety. This functionality is specially useful in treatment of cardiovascular disorders, stroke, senior citizens care or parkinsons etc.

2.1.2 IoMT Gateways: The smart devices dont have capability to transfer data to server, so IoMT gateways are physical devices or software programs which connect bionsensors with remaining IoMT application. The role of gateway is normalization of data and network connectivity. During normalizing captured data, gateways convert data from different formats into unique format which is preprocessed further for analysis. Through network connectivity, the bio-sensors are connected to WAN for communication (Seulki et al., 2013).

2.1.3 Cloud Storage: The servers are part of cloud storage device of IoMT, which is core part of complete system responsible for decision of diagnostics and prescribing further treatment based on monitored data. They implement signal processing techniques and covert data into desired format, data mining algorithms for right predictions, neural networks for discovering patterns of monitored data to recognize any abnormal pattern. In this way, IoMT creates the ecosystem for remote patient monitoring (Janis et al., 2008).



2.2 Woman Health Monitoring System:

The main goal of Woman Health Monitoring System is monitoring body parameters of woman of any age to make her aware about her own health so she can take good care of her own health and can visit physician when she observes any abnormal body parameters or alarms in her smart monitoring system. Following types of monitoring are possible with WHMS: i) Ovulation monitoring if the woman wants to conceive and she is under treatment of obstetrician ii) Fetus monitoring is the woman is pregnant iii) Menopause monitoring if the woman is facing hormonal imbalance problem iv) Regular body parameters like pulse rate, heart rate, blood-sugar level, body temperature, workout monitoring etc. Consider the WHMS as shown in figure 7. The smart devices are connected with mobile app where monitored raw data will be sent for storage as well as further diagnosis. If the monitoring data shows abnormal changes in parameters, the system generates alerts for physician and home caretaker (Mallya 2019).

If the situation is controlled situation then physician provides treatment through telecalling else she has been

advised to see physician as early as possible. Here, the system depends on two databases: Electronic Health Record database which maintains important medical history, the second database is patient's recent data captured by bio-sensors. The app is connected with health service provider which will diagnose change in body parameters. The monitored data, treatment and line of prescription will be made available for different health services like i) Diagnosis and treatment by concerned physician ii) The possibility of emergency can be detected by stored pattern.

2.3 MQTT Communication Protocol: The proposed WHMS can be made more secured and robust with integration of MQTT Communication Protocol. The MQ Telemetry Transport (MQTT) protocol, described by OASIS is communication protocol for IoT applications. It provides one-to-many message distribution based on publish/subscribe messaging protocol. This protocol is used for machine-to-machine communication where one or many machines are nominated as clients i.e. end devices responsible for generating data and servers are responsible for collating monitored data and converting it into useful information for IoT Application. This protocol supports three types of communication. Each type of communication is identified as OoS in this context and those are described as follows: Client -> Server : Publish Server Action : Publish message to subscribers

Table 1. Represents simple MQTT message with QoS=0 which is simple One client to multiple receiving devices communication.

Client -> Server :	Publish
Client Action :	Store Message
Server Actions :	Store Message;
Publish message to	Delete Message
subscribers;	
Server -> Client :	Puback
Client Action :	Discard Message

Table 1: MQTT QoS = 0 Protocol

This protocol ensures that the published message is guaranteed to arrive only once at the subscribers. In this protocol, Pubrec and Pubcomp represent acknowledgment messages from the server, whereas Pubrel is an acknowledgment message from the client. The loss of Pubrec causes the client to re-execute the protocol from its beginning, whereas the loss of Pubcomp causes the client to retransmit only the second part of the protocol, which starts at the Pubrel message. This additional machinery presumably ensures a single delivery of the published message to the subscribers. The message format handled by MQTT is as follows:

As shown in figure 8, MQTT header contains field message type which indicates the message is from sender or publisher, variable header contains username and password flag which can be used for authentication of message. The MQTT protocol requires three entities for execution: i. Publisher entity to publish data ii. Subscriber entity receives the data through a Broker. Iii. PKG or broker is the trusted third party as facilitator. There are four phases in the protocol. Setup phase is responsible for registration and key management. Data is encrypted in encrypt phase and in publish phase, Publisher publishes encrypted data and sends it to the broker. In decrypt phase, subscribed devices decrypt data. Figure 9 represents sequence diagram of Secure-MQTT.

Table 2. MQTT QoS = 1 Protocol											
Client -> Server :	Publish										
Client Action :	f ublish										
Client Action :	Store Message										
Server Actions :	Store Message OR										
Publish message	Store Message ID;										
to subscribers											
Server -> Client :	Pubrec										
Client -> Server :	Pubrel										
Server Actions :	Publish message to										
	subscribers; Delete Message										
	OR Delete Message ID										
Server -> Client :	Pubcomp										
Client Action :	Discard Message										

Figure 8: MQTT Header Frame Format

bit	7	6	5	4	3	2	1	0
byte I	Message Type				DUP Flag	QoS	Level	Ret
byte 2								
	-			Varial	ole Header	_		
_				P	ayload			-

- 1. Publisher and receiver devices register with Broker (Third party element) for secured data transfer.
- 2. Publisher device generates access tree based on access policy
- 3. Publisher device encrypts data using public parameters and generates ciphertext
- 4. Publisher embeds encrypted data in SPublish and sends It
- 5. Broker responds with PUBACK packet.
- 6. Publisher sends PUBREL packet to Broker.
- 7. Broker deletes data and sends PUBCOMP packet to Sender.

In this way, publishing device and receiving device communicate with each other in secured enviornment. The next section represents MQTT protocol in more secured way specially for sensor networks.

III. WHMS WITH INTEGRATED SMOTT: MQTT integration for any IoT application is always significant due to nature of MQTT. When MQTT is compared with COAP, XMPP, it has been found that MQTT needs low battery consumption, less utilization of CPU and network and mainly its simplicity for implementation. With Secure MQTT, it is possible to implement encryption and secure

- 1. Technical alarms as well as clinical alarms
- 2. Internally, prioritization among messages without human intervention
- 3. Secured environment of message passing through encryption-decryption of MQTT.





Following scenario explains how MQTT functions in WHMS: The scenario assumes that the pregnant lady is using CTG sensor to monitor her fetus movements and breathing rate. As shown in figure 11 represents architecture for given scenario where publisher device is CTG sensor and there are multiple receiving devices as mobile agent of user and mobile agent of gynecologist. The publishing and receiving devices have the artifcats for encryption and decryption of messages. The curved lines in figure represents UDP connection with broker.

Following sequence diagram (figure 12) describes how publishing device i.e. CTG sensor communicates with receiving devices like user and gynecologist as and when required based on scenario. Message numbers 8 and 9 show that when fetus body parameters are normal, the messages are sent to only one receiving device i.e. user. But when less fetus movements are detected by CTG sensor, the SPublish message is sent to Gynecologist receiving device also along with user receiving device. The controlling component of WHMS will instruct broker to send SPublish frame to gynecologist in terms of clinical alarm. Figure 11 uses formats of agent interaction protocol which is depicted through sequence diagram. Each lifeline is sequence diagram represents agent in communication.







As described in this scenario, MQTT protocol can handle heterogeneity in various scenarios and actors in accordance with multiple publishing devices and receiving devices. Figure 11 also describes that CTG sensor is at main focus since it is publishing device and other actors like user or gynecologist are playing passive roles, receiving information from user, based on needs, authorization and consent of user.

CONCLUSION

This paper represents study of Internet of Medical Things which is in much-demand to streamline healthcare services without increasing burden on health practitioners. As mentioned in study, IoMT supports remote healthcare practices with bio-sensors, gateways and cloud support. This paper also explores communication protocol - MQTT which is lightweight messaging protocol with pub/sub patterns. In this study, MQTT is applied for Woman Health Monitoring System which is Remote Healthcare system for women. The implementation section of this paper represents how MQTT protocol generates messaging frames in controlled

Mallya

manner for specific receiving devices and it can take decision autonomously to include new receiving device in communication as per the scenario. With application of Secure MQTT protocol, WHMS becomes more secured and controlled.

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Epidemiology of Bronchopulmonary Dysplasia Among Preterm Infants in Saudi Arabia

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ABSTRACT

Despite the overall improvement in preterm survival over the last years, more of these survivors have diagnosed with Bronchopulmonary dysplasia (BPD). BPD remains one of the most common conditions affecting preterm infants and linked with long-term impact on infant, family, healthcare system, and economy. The BPD incidence rate in Saudi Arabia was underreported in the literature conducted at a local level. The rate fluctuated between 17.7% and 36.5%. However, the national prevalence of BPD is not established yet. Therefore, an overall incidence rate of BPD in Saudi Arabia need to be established and therefore the burden of BPD can be studied and possibly minimised.

KEY WORDS: BPD, PRETERM, RESPIRATORY, BURDEN, SAUDI.

INTRODUCTION

Preterm infants are at risk of developing respiratory complications specific to factors associated with prematurity and medical management. The most common respiratory complication is Bronchopulmonary Dysplasia (BPD). This condition is mainly managed in the neonatal intensive care unit (NICU) with infants in hospital for many months. BPD is a serious complication unique to preterm infants. In 1960, Northway described BPD as the radiological and clinical abnormalities associated with the presence of RDS that occurred in moderate to late preterm infants. In 1985, O'Brodovich and Mellins revised this with BPD more clearly defined as inflammation, fibrosis, and hypertrophy of the smooth muscles caused by oxidant injury and mechanical ventilation (MV). Common risk factors leading to BPD are prematurity, oxygen toxicity,



and MV. The length of hospital stay for preterm infants diagnosed with BPD is longer than those without BPD. This review aims to establish the current incidence rate of BPD at Saudi Arabia. By establishing the rate, the approach to overcome the burden of BPD can be tackled and planned (Abolfotouh 2018).

Definition of BPD: Historically, there was discrepancy in identifying criteria for defining BPD. The earliest definition was based on radiological changes and oxygen requirement only. However, a severity-based definition of BPD considers total duration of supplemental oxygen requirement, need for positive pressure ventilation, and gestational age. For preterm infants less than 32 weeks of gestational age: "Mild BPD is defined as a need for supplemental oxygen for \geq 28 days but not at 36 weeks' PMA or discharge, moderate BPD as oxygen for \geq 28 days plus treatment with <30% oxygen at 36 weeks' PMA, and severe BPD as oxygen for \geq 28 days plus \geq 30% oxygen and/or positive pressure at 36 weeks' PMA".

However, this widely used definition may no longer be valid because it does not account for changes in respiratory support management such as the widespread use of high flow (HF) and incidence of long-term respiratory morbidities for preterm infants. Therefore, a recent revision for this definition was conducted to



develop an evidence-based definition. This proposed definition defines BPD based on the respiratory support mode administered at 36 weeks PMA regardless of previous oxygen therapy. BPD severity was ranked as follows: no support = no BPD, nasal cannula \leq 2 L/min = grade 1 BPD, nasal cannula > 2 L/min or non-invasive ventilation = grade 2 BPD, and invasive ventilation = grade 3 BPD (Al Hazzani et al., 2011).

Pathophysiology of BPD and Common Risk Factors: The lungs of preterm infants born at early gestations are immature and still undergoing development. Thus, immature lungs do not support efficient gas exchange and any injury of the lung at this stage will affect lung growth and potentially lead to long term pulmonary complications. The pathogenesis of BPD is multifactorial and risk factors are categorised into either pre or postnatal causes. The most significant factor associated with BPD incidence is prematurity. In addition, other factors can contribute to the development of BPD including positive pressure ventilation, oxygen toxicity, and pre/post-neonatal infection. All of these factors can separately or jointly provoke an inflammatory response within the lung (Al-Mouqdad et al., 2020).

In normal lung development, alveolarisation starts during late fetal development and continues into the early stage of childhood. In BPD, the alveolarisation is impaired and lung inflammation will be induced by either infectious agents such as viral infection or non-infectious factors such as high oxygen administration and positive pressure ventilation. During the inflammatory response, the release of cytokines and disturbance of growth factor signalling will result in an increase in lung tissue damage and cell apoptosis, which impact all different cell types, and cause inactivation of surfactant. Surfactant inactivation is a key cause of the RDS development in preterm infants (Bancalari 1986).

Prematurity and BPD: In premature infants, BPD is considered the most common cause of respiratory morbidity. BPD incidence is inversely related to gestational age and birth weight. Therefore, the risk of BPD is greatly increased among extremely preterm and very low birthweight infants.

Oxygen Toxicity and BPD: The toxic effects that excess oxygen can have on the newborn, particularly if preterm, are well described and known to contribute to significant morbidities such as BPD and retinopathy of prematurity (ROP). Awareness of the toxicity of oxygen has been increasing in neonatal medicine over the last few decades. Oxidative stress in premature infants occurs due to the free radicals generated by oxygen, which are not handled well by their undeveloped antioxidant systems (Costeloe 2012).

Therefore, the imbalance between oxidant and antioxidant factors leads to oxidative stress. Studies conducted by exposing rats and mice to 50% or more oxygen result in the inhibition of pulmonary growth and DNA synthesis. The administration of oxygen can compromise the development of the lung, as high levels of oxygen administration can result in free radical production, injuring the lung and resulting in long-term morphological changes including cessation of cell growth and development.

Mechanical Ventilation and BPD: In NICU settings, MV is commonly used as a lifesaving intervention, especially for respiratory failure associated with prematurity. However, the use of positive pressure ventilation and high tidal volumes can cause pulmonary baro/volutrauma, which results in a reduction in lung compliance and the development of lung injury. The need of MV in managing preterm infants has been found to be linked with the development of BPD. In addition, the length of MV correlates with the development of BPD. Therefore, by improving respiratory management practices and avoiding MV, BPD could be reduced. MV affects the dynamic characteristics of the preterm lung, as the decreased compliance caused by surfactant deficiency contributes to non-uniform lung expansion with areas over distended and others collapsed. Therefore, if the premature lung is over inflated via positive pressure ventilation and excess volume, this can lead to cellular injury and inflammation (Cotten 2005).

The Burden of BPD: Despite improvements in the survival of infants born <32 weeks' gestation over the last two decades, more of these survivors have a diagnosis of BPD. BPD remains one of the most common conditions affecting preterm infants and links with long-term impact on child health, the family, healthcare systems, and the economy.

Health Long-Term Outcomes of BPD: As the survival rate of preterm infants improves, more survivors will develop BPD. BPD infants suffer from many neurodevelopmental problems; survivors with BPD assessed at preschool and school age were found to perform below average on cognitive, psychomotor, and linguistic evaluation. The literature describes the long-term consequences of BPD as a crucial predictor of long-term respiratory outcomes in child and adulthood. Preterm survivors with BPD were found to have significantly impaired lung function and an increased risk of asthma compared to those without BPD. In addition, Pulmonary diseases developed in adulthood such as asthma and chronic obstructive pulmonary disease have been associated with preterm birth (Davidson 2017).

BPD Burden on Family: Parents play an important role in caring for BPD neonate. The short and long-term health and cognition outcomes for BPD neonate impose a significant burden on family to control and minimise the complications associated with BPD. Overall, parents having preterm infants reported to have social isolation, negative consequence in workplace, and financial burden (Doyle et al., 2005).

BPD Burden on Healthcare System and Economy: The economic burden of BPD is understudied. There were only two studies described it at national level in UK and

Canada. The EPICure UK study reported that an extremely preterm infant in the 11th year of life has significantly higher annual healthcare, social care and educational cost differences of approximately £2,500 per annum (approximately 12,500 SAR) compared to term-matched child, the cost was expressed for the financial year 2006-2007. A recent financial model from Canada has been developed to estimate the lifetime economic burden of an extremely preterm infant diagnosed with BPD. The model reported that an infant with BPD during their lifetime incurs over 700,000 Canadian dollars (approximately 2 million SAR) from healthcare costs (Halliday 2017).

BPD in Saudi Arabia: The prevalence and incidence of BPD are understudied in Saudi Arabia. Up to the best of my knowledge there were only limited studies that report BPD incidence at local level using retrospective approaches. In 2011, Alhazzani et al reported the outcome of very low birthe weight infants admitted to neonatal unit at a tertiary hospital in Riyadh during the period from January 2006 to December 2008. They define BPD as need of oxygen at 36 weeks of PMA, with a previous need of oxygen of at least 28 days, the BPD rate found to be 17.7% (i.e. 33 out of 186 infants included in this study). In 2018, Abolfotouh et al reported the early and late outcomes of extremely low birth weight in one tertiary hospital in Riyadh during the period from January 2005 to December 2007. The BPD defined as oxygen dependency at 36 weeks of PMA only. The BPD rate found to be 36.5% (i.e. 42 out of 117 infants included) (Northway et al., 1967).

A retrospective cohort study in a single tertiary neonatal centre in Riyadh was conducted to assess premature infants' outcome during the period from January 2015 to December 2019. The BPD defined as oxygen dependency at 36 weeks of PMA or at oxygen if discharge before at 34 and 35 weeks of PMA, the rate found to be around 20% for Saudi infants. The Majority of published studies report the BPD incidence in tertiary hospitals placed in the capital city. The limited number of studies describing BPD incidence is probably because of the absence of a national neonatal database. In addition to the lack of multicentre collaboration in researches between neonatal units. The development of the information technology sector in Saudi Arabia is hugely growing over the last years, especially after the implementation of the Kingdom 2030 vision.

Technology is a keystone of this valuable vision. The E-government initiatives of Saudi Arabia are progressing and successfully attained their goals in many governmental ministries, including the ministry of Health. The need for the national neonatal database is critically important to monitor and aid in both regional and national quality improvement of newborn infants in Saudi Arabia. Example of the national data uses include describing the prevalence of preterm birth, evaluate the impact of quality project at regional level, and support developing researches in Saudi Arabia and participation in multicentre international studies (Poindexter 2015).

CONCLUSION

The incidence of BPD in Saudi Arabia is not adequately and accurately reported. The need for a Saudi national neonatal database is vital to form a unique, reliable resource to report neonatal outcomes, including BPD. This resource will support local, regional, national, and international work ranging from quality project to observational and interventional studies. This database can also monitor the overall outcome of neonates in Saudi Arabia and support higher governmental decision based on these outcomes.

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Study of the Jumping Phenomenon in a Cam and Follower Mechanism

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ABSTRACT

The basic purpose of the present study is to help the UG/PG Students/Research Scholars/Engineers as well as Scientist to select the best combination of Cam and follower avoiding jumping phenomenon to perform the required task as per specific necessity. The study is carried out in the dynamics laboratory of the department of mechanical engineering to record the critical jumping speed with the help of experimental setup. In the first part of this study, the author perform the experiment by having the spring under compression to record the jumping speed by keeping several weights on the follower assembly. In second part of the study, the author recorded the jumping speed by compressing the spring gradually for the constant weight on the follower assembly.

KEY WORDS: CAM, FOLLOWER, JUMP.

INTRODUCTION

Cam and follower mechanism is a preferred mechanism due to its important functions of all most all the reciprocating machines used in transportation, medical, and production etc industries. A cam is a rotating or translating part of the cam follower mechanism that can transmit from one type motion to another. Actually, cam follower mechanism can be used to transmit regular to irregular motion at a very low cost that is very difficult even at higher costs by using other available sophisticated means. Mahesh R. Mali et al. suggested a lot of variety of cam and follower linkages that a designer or researcher can select based on one's requirements. Cam and follower mechanisms are also used to increase the I.C. engine efficiency by various optimization techniques. R.L. Norton and R.G.

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Mosier proposed a design for the dynamic behavior of cam and follower system and its great importance in working of I.C.Engine. J. W. David et a.l suggested an optimal and economical s design of a cam follower mechanism. The author tested this proposed economical design with the help of computer simulation and validated with the data already available in the literature. T. D. Choi et al. proposed cam follower mechanisms to achieve optimal gear train solution having lobes profile to be used in automobile industries. A. Cardona et al. suggested a cam designing technique for a gear train to be driven with the help of motor. The synthesis and analysis of a cam follower mechanism is a crucial step to achieve it economically. (Patel) investigated the optimal design solution for the design of a cam and follower system.

Khin Maung Chinthrows the light on motion transformation from oscillation or rotational into linear one. H. D. Desai and V. K. Patel studied the deflection in cam and follower mechanisms irrespective of its motions according to the loading conditions with the help of various computer software. Yuan L. Lai et.al suggested various failure modes in a cam and follower mechanism. A. Rivola et al. presented the various failure models in gear train and suggested the safe design using cam and follower system.



AmolAchyutrao Pande, Surendra C. Patel suggested the cam profile geometry modification for proper working and minimum failure possibilities. The authors suggested for the point contact between the cam and follower. The stresses induced in the material should be with the safe limit. Divya Pandey et.al studied about the forecast of cam follower systems life without failure. The authors presented both the satticas well as dynamic model of the cam and follower system with the help of finite element method. It was shown in the study that the working life of cam and follower mechanisms depends upon the proper design. Jevzy Zajaczkowski proposed mathematical equations for the economical and optimal design of cam follower mechanisms by considering the material elasticity of the various elements of the system. The author considered the weight of the materials used for the designing of cam follower assembly components also.

Mandal M. and Naskar, T.K. proposed the model of cam follower design for excellent performance. The author proposed computer simulation for the high performance of the system. The design of injection cams in heavy duty diesel engines is most challenging work. Lubrication has its importance in reducing friction and wear. Advancement in materials used in construction of cam and follower for reducing the weight, noise, vibrations, stresses and higher strengths along with rigidity for efficient and accurate operations is going on throughout the world since several years. Shailendra Singh, S. Sanyal presented a research considering the effect of hygrothermal atmosphere during analyzing the cam and follower system. The investigator suggested considering the hygrothermal performance at the time of dynamical testing of the materials used in the designing of the assembly. Shailendra Singh, S. Sanyal studied the hygrothermal relation with composite material used for the design of the cam follower system during the utilization in textile industries.

The authors considered various factors in the design and testing of the assembly and its curved surfaces along with the loading and unloading conditions. Hazim U. Jamali et al. suggested the lubrication system to be used in the assembly system to get better mechanism performance and optimal design system. The authors proposed a particular lubrication thickness of the lubricant and pressure distribution. Kushwaha M. presented lubrication model analysis for the contact surface between the rotating cam and follower. Toedorescu M. et al. presented the lubricating model for four cylinder engine mechanisms to achieve the higher performance. The authors gave a tribological lubricating analysis model for engine assembly including cam and follower mechanism. Nguyen M., Kim D. J. investigated the design for flexible cam profile and follower mechanisms with the help of various curved surfaces. Vela D. et al. used the available equipment and suggested the type of contact surfaces between cam and follower for getting optimum results. Wang J.et al. worked for lubrication in engine mechanisms along with cam and follower assembly.

Cuilli E at al. designed and developed circular cam follower assembly for different applications.Wu W. et al. worked on lubrication between cam and tappet type follower to be used in various applications. Shirzadegan M. et al. presented roller type follower and cam assembly with the help of computer simulation. Alakhramsing S.S. et al. investigated about cam and follower mechanisms lubrication in depth. The authors through light on roller slip, lubricating oil film thickness and friction between roller pin and contact surfaces.Yu I Podgornyj et al. defined the motion laws for cam and follower assembly mechanisms.

A huge literature is available on cam and follower mechanisms for Engineers/designers/ researchers but a few for U.G. /P.G. Students and research scholars. Therefore, the aim of present work is to facilitate the U.G., P.G. students and Research Scholars by providing experimental evidence/procedure available to them in their laboratories.

MATERIAL AND METHODOLOGY

Cam and follower experimental setup available in the Machine Dynamics laboratory of Mechanical Engineering Department is shown in Figure 1, which is a motorized. The cam shaft is connected with motor with the help of coupling. The shaft is supported with the ball bearings at both the ends. The cam is attached towards the free end of the cam shaft with the help of key. The follower reciprocates inside the bushes guide. This follower assembly can be changed as and when needed so for the cam to be used. There is a spring to keep the follower in contact with cam. The complete system is provided to rotate the cam against the follower. A mechanical tachometer and dial indicators are used for recording the experimental readings. The jumping occurs if the cam and follower moves due to the spring load.

Jumping happens when cam rotates at critical speed above certain value. At jumping, the speed is so high that the follower does not follow the cam and we get a sound of different type. Due to the compressive load applied by the spring, at higher speeds, follower moves without following the cam and thus jumping happens. This is the change of speed conditions due to high speeds. In jumping conditions, both the elements namely cam and follower of the cam system swing independently. in this case, follower does not remain in the control of its cam.To observe the phenomenon of jump, use of stethoscope is necessary.

Observations: The jumping phenomenon in cam follower setup is based upon two categories spring length and no load. At any particular time, anyone of the two quantities is kept constant. Digital tachometer is used to measure the rpm. Jumping phenomenon occurs at any certain point or voltage, where after, there is change in sound of striking of follower and cam. At this point time, we take the readings.



(a) the author noted the jumping with naked eye and calculated the jumping speed with the application of equation (1), that is obtained by equating the upward inertia force and downward retaining force.

$$W r \omega^2 / g = W + S$$

Here , W is the weight placed on the follower assembly, S is the compressive load applied by the spring, ω is the angular velocity of cam and r is the minimum radius of the cam.

(1)

(2)

(b) the author recorded the jumping speed according to the weight placed on the follower assembly keeping the spring load constant. Here, we kept the initial spring compression at a certain level and recorded the jumping speed with the help of mechanical tachometer for different follower weights by adding them successively (shown in Table 1) and plotted the graph of follower weight Vs Jump speed which is shown in Figure 2.

$$\omega = (W+S) g / (r W)$$

This relation shows that if the follower weight increases, the jump speed goes on decreases.

(c) Now, we record the second set of observations to observe the relation between jumping speed and spring compression by making constant weight on the follower assembly. The author recorded these observations in Table 2 and a graph is drawn in Figure 3 between jumping speed and spring force. Table 1. Observations of Follower Weight and Jump SpeedKeeping Spring Length Constant

S N	W (Weight on Follower Assembly) in Kg	N (Jumping Speed) in RPM	Spring Length in cm
1	0.5	407	3.7
2	1.0	339	3.7
3	1.5	270	3.7
4	2.0	200	3.7
5	2.5	146	3.7

Table 2. Observations of Spring Compression and JumpSpeed Keeping Follower Assembly Weight Constant (WithNo Load Conditions)

S N	W (Weight on Follower Assembly) in Kg	L (Spring Length) in cm	N (Jumping Speed) in RPM
1	0	3.5	364
2	0	3.3	370
3	0	3.0	397
4	0	2.8	430
5	0	2.5	500





RESULTS AND DISCUSSION

We observed from Table 1 that the jumping speed is inversely proportional to the weight placed on the follower assembly. It is evident from Figure 2 also that with the increase the load on the follower assembly, the Jump speed decreased with the spring length constant. From Table 2, we see that with no load on follower

Hasan

assembly, the jumping speed is inversely proportional to the compression length of spring. It is evident from Figure 3 also that with the decrease of the spring compression length on the follower assembly, the Jump speed is increased while there is no increment in the weight on the follower assembly.



CONCLUSION

At jumping speed, both follower and cam does not obey each other. Jumping is not desirable in any case because the constrained motion rules are violated along with excessive noise, vibrations and hazardous working conditions. We observed that spring stiffness as well as compression of the spring is the key parameters in the cam and follower mechanisms design. If there is no compression in the spring, there will be zero contact between cam and follower and both will separate and follower will have the ability to jump the cam. Therefore, jump is undesirable in cam and follower mechanisms. So, we should always provide sufficient spring force and preload to the cam and follower pair at all the duration to make sure that both cam and follower remain in contact during the entire rotation. This work can be extended in future up to vibration measurement along with the jump speed. The maximum speed of the cam or jump speed along with frequency of vibration should be notified to the designer in the initial stage of cam and follower mechanism design.

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A Comparative Analysis of Public Education System of Indonesia and Uzbekistan

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ABSTRACT

The Government of Uzbekistan, experiencing modern reforms in an educational sector as a strategic part of a development program after the last presidential elections, spends an enormous portion of its resources on public education – significantly more than other countries in Central Asia, elsewhere with a similar income level, however, satisfactory results yet to be achieved and remains one of the crucial issues of the republic. Meanwhile, far in South-East Asia, Indonesia has made dramatic progress on expanding access to education, directing a huge stream of money towards formal education over the past few decades, but still, the learning outcomes remain low. In addition to key reforms in mandatory schooling in terms of increased quality of investment, utilization of information, communications hold considerable promise in improving educational outcomes. This comparative study on the compulsory education of both countries investigates the reasons for the low results in schooling in Indonesia and Uzbekistan. Throughout the survey, we have interviewed school teachers, principals, and authorities, analyzing available sources to find out the problem-causing factors. Drawing on our findings indicating the need for reforming the teaching-learning process, and proper investments in public education to reach promising milestones.

KEY WORDS: PUBLIC EDUCATION; PRIMARY SCHOOLS; FINANCING EDUCATION; EDUCATIONAL ISSUES; INDONESIA; UZBEKISTAN; SOUTHEAST ASIA; CENTRAL ASIA.

INTRODUCTION

Humanity is facing the greatest challenge since World War Two as it has weathered the global financial and economic crisis well, certainly better than many economies at its level of development in some regions. The covid-19 has affected people regardless of nationality, income, or even gender. Education is no exception. In such a case, this challenge has touched longstanding scars on the educational system of Indonesia and Uzbekistan.



The main obstacle, however, of human development in Uzbekistan lies in the development of skilled and knowledgeable personnel who can facilitate the transition to an internationally competitive economy and education. The availability of quality human resources is critical in effecting this transformation. The government, with the assistance of Asia Development Bank (ADB) and other development partners, is seeking to accelerate this transformation. Uzbekistan's education spending as a share of GDP is one of the highest in the world. Government education spending amounted to 5.4 percent of GDP in 2017 and 5.9 percent in 2018, more than in Kazakhstan, Russia, Turkey, countries with similar incomes, regional peers, and the OECD (Organization for Economic Co-operation and Development) (Izvorski et al. 2019). Ensuring the efficiency, effectiveness, and sustainability of such high investment in education is a challenge for the country's fragile economy.



Shaturaev

Indonesia has made significant improvements in its education sector over the past 15 years through major reforms. In particular, gains have been made in terms of improving access to education, as well as educational attainment (The World Bank 2017). Despite these gains, however, Indonesia still lags behind many regional peers in terms of student learning – based on Program for International Student Assessment (PISA) 2018 scores, only 30 percent of students met the most basic level of literacy proficiency (OECD 2019). Indonesia lags behind many emerging market peers in terms of spending and learning outcomes as measured by global benchmarks such as PISA scores (Figure 1).

Such low levels of sector productivity are concerning, especially when the Government of Indonesia (GoI) has a legal mandate to spend 20 percent of its budget on the education sector (Bhardwaj, Yarrow, and Cali 2020). While the Indonesian mandate may appear to be a very large amount, when expressed in terms of the share of GDP, Indonesia lags behind its regional peers in public education spending (Figure 2). This an effect primarily of low levels of tax collection, which is expected to worsen during the COVID crisis, however, the Minister of Education and Culture (Mendikbud) Nadiem Makarim has allowed local governments to open schools or carry out face-to-face learning activities starting January 2021. The opening of these schools is no longer based on zoning for the spread of COVID-19.

Background

Education in Indonesia: Indonesia, home to more than 275 million people, is the fourth most populous country in the world. It is also the largest archipelago on the globe. Its territory spans more than 17,000 islands that stretch for 3,181 miles along the equator between the Pacific and Indian Oceans (Worldometer 2020). After independence in 1945, Indonesia constitutionally enshrined education as a right of all Indonesian citizens and sought to establish a more egalitarian and inclusive mass education system. Although public education is mostly secular and Indonesia is formally a secular state, Islamic education is highly prominent in Indonesia's large private education sector. The massive 29 million member-strong Islamic organization Muhammadiyah (followers of Muhammad), for instance, currently operates 172 universities, some 2,600 elementary schools, and close to 3,000 secondary schools throughout Indonesia. These institutions teach a secular, general academic curriculum in addition to religious studies.

The Republic of Indonesia runs a 6-3-3 for public education structure. Indonesia's education system comprises four levels of education: primary (grades 1–6), junior secondary (grades 7–9), senior secondary (grades 10–12), and higher education. The first two levels constitute 'basic education' as that term is used in the Indonesian context (Shaturaev 2014). State educational institutions dominate the education system, particularly at primary and junior secondary levels. However, the private sector also plays a significant role, accounting for around 48 percent of all schools, 31 percent of all

students, and 38 percent of all teachers. It also accounts for 96 percent of all HEIs and almost 63 percent of higher education enrolments.

The state educational system is mostly non-sectarian although it includes some religious (typically but not only Islamic) schools and HEIs. The private educational system, by contrast, is dominated by religiously oriented schools and HEIs, in particular, those associated with Indonesia's two major Islamic social organizations, Muhammadiyah and Nahdlatul Ulama, although it also includes non-religious commercially oriented institutions especially in higher education. Generally, state educational institutions are considered to be of higher quality than private educational institutions although there is great variation among both public and private institutions (Suryadarma and Jones 2013).

Education In Uzbekistan: In 2017, education reforms in Uzbekistan changed from a 12-year program to 11 years after a previous reform disappointed and troubled parents and children. Eleven years of primary and secondary education are obligatory, starting at age seven. The rate of attendance in those grades is high, although the figure is significantly lower in rural areas than in urban centers. Preschool registration has decreased significantly since 1991. The official literacy rate is 99 percent. However, in the post-Soviet era educational standards have fallen. Funding and training have not been sufficient to effectively educate the expanding younger cohorts of the population.

Between 1992 and 2004, government spending on education dropped from 12 percent to 6.3 percent of gross domestic product. In 2006 education's share of the budget increased to 8.1 percent. Lack of budgetary support has been more noticeable at the primary and secondary levels, as the government has continued to subsidize university students. Between 1992 and 2001, university attendance dropped from 19 percent of the college-age population to 6.4 percent. The three largest of Uzbekistan's 63 institutions of higher learning are in Nukus, Samarkand, and Tashkent, with all three being state-funded. Private schools are forbidden as a result of a government crackdown on the establishment of Islamic fundamentalist (Wahhabi) schools. However, in 1999 the government-supported Tashkent Islamic University was founded for the teaching of Islam (Shaturaev 2014).

Approximately 60 percent of Uzbekistan's population is covered under the system of education. The earlier educational system required 11 years of compulsory schooling for both men and women. In 1992 the policy decision was made to change from 11 to 9 years of compulsory education. After nine years of compulsory schooling, students can prepare for higher education in tenth or eleventh grade or turn to vocational training. After graduating from any type of secondary education, an individual can enter a higher education institution to obtain a bachelor's degree and continue study toward a master's or doctoral degree (Shaturaev 2014). As of January 2007, there were 1,055 new secondary specialized vocational educational establishments, including 99 academic lyceums and 953 vocational colleges. Of these vocational colleges, 296 were housed in newly constructed buildings, and 628 were housed in the buildings of former vocational schools having undergone major reconstruction including equipping them with modern teaching materials and laboratories. Secondary specialized vocational educational establishments enrolled 1,075,000 students, out of which 1,021,900 students (164,400 after the grade 11) enrolled in 953 vocational colleges and 53,100 students enrolled in 99 academic lyceums (Niyozov and Dastambuev 2013).

CONCLUSION

To conclude the result of the study, the researcher will discuss based on the research questions as proposed in chapter I section 1.4. There are four specific research questions and one general research question, which underpinned this study. All of them, in this part, will be reasserted and it will be followed by its explanation and description to answer the problems being raised. Based on the analysis data got from questionnaires, classroom observation, interview data, and data gathering. Some conclusions can be presented. First, related to the first research question i.e. "What kind of policies do Indonesia and Uzbekistan run in their primary education?" The data showed that there is a significant difference between the Primary Education System of Indonesia and Uzbekistan. The Republic of Indonesia runs a 6-3-3 formal education structure. (UNESCO IBE, World Data on Education. 7th Edition, 2010-2011) Meanwhile, Uzbekistan runs a 4-5-3 formal education structure. (Seitkhalilov et al. 2002) Another difference in basic education level between the two countries is that Education System is decentralized in Indonesia, simultaneously, it remains centralized, but the management of education is still decentralized in Uzbekistan.

However, there are some similarities in primary education in both countries as well. For instance, compulsory education is free. According to the Indonesia FBE (Free Basic Education) policy, school fees are to be abolished in primary and junior secondary schools. It is proved with the Law on Education of the Republic of Uzbekistan (Article 4), adopted on 29 August 1997 (No.464). Second, regarding the second research question: "What are the current problems in primary education in both countries?" the data from the questionnaires given to the 4 observed elementary schools pupils, teacher interviews, and other collected data show that there are enough problems in basic education level in both countries. There are the same problems in each country, like dropouts (Indonesia was 20.0%, male 22.6%, and female 17.2%) for the school year ending in 2010, while in Uzbekistan total number was 1.9%, respectively, male 2.2%, and female 1.7% for the school year ending in 2010), lack of quality teachers, lack of teaching tools, and books and missing modern teaching tools in rural areas.

Therefore, it can be concluded, based on the school observation that Primary Education in Indonesia and Uzbekistan have to take some extra effort to improve and reach high results. Third, the researcher has looked for an answer to the third research question "What kind of teaching methods are used by primary school teachers in both countries?" The data showed that in Indonesia, nowadays, according to school observation, teacher-centered class instruction has changed into student-centered instruction. In the elementary school of Uzbekistan starting from 2012 according to President Decree No 1875 December 2012, the teacher-centered system changed into a student-centered system. It means that this policy requires students to be much active, 70% of speech in the classroom should be by students while 30% by the teacher (Shaturaev 2019). The teaching methods in urban schools are the same in both countries, by using modern teaching devices both countries are reaching quite high expectations.

In outlying areas, it remains a crucial issue in either Indonesia or Uzbekistan. Finally, the fourth specific research question is "How is the classroom arrangement and management in both countries' primary schools?" Collected data and images show that there is a significant difference between schools in Indonesia. SDN Sukawarna 2 and SDN Banjasari differ one from another in terms of classroom arrangement and managements almost same. SDN Banjarsari is equipped with the latest teaching devices while in SDN Sukawarna 2 these kinds of tools are missing. (See Appendix 0) The Uzbek school No 291, which is located in Tashkent city, one can meet the latest teaching-learning tools, and the class condition is in a good look. In Tesha Saydaliev school No 2 there are no new teaching gadgets, but still owning teaching aids. To summarize, nevertheless, some crucial issues remain, such as lack of quality teachers, dropouts, access to education in outlying areas, and supplying books and proving teacher-learning gadgets. There are, however, some reformations being taken and new policies have been introduced in both countries to improve quality of education, teacher effectiveness, access to education, and teacher pieces of training, and these efforts will pay off soon for either Indonesia or Uzbekistan.

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A Secure and Efficient Authentication in E-Commerce

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ABSTRACT

E-commerce is the technique to conduct commercial transactions using wireless devices. More precisely, E-commerce is defined as the new emerging applications and services that people can access through internet enabled mobile devices such as smartphones, PDAs, i-pads and laptops anytime & anywhere. Nowadays, E-commerce transactions have exploded around the world due to the advancement of Internet technology. But E-commerce transactions are suffered by many attacks due to the lack of secured and efficient security infrastructure. Therefore, secure and effective security requirements are required to prevent E-commerce transactions from the malicious attacks. However, this paper represents the authentication based secure framework for E-commerce applications & services. This paper is also proposed a secure and efficient authentication technique using ECDSA algorithm to ensure the confirming services of E-Commerce to the end customers.

KEY WORDS: E-COMMERCE, FRAMEWORK AND AUTHENTICATION USING ECDSA.

INTRODUCTION

The term E-Commerce was coined by Dr. Robert Jacobson, Principal Consultant to the California State Assembly's Utilities & Commerce Committee, in 1984, to define online transaction processing between customers and businesses organization or between one business organization and another. E-Commerce is the part of new business model that exchanges the valuable services (buying and selling goods) among the business organizations and consumers using wireless electronic devices such as hand-held computers (tablets), mobile phones or laptops without needing to find a place to plug in, which is based on the Wireless Application Protocol (WAP). The integration of Internet, Wireless and E-Commerce produces a successful



E-Commerce. With E-Commerce, countries around the world are tried to improve their business volume, education, security, retail management and economic infrastructure, etc. These are achieved by using Wireless Sensor Networks (WSN) and technologies such as Radio-Frequency Identification (RFID) (Deepika 2018).

E-Commerce can be B2B (business to business) or B2C (business to customer) oriented. The term B2B is the exchange of products & services or information between business organizations rather than business organizations & customers whereas B2C refers to the process of selling to individual customers directly through online. These models are used to improve the efficiency & effectiveness of the organization's sales report & better delivery status also. With rapid development of E-Commerce combined with smart technology, the security concerns related to E-commerce infrastructure is also increased simultaneously. Smart technology not only gathers user's credentials, but can also monitor user's activities. However, the scope of this paper relies on a secure authentication technique regarding B2C where the information is shared between business organizations and customers for improving the efficiency of selling and buying process without any fear of attacks.



In this context, we will briefly explain about related works regarding security mechanisms in respect of E-commerce transactions. A new mobile payment system based on mobile traveller's check (MTC) for mobile commerce is recommend by Shaik Shakeel Ahamad & others. MTC uses elliptic curve digital signature algorithm (ECDSA) for generating and verifying digital signatures. Robert Pinheiro analyzes a well-designed three factor authentication scheme that combines a biometric with a PIN and a registered cell phone acts as a token would offer strong security in E-Commerce. Sanwar ALI et al. have discussed different security measures and the application of the cryptography for key generation, authentication, digital signature and digital certificate in E-Commerce. Seema Nambiar et al. have discussed the framework of public key infrastructure as a basis for security in different mobile technologies, and also analyzed the security measures in mobile security technologies. An implementation of 1024-bit RSA encryption/decryption algorithm using VB.NET for securing ecommerce payment transaction is proposed by Chinedu J. Nwoye. Ibrahim Sayed Abdelwahab Mohamed discusses the E-Commerce security issues and the use of digital signature in different applications of E-Commerce (Al Imem Ali 2015).

It is concerned that online transactions through internet enabled devices are still suffered by challenges although many researchers have proposed different authentication mechanisms. Since, Public key digital signature algorithms are used to eliminate authentication issue regarding E-commerce transactions. For this we have recommended a secure end-to-end authentication mechanism using elliptic curve digital signature algorithm (ECDSA). Its security is based on the difficulty of the elliptic curve discrete logarithm problem and works on significantly smaller key size with same level of security which offers faster computations and less storage space related to other public key digital signature algorithms. The paper is organized as follows. Section 2 represents a secure authentication based E-commerce framework. Section 3 depicts a secure end-to-end authentication technique using ECDSA with summary performances compared to RSA & DSA algorithms. Section 4 concludes the paper.



Authentication Based E-Commerce Framework: The authentication based E-commerce framework consists of some sub modules based on the working flows

of customer's order regarding products or services. E-commerce addresses electronic commerce via internet enabled devices, where the customer must not be physical or eye contact with the purchased products. The following Figure-1 shows that how to interact the sub systems of the framework to each other in securely & effectively. Here, the Wireless Application Protocol (WAP) is a standard protocol for the presentation and delivery of wireless information and telephony services on different internet enabled devices and wireless terminals.

Any transaction based on the above secure E-Commerce framework between two parties (B2C), the following corresponding steps are listed below:

- 1. The customer searches E-commerce sites for buying products & services through online.
- 2. Selects item(s) for own interest.
- 3. Customer sends request to the system (WAP portal) for buying the selected item(s). Here system checks access right of the item(s).
- 4. If the item(s) is available to the customer, the system redirects the payment transaction process to the trusted financial organization. The transaction through electronic payment card elaborates the following steps.
- 1. Customer enters information (electronic payment card details) on the device as per instructions are provided by FSP (financial service provider).
- 2. Entered information is encrypted by the customer using digital signature algorithm & sends to the service provider.
- 3. Sharing information between service provider & third party (gateway).
- 4. Third party decrypts the encrypted information & authenticates using verifier algorithm.
- 5. After successful authentication, payments done between customer & bank.
- 6. If payment transaction is successfully done, the financial institute sends payment report to the financial service provider (FSP).
- 7. FSP sends payment acknowledgment (ACK) to the WAP commerce portal.
- 8. After that FSP approves the buying product(s) & directs to the shipping department.
- 9. Shipping department delivers the product(s) to the customer.

Therefore, E-Commerce framework delivers applications & services to the end users with relatively low cost. But the process of B2C is attacked by several attackers such as Man-In-The-Browser (MITB) attack [15]. MITB is the attack that resides in a user's browser and can be programmed to trigger when a user want to access specific sites, such as an on-line shipping site. To mitigate such issues a strong authentication technique based on B2C communication channel is required.

3. A Secure And Efficient End-To-End Authentication Technique Using Ecdsa Algorithm: Communication and sending sensitive information through network is one of the most important activities of E-Commerce services; hence this is a vital security segment to protect customer's credentials of internet enabled devices. In this context, this authentication technique works more effectively and securely (Chao-Tsong et al., 2014).

3.1 Proposed Work: We have proposed a secure and efficient authentication technique using ECDSA during transaction between the customer at the sender end & FSP at the receiver end. The following steps are taken at the customer end during E-Commerce transaction.

- 1. Customer enters information (electronic payment card details) through internet enabled device.
- 2. The message digest (MD) of entered information is calculated using SHA-1 hash function by the customer.
- 3. This MD is encrypted by using a private key that is generated by customer to form a signature.
- 4. The signature is appended with the original information and sent to the FSP.

The following steps are taken at the FSP end during E-Commerce transaction.

- 1. The FSP decrypts the signature by using a public key which is known to form MD1.
- 2. The FSP now computes the message digest (MD2) from message representing an E-Commerce transaction which is sent with the signature using SHA-1 hash function.
- 3. Then MD1 & MD2 are compared.
- 4. If MD1 is same as MD2, then the transaction between customer & FSP is successfully done. Otherwise it will be rejected.

Therefore, the private key of the customer is only used to encrypt & public key is used to decrypt that ensures the authenticity. The proposed technique is able to prevent the M-commerce transactions from the intruders. The implementation of ECDSA is done by Crypto tool. There are three processes namely key pair generation, digital signature creation, verification & extraction.

A. Key pair generation

Before functioning of authentication using ECDSA, the customer needs to know its private key. So the following steps are followed by the customer.

- 1. Take an Elliptic curve E described through the curve equation: $y^2 = x^3 + ax + b \pmod{p}$.
- 2. Set point G on curve E (through its (x, y) coordinates): G has the prime order n and the cofactor k (n*k is the number of points on E).
- 3. Set the public key W=(x, y) is a point on curve E and multiple of G. The public key is derived from the private key and the domain parameters (E, G, and n).
- 4. Set secret key's which is the solution of the EC discrete log problem W=x*G where x is the selected random number in the interval [1, n-1] by the customer.
- 5. After calculating by Crypto tool, the following key values are generated.

Figure 2: Key value generation	
The public key $W = (x,y)$ is a point on curve E and a multiple of G	Bit len_
x = 221034806193162029739047659656539867303168916032776121616421536939553363471560 y = 55507631873308481459612902463783960520345927798266198900578678375199332481743	254 256
The sected key s is the solution of the EC discrete log problem W = srG (is unknown).	Bit len
s = 52828800510264307170691041978472068301316327321608918621303481071689503495639	255

B. Digital signature creation: The customer creates signature which will be verified by the FSP using public key which is known. For signature creation of the information, the following steps are followed by the customer (Robert Pinheiro 2002).

- 1. Compute e= SHA-1 (message representing an M-commerce transaction is converted in to an integer).
- 2. Select a random integer k, $1 \le k \le n-1$.
- 3. Calculate the curve point $(x1, y1) = k^*G$.
- 4. Calculate c=x1 mod n. If c=0, go to step 2.
- 5. Calculate d= k-1 (z+ cx) mod n, where z is left most bit of e. If d=0, go to step-2.
- 6. The signature is the (c, d) pair.

Following figure shows the generated signature.

Figure 3: Signature generation																									
00000000 0000014 0000020 00000042 00000058 00000058 00000058 00000058 00000058 00000058 00000058 00000058 00000058 00000058 00000057 000000148 00000118 00000144	5302070313300000 5222070313320000 5222070	63 20 38 36 30 38 36 30 38 36 30 38 36 30 20 20 20 20 20 20 20 20 20 20 20 20 20	67 20 338 20 335 39 20 35 39 20 35 30 20 20 20 20 20 20 20 20 20 20 20 20 20	62059358569300020024	61 20 377 61 336 337 20 20 20 20 54	74 20 39 30 30 30 30 30 30 30 30 30 30 30 30 30	728296D35749D050E	7239930659070030424	65031836031320E2032025202	3A 20 37 39 30 20 33 20 20 20 20 20 20 20 20 20	20 20 31 35 20 36 30 36 20 20 20 20 20 20 20 20 20 20 20 20 20	2037602172040237	20 334 30 20 32 32 32 32 20 21 20 41 20 45 20 45 20 45 20 45 20 45 20 45 20 45 20 45 20 45 20 45 20 45 20 20 45 20 20 45 20 20 20 20 20 20 20 20 20 20 20 20 20	204777005334052641041	20 30 32 32 32 32 32 32 20 20 20 20 20 20 20 20 20 20 20 20 20	20 35 35 30 39 39 20 50 60 60 60 60 20 51	20 34 30 34 20 35 34 20 65 20 20 48 20	533991200490262090120	6338230 338230 33052720 2720 2720	3D 37 34 325 37 38 4 20 4 20 6 20 6 20 6 20 6 20 6 20 6 20	5337614659080000000	20050804260404060	51994407 28350429 068379999 75237963 (d=) 323612364 18556755; 33903879 3823794 5199 EC unct.ton	584054 171747750 195647637 336000534 3660145105 136723494 203874290 hatur= 1ex Algor F-DSA ENA-1	[c=1 33780 98475 92260 10518 740 01264 40852 95496 ngth ithm ash i



C. Verification & Extraction: FSP verifies authenticity of the signed document using public key curve point W. Hence the following steps are followed by the FSP.

- 1. Verify that W is not equal to 0 (identity element); otherwise its coordinates are valid.
- 2. Verify the W lies on the curve.
- 3. Verify that pW=0.
- 4. Verify that c and d are integer in [1, n-1].
- 5. Calculate e=SHA-1(received message representing an M-commerce transaction converted into integer).
- 6. Let z be the left most bit of e.
- 7. Calculate $u1=z d-1 \mod n$ and $u2=c d-1 \mod n$.
- 8. Calculate curve point (x1, y1) = u1.G + u2.W. If (x1, y1) = u1.G + u2.W.

Kumbhakar et al.,

y1) =0, then the signature is not valid.

- 9. If c≡x1 (mod p), then the signature is valid. Otherwise it is invalid.
- 10. The following figure shows the extracted signature

Elliptic curve cryptography works on the equation $y_{2=}(x_{3+ax+b}) \mod p$. The prime modulo (range of 160 bits) allows modular square root and modular multiplicative inverse. Since the possible values of y are between 0 and p-1. Only a smaller subset of those values will be a perfect square which will give N possible points on the curve where N < p where N is the number of perfect squares between 0 and p. Since each x will produce positive and negative values of the square-root

of y2. Hence there are N/2 possible x coordinates that are valid and give a point on the curve. So this elliptic curve has a finite number of points on it, and it's all because of the integer calculations and the modulus.

The point multiplication k*n (which is the addition of the point n to itself k times). So, if R=k*n, where R is a symmetric point & there is no way to find out the value of k although R & n are known because there is no point subtraction or point division. The private key is a random number that is generated, and the public key is a point on the curve generated from the point multiplication of G with the private key. If we set 'x' as the private key and 'W' as public key (a point), we have W = x*G (where G is the point of reference in the curve parameters).

Table 1. Time execution of the phases for ECDSA & DSA													
Phases	Messages	Messages ECDSA											
		Sig. size	Size	Time	Sig. size	Size	Time						
		(bits)	(bytes)	(Sec.)	(bits)	(bytes)	(Sec.)						
Key generation	Sample 1	N/A	2050	0.117	N/A	2050	2.309						
	Sample 2	N/A	2330	0.056	N/A	2330	1.018						
	Sample 3	N/A	2753	0.059	N/A	2753	3.818						
	Sample 4	N/A	983	0.047	N/A	983	3.245						
	Sample 5	N/A	845	0.046	N/A	845	2.044						
	Sample 6	N/A	1379	0.093	N/A	1379	3.261						
	Sample 7	N/A	1079	0.047	N/A	1079	1.872						
	Sample 8	N/A	919	0.063	N/A	919	4.118						
	Sample 9	N/A	720	0.063	N/A	720	0.920						
	Sample 10	N/A	414	0.078	N/A	414	3.573						
Signature	Sample 1	381	2050	0.006	376	2050	0.004						
generation	Sample 2	382	2330	0.006	368	2330	0.006						
	Sample 3	384	2753	0.006	368	2753	0.004						
	Sample 4	378	983	0.000	376	983	0.000						
	Sample 5	383	845	0.000	368	845	0.000						
	Sample 6	384	1379	0.056	368	1379	0.000						
	Sample 7	375	1079	0.000	368	1079	0.000						
	Sample 8	383	919	0.000	376	919	0.014						
	Sample 9	380	720	0.000	368	720	0.000						
	Sample 10	384	414	0.016	368	414	0.000						
Verification	Sample 1	381	2050	0.010	376	2050	0.010						
£t	Sample 2	382	2330	0.010	368	2330	0.012						
Extraction	Sample 3	384	2753	0.012	368	2753	0.012						
	Sample 4	378	983	0.014	376	983	0.016						
	Sample 5	383	845	0.016	368	845	0.000						
	Sample 6	384	1379	0.014	368	1379	0.014						
	Sample 7	375	1079	0.000	368	1079	0.016						
	Sample 8	383	919	0.000	376	919	0.014						
	Sample 9	380	720	0.014	368	720	0.016						
	Sample 10	384	414	0.016	368	414	0.014						

Now, (c, d) is the signature pair that is mentioned in the signature creation phase and curve point $P=k^*G$ (k is a random number). The following equation can be used to compute d. $d=k-1(z + c^*x) \mod n$, where z is the hash of the message, x is the private key and c is the x

coordinate of k*G. If P is equal to c, the signature is valid. Otherwise it is not . To calculate P using the function P=d-1*z*G+d-1*c*W

Or, $P=d-1^*z^*G + d-1^*c^*x^*G$, (where $W=x^*G$) Or, $P=d-1(z + c^*x) G$, Or, $k^*G=d-1(z + c^*x) G$, Or, $k=d-1(z + c^*x)$, (removing G) Or $d=k-1(z + c^*x)$, (Inverting k & d).

So, it is matched. Therefore, k (random number) & x (private key) are required to calculate d, but c & W (public key point) are only needed to verify the signature. There is no way to calculate x or k from c & W due to trap door function in ECDSA point multiplication. So, it

makes ECDSA algorithm secure. Further, ECDSA works on smaller key size and consuming less memory space. The ECDSA generates d in the interval [1, n-1] by taking the x coordinate of k*G (random point) and reducing it modulo n. These are helpful to make ECDSA algorithm computationally faster. Hence proposed work using ECDSA algorithm enhances the authentication security in E-commerce transactions between customer & FSP.

Table 2. Time execution of the phases for ECDSA & RSA											
Phases	Messages		ECDSA		I	DSA					
		Sig. size	Size	Time	Sig. size	Size	Time				
		(bits)	(bytes)	(Sec.)	(bits)	(bytes)	(Sec.)				
Key generation	Sample 1	N/A	2050	0.117	N/A	2050	0.706				
	Sample 2	N/A	2330	0.056	N/A	2330	1.109				
	Sample 3	N/A	2753	0.059	N/A	2753	1.234				
	Sample 4	N/A	983	0.047	N/A	983	0.702				
	Sample 5	N/A	845	0.046	N/A	845	0.717				
	Sample 6	N/A	1379	0.093	N/A	1379	0.665				
	Sample 7	N/A	1079	0.047	N/A	1079	0.796				
	Sample 8	N/A	919	0.063	N/A	919	0.686				
	Sample 9	N/A	720	0.063	N/A	720	0.702				
	Sample 10	N/A	414	0.078	N/A	414	0.858				
Signature	Sample 1	381	2050	0.006	1024	2050	0.010				
generation	Sample 2	382	2330	0.006	1024	2330	0.010				
	Sample 3	384	2753	0.006	1024	2753	0.010				
	Sample 4	378	983	0.000	1024	983	0.000				
	Sample 5	383	845	0.000	1024	845	0.014				
	Sample 6	384	1379	0.056	1024	1379	0.016				
	Sample 7	375	1079	0.000	1024	1079	0.016				
	Sample 8	383	919	0.000	1024	919	0.016				
	Sample 9	380	720	0.000	1024	720	0.000				
	Sample 10	384	414	0.016	1024	414	0.014				
Verification &	Sample 1	381	2050	0.010	1024	2050	0.000				
Extraction	Sample 2	382	2330	0.010	1024	2330	0.000				
	Sample 3	384	2753	0.012	1024	2753	0.000				
	Sample 4	378	983	0.014	1024	983	0.000				
	Sample 5	383	845	0.016	1024	845	0.000				
	Sample 6	384	1379	0.014	1024	1379	0.000				
	Sample 7	375	1079	0.000	1024	1079	0.000				
	Sample 8	383	919	0.000	1024	919	0.000				
	Sample 9	380	720	0.014	1024	720	0.000				
	Sample 10	384	414	0.016	1024	414	0.000				

Table 3. Time execution summary for ECDSA, RSA & DSA			
Time(sec.)	ECDSA	RSA	DSA
Key generation	0.0669	0.8175	2.6178
Signature generation	0.009	0.0106	0.0028
Verification & Extraction	0.0106	0	0.0124
Total	0.0865	0.8281	2.6330

3.2 Performance Analysis: The entire execution process of proposed model works on the basis of following requirements:

- Operating system: Microsoft windows 7(32 bit) & Processor: Intel(R) Atom(TM) CPU N450, 1.67 GHz, RAM-1GB.
- Crypto tool "CrypTool 1.4.40" is used to compute the proposed model.

A. Evaluation performances of ECDSA compared with DSA: The bit length of the ECDSA for the public key is



Kumbhakar et al.,



the twice of the security level. For instance, the security level of 80 bits(where 280 operations to find the private key), the length of ECDSA public key is 160 bits regarding the size of a DSA public key is at 1024 bits. Therefore we have set bit length prime192v1 for ECDSA & 1024 bits for DSA to achieve the performances of them. So, the following Table-1 represents the summary performances of the entire implementation by ECDSA & DSA. Here SHA – 1 hash function is used for both cases.

B. Evaluation performances of ECDSA compared with RSA: If we compare ECDSA with RSA regarding same level security, then we can say that ECDSA requires smaller key size compared to RSA. For an example, key size of 1024 bits for RSA is equivalent to the key size of 192 bits for ECDSA. Therefore, the following Table-2 represents the summary performances of RSA & ECDSA. Here SHA – 1 hash function is also used and bit length of RSA is 1024 bits which is compared to prime192v1 of ECDSA (Sanwar Ali 2015).

Now, we have calculated the average execution time over 10 samples taken for key generation, signature generation & verification.

We have plotted the summary execution time of different phases in ECDSA, DSA & RSA respectively. This is shown in the following graphical representation.

We have calculated the total execution time for three phases in respect of ECDSA, RSA and DSA. This is shown in the Graph-2. Now we have represented the overall performances of RSA, ECDSA and DSA by combining three phases in terms of execution time as shown below. After observing the above figure, it is clearly state that the ECDSA algorithm gives more secure and efficient performances for entire set of execution. Although ECDSA is a bit slower than RSA only for verification, but ECDSA with same level of security offers faster implementations by consuming less memory relatively compared to others algorithms like RSA and DSA.

CONCLUSION

ECDSA algorithm uses scalar random in point multiplication k*n (k is the random number) to protect the signature from the attackers. So, strong randomness in ECDSA algorithm increases the authentication security level of E-Commerce transactions. This paper has proposed a secure and efficient end-to-end authentication technique using ECDSA algorithm in E-Commerce transactions. Using this algorithm, we have plotted the summary performances of ECDSA compared to RSA and DSA algorithms respectively. We have observed that the proposed model becomes more secure and faster than the other public key digital signature algorithms in E-Commerce authentication system. However, our future work will be deliver a secure integration technique of cloud computing and IoT technology using machine learning in E-Commerce paradigm.

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Enhancement of Assamese Speech Signals Using Learning Based Techniques

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ABSTRACT

For efficient recognition and proper interpretation of a speech signal in ASR models, de-noising of corrupted signals becomes very important. There are many traditional noise removing techniques which proved to be reliable but researchers have found the learning based approaches to be more fruitful than those traditional methods. Deep learning techniques have been popularly used in speech de-noising and recognition purposes and have become an integral part of such ASR systems. In this work, Auto-encoders and other ANN models have been implemented to remove noise from Assamese speech signals irrespective of the speaker, gender and the dialectal identity of the samples. The sample set consist of clean Assamese sentences of two, three, four, five and six words and corrupted signals with AWGN variation of 3 dB to -3 dB which increases the sample size and also makes the system robust. Despite of certain limitations, the satisfactory experimental results justifies the proposed de-noising method for Assamese speech.

KEY WORDS: AUTO-ENCODER; ASSAMESE; ARTIFICIAL NEURAL NETWORK; NOISE ; SPEECH.

INTRODUCTION

The presence of noise signal can be felt almost everywhere. The desired output of all the applications that take voice or speech signals as input is generally corrupted by noise that is present at the surrounding or in the transmission channel. De-noising is an important operation which is necessary for determining the efficient outcome of the speech signals (Upadhyay et. al, 2013). Different techniques performing speech signal de-noising have been reported by various researchers over the years for various speech recognition applications. Despite of all the available techniques, the requirement of an automatic speech de-noising method have laid the stress



on designing a learning aided approach. Learning based technique such as Shallow Neural Network (SNN) and deep learning such as Auto-encoder (AE) have proved to be efficient for implementation as a non-linear filter for noise removal (Tamura et al., 1989, Osaka et al., 2015 & Badri, 2010).

The non-linear nature of Artificial Neural Network (ANN) and its ability to retain its learning from the environment in supervised and/or unsupervised manner makes them highly suitable for noise removal applications (Wan et al., 1999). It has been reported by various researchers over the past decade that learning based techniques have been extensively used for the purpose of speech signal denoising applications. In (Cox, 1988), it has been reported that ANN can act as a filter in noise reduction application. Several distinct neural network based frameworks have been reported in the literature where the ability of the learning based technique can be implemented in various fields of application (Feizi, 2019). In (Rajini et al., 2019), the authors have concluded that the Adaptive filter using LMS filter technique is the most suitable method for speech signal de-noising. They have also mentioned that among the neural network method ADALINE technique



performs better, but the main limitation of the ANN method is the training latency.

In this paper we have reported a Stacked Auto-encoder based speech signal de-noising approach where the results are compared with various other learning based classifiers such as Recurrent Neural Network (RNN), Feed Forward Neural Network (FFNN) for the purpose of enhancement of the signal by obtaining lower Mean Square Error (MSE) and higher Peak Signal to Noise Ratio (PSNR) value. The rest of the paper is organized in the following sections. Section 2 includes certain basic considerations and related literature. Section 3 describes the proposed work. Experimental results are highlighted in Section 4. Section 5 concludes the paper.

Basic Considerations (Headline): This section provides a brief description of certain relevant topics related to the design of a speech signal de-noising system:

De-noising: With the rapid increase of speech based communication applications, the need to reduce the noise from the speech samples have become an important requirement. The main aim of the speech denoising model is to remove the noise from the speech signals while enhancing the speech quality and also the intelligibility of the speech signal. Many researchers have proposed a host of techniques which can be implemented for reduction of noise in speech signals (Osaka et al., 2015 & Daqrouq et al., 2009), but the current work focuses in the implementation of ANN based techniques for noise removal in Assamese speech.

Feed Forward Neural Network (FFNN): Figure 1. shows the architecture of a multilayer FFNN. The neurons in all the layers except the output layer of a FFNN architecture has a forward connection to the units in the subsequent layer. The connections have weights associated with them and the nonlinear transfer functions of the neurons allows the network to learn the linear and non-linear relationship between the input and output samples. The learning takes place with the back-propagation technique (Svozil et al., 1997).



Recurrent Neural Network (RNN): ANN has the ability to learn dynamic and time series relations between the input and the output. This is because of the network

architecture where the output depends not only in the current input but also on the previous state of the network (Mikolov et al., 2010). The feedback loop present in the RNN architecture help the network retain the temporal information present in the samples. Figure 2. shows an RNN architecture.



Auto-Encoder (AE): Auto-encoder which is a form of feed forward neural network, learns by unsupervised methods. The main objective of an Auto-encoder is to learn a representation by reducing the dimension of the sample. The auto-encoder has the ability to learn the sample representation by ignoring the noise present in it and therefore act as a de-noising filter. Schematic of a basic AE is shown in Figure 3.



The AE has three segments which are the encoder, bottleneck part and the decoder. The low dimensional representation of the input samples takes place in the bottleneck part which is also known as the latent space representation. The input sample in the encoder part can be represented as h = f(x), where is the input sample set and the decoder part can be mathematically represented as o = g(h) where o is the similar representation of the input space *x*.

Stacked Autoencoders (SAE) as shown in Figure 4 are auto-encoders stacked together to form a multi layer network which has the characteristics of performing noise reduction and is found to be resilient to all types of background noise variations. More number of autoencoders stacked together give a better representation of the samples. SAE being an unsupervised method is useful for situations where there are noises (Baldi, 2012). In our work we have stacked two auto-encoders, the output equation of which can be shown in Equation (1) (Sharma et al., 2019).

$$\sum_{r=1}^{Q} X_{E_r} = f_r \left(\sum_{r=1}^{Q} \left(\sum_{l=1}^{P} X_{Dl} \cdot w_{Slr} + e_{1r} \right) \right)$$
(1)

where r=1,2,...Q,Q, is the size of the output layer of the second auto-encoder.



Proposed Work: The basic block diagram of our proposed work is shown in Figure. 5. Here, different learning based models are implemented to remove the noise from the sample signals and obtain satisfactory RMSE and PSNR values. The learning based models are trained extensively and subsequently tested to obtained the enhanced signal.

Dataset: For the automatic de-noising of speech samples, we have considered the Assamese language which is ethnographically rich and diverse. The samples consists of telephonic speech from 12 speakers. Each speaker uttered different Assamese sentences for at least three utterances. Further, the speech samples were subjected to SNR variations by adding AWGN noise between 3 dB to -3 dB which increases the dataset and makes the system robust. Thus a set of 1260 speech samples were collected.

METHODOLOGY

In this work, the basic approach is based on the data collection for training and testing of the learning based classifiers for the denoising purpose. The configuration of the network is an important task during the process. The performance measure of the network models are done by considering the RMSE and PSNR values. The model learns in a supervised manner through the process of obtaining a 'mapping' between a clean and noisy speech spectra, with root mean squared error (RMSE) loss function shown in Equation (2) which is a way to observe how well the model has fitted to the training data.

$$RMSE = \sqrt{\frac{1}{n} \sum_{k} \left(\hat{y}_{k} - y_{k}\right)^{2}}$$
(2)

where, and are the estimated observation and the actual observation respectively.



PSNR will be calculated between the output clean signal and input noisy signal to verify the quality of signal enhancement system. The efficiency of this system was tested by several speech signals.

RESULTS AND DISCUSSION

As mentioned earlier, the goal of our work is to perform the speech de-noising using learning based classifiers. RMSE and PSNR values were considered for the performance evaluation of the proposed system. High value of PSNR and lesser value of RMSE gives the best result. The PSNR value is evaluated between the output de-noised speech signal and input noise mixed signal to verify the performance of the speech de-noising system. The system efficiency was tested by taking into consideration various speech samples. The parameters of the network structures used in the experiment is outlined in Table 1.

A set of trails are carried out to fix the neuron size of the layers of the networks. The iterative process varies depending upon various learning rates and different values of momentum. Table 2 summarizes the average test results obtained by different network structures. The RMSE values and PSNR values with variations in AWGN is summarized in the table. From Table 2. it is observed that SAE has got higher value of PSNR as compared to FFNN and RNN. The corresponding RMSE value is also shown. The best result is obtained for lesser value of RMSE and higher value of PSNR.

From Figure 6 it is observed that, in -3 db addition of noise, the SAE shows a PSNR value of 35.4 which is better than that of RNN ans FFNN models. With voice samples corrupted by -1 dB SNR, the SAE model shows a performance improvement of around 5 - 12 % that that of RNN and FFNN respectively. The significance of the result is that the degradation of the voice quality

Sharma & Kumar Sarma

has no effect and the performance of the SAE is found to be nearly consistent. The experiment shows that the de-noising quality of SAE is better than that of the other learning based classifiers although the training latency of SAE is higher.

Table 1. Simulation	parameters	of the	network	used	for	speech	signal	de-
noising.								

Sl No.	Network	items	parameters
1	FFNN	Hidden layers	Two (with 80 and 90
		Training algorithm	neurons respectively)
		Maximum epochs	Scaled Conjugate
		Training type	Gradient 2000
		Goal	Back propagation 10 ⁻³
2	RNN	Hidden layers	Two (with 40 and 50
		Training algorithm	neurons respectively)
		Maximum epochs	Scaled Conjugate Gradient
		Training type	2000
		Goal	Back propagation 10 ⁻³
3	SAE	Maximum epochs	5000
		Loss function	MSE
		Transfer function	Purelin
		Training algorithm	Scaled Conjugate Gradient
		Weight regularization	0.001

Table	2.	Performance	measure	\mathbf{of}	various	network
archite	ectu	ures.				

Network type	AWGN in dB	RMSE	PSNR
FFNN	-3	.21	22.1
	-2	.20	25.3
	-1	.18	26.8
	1	.16	28.4
	2	.14	31.5
	3	.11	32.6
RNN	-3	.11	32.8
	-2	.10	33.1
	-1	.09	34.2
	1	.09	35.3
	2	.08	36.5
	3	.07	38.4
SAE	-3	.09	35.4
	-2	.08	36.8
	-1	.07	39.4
	1	.06	41.2
	2	.05	42.6
	3	.04	44.5

CONCLUSION

In this paper, we have focused on the design of an Autoencoder based de-noising of Assamese speech samples. Several speech samples are mixed with a range of Gaussian noises which introduces a range of de-noising conditions with variation in the noisy samples. From the experimental results it has been found that the SAE based approach yields a better result for de-noising purpose



than other network types. The PSNR values obtained using SAE is better as compared to other models used for de-noising the speech samples. There is an improvement of around 6 % to 11 % in the PSNR value because of the use of SAE model. Despite of higher computational latency the proposed approach provides better signal de-noising and can be effectively used in real situations to remove various noises present in the signal.

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Exploratory Analysis of Factors Influencing AI–Enabled Customer Experience for E–Commerce Industry

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ABSTRACT

AI is the talk of the town in which the customer is a king. This research investigates how the integration of Artificial Intelligence in online shopping on e-commerce platforms can lead to AI enable customer experience. It also aims to explore the factors affecting artificial intelligence-enabled customer experience. The study is proposing a model from trust commitment theory and service quality model. The author used exploratory factor analysis to extract the constructs contributing to each variable in the model. Data is collected through a self-designed questionnaire wherein 150 people were targeted out of which 112 responded but after cleaning the data, 109 were left. As part of the conclusion, the author made some suggestions and recommendations for E-tailers deploying AI in services provided to their customers.

KEY WORDS: ARTIFICIAL INTELLIGENCE, CUSTOMER EXPERIENCE, E-COMMERCE, PERSONALIZATION, SERVICE QUALITY.

INTRODUCTION

The copacetic relationship companies have with their clients only works if the customers get value. There is no selling here – only relevancy says Colson (Chief Algorithm Officer at Stitch Fix) Every brand, every organization at present is working hard to provide a better customer experience. According to Anand Rao, Global Artificial Intelligence lead at PWC says that their latest AI research reveals that 86% of businesses right now are enjoying the benefits of a better customer experience through AI (Forbes report, 2020). Companies leverage AI to find a much faster of coming to data-driven decisions to improve the experience of their customers (Ben Harell, CMO, Priceline).



Companies are making decisions that are supported by data and based on the preferences of customers. According to the BCG report (2017), it says that brands that provide personalized experiences by incorporating advanced technologies and tools like artificial intelligence are seeing revenue increase by 6% to 10% - two to three times faster than those who don't. From the above-mentioned reports, it is wise to say that the benefits of artificial intelligence are innumerable. Brands are focusing on the use of technology to get one step closer to the customers and literature is rich with the studies from the point of view of organizations deploying these technologies but there is a dearth of research on how customers perceive and think of AI initiatives while online shopping through E-commerce platforms.

Amidst Covid-19 breakdown, E-commerce has seen tremendous growth and people started buying online to avoid human contacts. Also, according to an article in Economics times retail by Bain & Company, it is predicted that the Indian e-retail market will reach nearly 300-350 million shoppers over the next five years with online Gross merchandise value (GMV) will reach to 100-120 billion dollars by 2025. Artificial Intelligence is already embedded in E-commerce platforms; it becomes important to understand AI-enabled customer experience.



The finding of this research will help e-tailers to know and understand customer experience driven by artificial intelligence.

Literature Review: It is always the case that customer is at the center while designing any strategy. The predictive index and predictive science are all that the companies want, to upgrade customer and to ensure that customer is getting the best bang for the buck. Artificial Intelligence is the next generation technology disruption transforming how we live, interact and work. In the future, it is likely to substantially change both marketing strategies and customer behavior (Davenport.T 2020.) AI can possibly influence our lives decidedly. For purchasers, it can robotize dull errands and aid troublesome ones. For organizations, it can give a serious edge, separate items, and benefits, and even add to progress or failure (Jeffs. V, 2017).

Many researches have been conducted to understand the implication of the effects of AI-CRM on customer relationships and in particular the outcomes for customers and stakeholders (Libai.B, 2020). According to Salesforce, 84% of customers say the experience a company provides is as important as its products and services. Customers are the key to any business and researches are being conducted to understand how artificial intelligence tools can help in enhancing customer experience (Sujata.J 2019). AI will become the basis for customer personalization and the brands must utilize AI in their marketing (Pearson.A 2019). Also, Artificial Intelligence is revolutionizing the way customers interact with brands and studies are talking about AI-enabled customer experience in the context of online beauty (Ameen. N, 2021) and how retailers can have an advantage from it.

Most of the researches are from point of view of organization and companies deploying AI. There is a lack of empirical research to analyze and understand how the integration of AI in online shopping can lead to an AIenabled customer experience. There are fewer researches based on geography-India specific with compiled reference to E-commerce industry as Indian e-commerce will reach US\$ 99 billion by 2024, growing at a 27% CAGR over 2019-24, with grocery and fashion/apparel likely to be the key drivers of incremental growth (IBEF report 2020) so there is a lot of scope for the study.

RESEARCH METHODOLOGY

A. Data: Data is collected through primary sources like self-designed questionnaire and expert interviews. For the primary survey, a convenience sampling method was used and the questionnaire was floated in the Delhi-NCR region.

B.Expert Interviews: Interviews of five experts belonging to artificial intelligence, customer relationship management, and digital marketing domains were conducted to know the practical applications of artificial intelligence in the E-commerce industry. Also, these interviews helped

in drawing and better understanding the variables, which were already present in the literature. All of the experts agreed on the importance of convenience and personalization in providing a good customer experience. Customer centricity is keeping the customer at the center of everything while making any organizational decision and is achieved through the personalization factor.

While one of the experts was with the opinion that service quality matters a lot in building at par customer experience. For providing better service quality 4E method can be opted by companies which are Enable, Educate, Entice and Enforce (Behavior Change Theory). Furthermore, after deploying AI, companies should check the BIT score, which stands for Behavior, Interaction and Transactions score to understand which customer is likely to be valuable to the business. Satisfying the need of the customer is very important in E-commerce where your company's intervention is lesser means you are using artificial intelligence. The more value you add the more people will be happy from the platform. Moreover, one of the experts was with the opinion that gaining the trust of the customer with new technology (AI) where less human interaction is present becomes all the more crucial. Moreover, to reduce perceived sacrifice, chatbots should not ask mundane and repetitive questions from customers as the decrease in sacrifice will positively affect customer experience.

C. Variables: Personalization- Personalization is an interaction that empowers us to tailor client journeys and encounters according to the need and inclination of a particular client (Bilgihan, Kandampully, & Zhang, 2016). It manages continuous individualization of a service/product to suit every guest's one-of-a-kind necessities and guides them through a custom conversion funnel. Zanker et al. (2019) described three dimensions of personalization in online services (i) user interface, (ii) content, and (iii) interaction process. These dimensions are further defined below:

i. User Interface- Personalization of the user interface alludes to the flexibility of the screen design and overall presentation, e.g., for differing screen sizes (Findlater & Mc Grenere, 2020). Personalization has become an indispensable piece of planning an advanced framework because of the capacity to assemble an association with the end-user. The primary objective of personalization is to give a contextual experience by conveying substance and usefulness that line up with explicit user needs or interests with no specific effort from users.

ii. Content- Personalization of content alludes to the differentiation of data-dependent on an individual client's profile, including item or service contributions, and costs. Content personalization, the system for conveying pertinent and focused content dependent on what intrigues your crowd, is instrumental for connecting with clients on an individual level. Giving custom-made suggestions to clients is the contrast between deals and incredible deals.

iii. Interaction Process- Personalization of the interaction process alludes to the self-rule of AI calculations to choose when and how to move toward clients

H 1a: Personalization has a positive direct impact on trust.

H 1b: Personalization has negative direct impact on perceived sacrifice.

H 1c: Personalization has a positive direct impact on relationship commitment.

Perceived convenience- Service convenience is defined as "the capacity to accomplish an errand in the briefest measure of time with minimal use of human energy" (Morganosky, 1986). Convenience in AI-Enabled e-commerce services means these are self-services that are available 24X7 and can be used from anywhere (Walch,2019).

i. Time

ii. Location

H 2a: Perceived convenience has a positive direct impact on trust.

H 2b: Perceived convenience has a negative direct impact on perceived sacrifice.

AI-enabled service quality- Artificial intelligence in customer service isn't just changing the customer's work yet, besides, improving customer dedication and its brand reputation. On account of the accessibility of apparatuses like artificial intelligence-fueled customer service bots, organizations in the B2C business section are progressively entering a time of robotized customer service that is boosting the brand insight for customers. Earlier studies on self-service technologies show that customers evaluate service quality on the mentioned four aspects: (i) security, (ii) reliability, (iii) customer service, and (iv) interface design (Mckecnie, Ganguly, & Roy, 2011; Wolfinbarger & Gilly, 2003).

i. Security- The quality of AI-enabled services depends to a huge extent on the amount and quality of personal information a brand can collect about customers. While much of this data is typically not sensitive, the amalgamation of seemingly non-sensitive personal information can result in an extensive user profile that, with insufficient security precautions, would enable fraudsters to create false identities (Cheatham et al., 2019).

ii. Reliability- Accepting a capacity for 'unbiased' customer interactions, Saratchandra (2019) says that artificial intelligence upgrades the reliability of customer services.

iii. Customer Service- Chatbots and other AI-helped client care apparatuses are progressively utilized as

a computerized and possibly proficient method of improving the client journey (Treasure Data, 2019).

iv. Interface Design- Since numerous AI-empowered services depend on a self-service model, a carefully planned UI is frequently depicted as a basic success factor of such services. Indeed, AI can change the UI as it can handle all substance of the interface configuration including visual components, typography, movements, and graphical data (Irfan, 2020).

H 3a: AI-enabled service quality has a positive direct impact on trust.

H 3b: AI-enabled service quality has negative direct impact on perceived sacrifice.

Trust- An exemplary meaning of trust is a mentality of the sure assumption that one's weaknesses in a dangerous circumstance won't be misused. With regards to online commerce, this incorporates trusting the brand just as the innovation. With regards to AI, late investigations show that trust is a key in guaranteeing the acknowledgment, proceeding with progress, and improvement of this innovation and technology (Siau & Wang, 2018). The concept of trust is more intricate in the context of AIenabled customer service, where trust is not restricted to the technology and brand, but also the purpose and process of using AI (Hengster et al., 2016; Siau & Wang, 2018).

i. Technology

ii. Process- This dimension touches on the understandability of the technology. When algorithms and functional logics are explicit and clear, trust is likely to be strengthened (Lee & See, 2004).

iii. Purpose- The purpose shows faith in intentions (Hengster et al., 2016), iv. Brand

H 4: Trust has a positive direct impact on AI-enabled customer experience.

Relationship commitment- Relationship commitment alludes to an undergoing aspiration to maintain an esteemed relationship with a brand (Moorman, Zaltman, Et Deshpande, 1992). Purchasers can turn out to be keener on associating with brands on the off chance that they experience positive connections and assemble solid relationships with them, which can lead them to be more dedicated towards these brands. Relationship commitment is a result of long-haul up to par interactions among customers and retailers (Wang et al., 2016). It guides clients to accept that there could be no other elective brands that would give comparable advantages, making them more averse to shop from elective brands. According to Gustafsson et al, 2005; Keiningham et al., 2017; Verhoef et al., 2009) researchers say that when communicating with brands, customers develop below mentioned three types of commitments:

Gupta et al.,

i. Affective commitment- Affective or emotional commitment refers to the emotional and personal involvement of customers that results in a higher level of trust and commitment (Gustafsson et al., 2005).

ii. Normative commitment- Normative or social commitment is based on subjective norms established over time, where customers feel that they ought to stay with a brand (Shukla et al., 2016).

iii. Calculative commitment- Calculative or functional commitment takes into account possible costs customers accrue by switching to another brand, which may be the result of a less attractive alternative brand or the absence of alternative brands (Shukla et al., 2016).

H 5: Relationship commitment has a positive direct impact on AI-enabled customer experience.



Table 1. Conversion of Likert Scale into Numerical Scale							
Likert Scale	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
Number	1	2	3	4	5	6	7

Table 2. KMO and Bartlett's Test					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.848			
Bartlett's Test of Sphericity	Approx. Chi-	2970.182			
	Square				
	df	465			
	Sig.	.000			

Perceived sacrifice- Perceived sacrifice relates to "what is surrendered or sacrificed to acquire an item or service" and incorporates financial and non-money related expenses including time, exertion, intellectual commitment, or sentiments like aggravation and irritation (Zeithaml, 1988).

i. Time-consuming- Lack of human agents in AIempowered services may create a hitch for customers which may lead to customers spending more time in understanding and using the services. Clients may see this as a sacrifice, particularly those first-time clients (Gaurvit, 2019).

ii. Loss of privacy- AI-empowered services additionally requires individual information from buyers to work effectively, which can be seen as a further loss of privacy.

iii. Irritation- In the research of Andre et al., 2018, emphasized the need to explore sacrifices made by the customers while using automated services when limited

numbers of options are present to choose from. The customers get irritated when they are not able to find the desired product.

iv. Lack of human interaction: As AI-enabled services consist of self-service, there is a lack of human interactions, and many studies highlight the importance of human interactions (Pham & Ahammad, 2017).

H 6: Perceived sacrifice has a negative direct impact on AI-enabled customer experience.

Al-enabled customer experience: Customer experience alludes to the overall experience a customer has with a retailer, in light of their connections with and considerations about the brand(Oh, Teo, & Sambamurthy, 2012). According to a study by Gartner,2020, the utilization of AI technologies, for example, AI, machine learning, and Natural Language Processing can help understand customer opinion and customer input at scale, accuracy, and speed not feasible through humans. This proposes that AI can possibly become one of the main tools for retailers to constantly improve the customer experience and along these lines to remain competitive (Newman, 2019).

AI-enabled customer experiences consist of hedonic and recognition aspects:

i. The hedonic aspect refers to memorable, exciting, comforting, educational, and novel experiences (Foroudi et al., 2018).

ii. The recognition aspect refers to the feeling of importance, respect, being welcome, safety, relationship (Foroudi et al., 2018). In AI-enabled services, both hedonic

and recognition aspects of the customer experience can be improved in terms of time, efficiency, enjoyment, and personalization (Saponaro et al., 2018).

Table 3. Communalities		
	Initial	Extraction
My experience with E-Commerce platform has been memorable	1.000	.725
I feel welcomed while using the E-Commerce platform	1.000	.823
I feel important while using E-Commerce platform	1.000	.763
I feel respected while using E-Commerce platform	1.000	.772
I feel comfortable while using E-Commerce platform	1.000	.803
I feel excited while using E-Commerce platform as it provides variety of offers and deals	1.000	.813
I feel informed about the details of the product while purchasing it	1.000	.798
I feel safe while making prepaid purchase while using E-commerce platform	1.000	.673
I feel E-Commerce platforms are well designed and easy to use	1.000	.757
I feel secure while entering my personal and payment details on E-Commerce platform	1.000	.820
I can rely on E-commerce platform for fulfillment of my needs.	1.000	.742
I feel chat bots and self-help customer service provide solutions as per my expectations.	1.000	.671
It would be very hard for me to switch away from E-Commerce platforms even if I want to	1.000	.760
I feel that my life would be affected in some way or the other if I switch from	1.000	.834
E-Commerce platform		
I feel that I am habitual of using E-Commerce platform that it would be costly for me	1.000	.825
to switch from it.		
I feel I have an emotional and personal attachment with E-Commerce platform	1.000	.755
The performance of E-Commerce always meets my expectations	1.000	.783
I feel that E-Commerce platforms have good features	1.000	.788
I trust E-Commerce platform because they provide good quality products	1.000	.738
E-Commerce platform shows interest in me as a customer	1.000	.678
E-Commerce platform allows me to use the service whenever I choose	1.000	.832
E-Commerce platform allows me to use the service at a convenient time	1.000	.925
E-Commerce platform allows me to use the service wherever I choose	1.000	.915
E-Commerce platform allows me to use the services from the comfort of home	1.000	.893
I value E-Commerce platform as it adjusts itself according to the device I use	1.000	.771
I value E-Commerce platform that acquires my personal preferences and personalize the	1.000	.886
services and products itself.		
I value E-Commerce platform because they notify me about the offers and deals on the	1.000	.811
product I was searching for		
Using E-Commerce is time consuming	1.000	.689
I get annoyed while using E-commerce platform when I am not able to find desired product	1.000	.628
I am concerned about the loss of privacy while using E-Commerce platform	1.000	.656
I am concerned about the lack of human interaction while using E-Commerce platform	1.000	.721
Extraction Method: Principal Component Analysis.		

Proposed Model & Hypothesis Development: The model has been drawn from service quality model (Parasuraman et al., 1994) and trust commitment theory (Morgan & Hunt, 1994) to understand how the incorporation of AI-enabled tools and services can enhance the customer experience. The model has intermingled the factors that are pertinent to this study of customer experience with AI- enabled services. Moreover, perceived sacrifice and trust are considered as mediating variables in the model, wherein, personalization, service quality and perceived convenience are independent variables and

the dependent factor is AI-enabled customer experience. Also, the model incorporates relationship commitment from trust-commitment theory to check its effect on AI-enabled customer experience.

Proposed Model

IV. Data Analysis & Interpretation

Measurement Scales: The measurement items (all statements) for all constructs were adopted from previous studies. Also, multiple items were used to measure each

factor. For each item, a seven-point Likert Scale is used ranging from "Strongly Disagree to "Strongly Agree.

We have used EFA (Exploratory Factor Analysis) to explore the construct under each variable. PCA (Principal Component Analysis) method is used with Varimax Rotation.

		Initial Eigen	values	Extraction Sums of Squared Loadings Rotation Sums of			traction Sums of Squared Loadings Rotation Sums of Squ		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.071	35.714	35.714	11.071	35.714	35.714	6.170	19.902	19.902
2	4.016	12.955	48.669	4.016	12.955	48.669	4.199	13.544	33.446
3	3.397	10.957	59.626	3.397	10.957	59.626	3.443	11.105	44.552
4	2.015	6.500	66.126	2.015	6.500	66.126	2.870	9.257	53.808
5	1.269	4.093	70.219	1.269	4.093	70.219	2.626	8.472	62.280
6	1.212	3.911	74.130	1.212	3.911	74.130	2.524	8.140	70.420
7	1.069	3.447	77.577	1.069	3.447	77.577	2.219	7.157	77.577
8	.842	2.716	80.293		-		1		
9	.780	2.517	82.810						
10	.543	1.752	84.562						
11	.533	1.719	86.281			1 1 + 1			
12	.492	1.587	87.868						
13	.433	1.396	89.264		Charles and the second	1	1		
14	.406	1.309	90.573						
15	.339	1.092	91.665						
16	.312	1.008	92.673						
17	.280	.902	93.575						
18	.257	.829	94.405						
19	.225	.726	95.130						
20	.218	.704	95.834						
21	.202	.653	96.487			1.1			
22	.181	.585	97.073						
23	.161	.519	97.591			1	-		
24	.156	.504	98.095						-
25	.151	.487	98.582						
26	.105	.339	98.921						
27	.087	.282	99.203	-	p Real Contractor Contractor	1 Aug			
28	.084	.272	99.475						
29	.074	.238	99.713				-		
30	.050	.160	99.873		1	· · · · · · · · · · · · · · · · · · ·	+		
31	.040	.127	100.000		·	·	-		

Table 5. Rotated Component Matrixa							
		Co	mpon	ent			
	1	2	3	4	5	6	7
1 I feel welcomed while using E-Commerce platform 2. I feel excited while using E-Commerce platform as it	.857						
provides variety of offers and deals							
3 I feel comfortable while using E-Commerce platform	.847						
4 I feel informed about the details of the product while purchasing it	.829						
5 I feel important while using E-Commerce platform	.825						
6 I feel respected while using E-Commerce platform	.803						
7 My experience with E-Commerce platform has been memorable	.776						
8 I feel safe while making prepaid purchase while using E-commerce platform	.676						
9 E-Commerce platform allows me to use the service at a convenient time		.903					
10 E-Commerce platform allows me to use the service wherever I choose		.883					
11 E-Commerce platform allows me to use the services from the comfort of home		.857					
12 E-Commerce platform allows me to use the service whenever I choose		.851					
13 I feel that I am habitual of using E-Commerce platform that it would be			.853				
costly for me to switch from it.							
14 I feel that my life would be affected in someway or the other if			.845				
I switch from E-Commerce platform							
15 I feel I have an emotional and personal attachment with E-Commerce platform			.790				
16 It would be very hard for me to switch away from			.786				
E-Commerce platforms even if I want to							
17 I trust E-Commerce platform because they provide good quality products				.794			
18 The performance of E-Commerce always meets my expectations				.790			
19 I feel that E-Commerce platforms have good features		.445		.660			
20 E-Commerce platform shows interest in me as a customer				.595			

Gupta et al.,

21 I feel secure while entering my personal and payment details on E-Commerce platform		.803	3	
22 I feel chat hots and self-help customer service provide solutions as per my expectations				675
22.1 reef char bots and sen help customer service provide solutions as per my expectations.			660	.075
25 I can fely on E-commerce platform for furniment of my needs.			.009	
24 I feel E-Commerce platforms are well designed and easy to use			.609	
25 I value E-Commerce platform that acquires my personal preferences and				.870
personalize the services and products itself.				
26 I value E-Commerce platform because they notify me about the offers and				.757
deals on the product I was searching for				
27 I value E-Commerce platform as it adjust itself according to the device I use				.712
28 I am concerned about the lack of human interaction while using E-Commerce platform				
.758				
29 Using E-Commerce is time consuming				.757
30 I am concerned about the loss of privacy while using E-Commerce platform	.425			.654
31 I get annoyed while using E-commerce platform when I am not able to find desired product	:			.609
Extraction Method: Principal Component Analysis.				
Rotation Method: Varimax with Kaiser Normalization. a				
a. Rotation converged in 8 iterations.				

Table 6. Reliability Statistics for Questionnaire				
Cronbach's Alpha	N of Items			
.900	31			

This test fulfills the assumption of KMO which needs to be more than 0.6 and here it is 0.848 which means that sample is adequate up to 84.8%. Also, the significant value should be less than 0.05 and here P-value is 0.000 which means the result is appropriate and normality is achieved. Now we will move ahead with communalities. The basic assumption about communality is that it should be more than 0.5 and in the below table it is achieved as all the values are above 0.5.

The above table shows the total variance explained by the factors and it is 77.577 which is satisfactory. This states that 77.577% of variance is explained by mentioned 7 factors in the model. The above rotation component matrix shows the statements falling under which factors. The KMO value for each statement is near or more than 0.6 which fulfills the basic assumption. As from the table we can say that statements 1-8 come under factor 1 which is AI-enabled customer experience. Statements 9-12 fall under factor 2 which is AI-enabled service quality. Statements 13-16 contribute to factor 4 which is a Relationship commitment.

Table 7. Reliability Results as per factors						
Factor	No of Statement in the Factor	Cronbach's Alpha value				
AI-enabled Customer Experience	8	0.945				
AI-enabled service Quality	4	0.856				
Relationship Commitment	4	0.903				
Trust	4	0.869				
Perceived Convenience	4	0.964				
Personalization	3	0.898				
Perceived Sacrifice	4	0.729				

Now the statement 19 comes under Factor 2 with KMO .445 and Factor 4 with KMO .660 we will consider statement 19 into factor 4 based on KMO assumption so statements 17-20 fall under factor 4 that is Trust. Now Factor 5 which is Perceived Convenience consists of statements 21-24. with satisfactory KMO values. Factor 6 is Personalization and it consists of 3 statements which

are 25, 26 and 27 statements with KMO above 0.6. Again, the statement 30 falls under Factor 2 and Factor 7, based on KMO value which needs to be more than 0.6, we will put the statement under Factor 7 which is Perceived Sacrifice. So from this table, we can get the statements and appropriate factors, and all the hypotheses and criteria are met.

Reliability Analysis: For checking, the reliability of the questionnaire and reliability of each factor Cronbach's Alpha test is done.

From table 6, the Cronbach's Alpha value is 0.9, so we can say that the questionnaire is reliable.

From table 7, Combined Cronbach's Alpha for each variable is more than 0.7, which means that all the variables and contributing statements are reliable.

FINDINGS & CONCLUSION

The findings show that two types of AI enable customer experience exists namely hedonic which includes memorable, exciting, sense of comfort and education in our context and other is the recognition which includes important, respect, welcome, and safety in our study. While retailers need to implement innovative technology, it is pivotal to understand how customers perceive the technology. The important points that can be concluded from the above study are that all the seven factors are reliable and all the statements are considered and extracted in EFA, so the model is the best fit and can be used by the E-Commerce industry. It also shows that although people have a concern about the loss of privacy still people are habitual of purchasing from E-Commerce platform and somehow that it would be difficult for them to switch from it to offline stores, so the E-tailers can come up with some measures for the privacy of customers so that they can get rid of their concerns. Also, customers get annoved when they are not able to find their desired product, so the brands should come up with some features with the help of which customers could find their desired products easily.

Limitations and Future Research: This research only focused to explore and extract the factors under each variable that influences artificial intelligence-enabled customer experience in the E-commerce industry in Delhi-NCR, India. The study can be conducted in crossstates and cross-national contexts. The relationships and mediating effect is yet to be established and empirically verified, and the model is yet to be confirmed by using Confirmatory Factor Analysis through the software IBM Amos. Moreover, this study was e-commerce focused, so there is room to carry forward the research on different consumer segments which provide AI-enabled services and experiences. Also, the data that was left after cleaning was 109, so the future research can be carried by using a larger sample size to maximize the chance of generalizing the findings.

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An Empirical Study of Online Consumer Behavior for Apparel & Electronics Segment

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ABSTRACT

With the advent of internet and e-commerce the face of shopping has evolved in India. Not only are consumers buying online like never before but their behavioral traits while shopping online is an area which has always perplexed marketing researchers. The research work carried out in this paper primarily comprises of understanding and assessing consumers shopping patterns with specific reference to apparel and electronic category and the parameters which consumers evaluate before buying and post purchase leading to repurchase intentions. The study distinctively uses statistical techniques to differentiate buyers as per demography and unravels factors such as comfort, trust, convenience, time and ease of use to buy apparel and electronic products online. Display of products in an E-commerce set up is also looked up by many consumers as well as comparison between price points and delivery time are some of the key reasons elicited in this study. Apart from these, psychographic traits of consumers are explored for planned purchases and has a wide scope of research.

KEY WORDS: ONLINE SHOPPING, ONLINE CONSUMER BEHAVIOR, E-COMMERCE, APPARELS & ELECTRONICS, INDIAN MARKETS.

INTRODUCTION

Shopping seem to be an important aspect of Indian culture, so Indian consumer perceived with different context. The journey has begun from weekly bazar & come to a stage of E-commerce. Ecommerce is evolving industry in India. Development & prior understanding has helped them to drive business.

Factors propelling the growth of E-Commerce

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- 1. Accessibility to Internet.
- 2. Advancement in Smart-phone industry to grab the shopping.
- 3. Smaller towns don't have exposure towards the Branded products, so online provide exposure towards it.
- 4. Advancement in Logistics, international as well as domestic.
- 5. Metro people lifestyle has changed, busy schedule has made them look for fast, quality, customized & all-products based kind shopping approach.
- 6. Market size is huge, scope for growth & attending same customer
- 7. (Internet user-base is at 500-odd million Internet users (in 2020). (IAMAI)

Review of Literature: Consumer behaviour is a simple yet complex phenomenon. The amount of spends that happen on online shopping has changed ever since the proliferation of E-commerce payers and Internet



penetration. Although it is different than shopping offline there are certain set theories and framework that hold true for both the modes of shopping. Theory of planned behavior (TPB) is a one such potent theory within an expectancy value frame work, but also a social theory which enumerates the human decision process which eventually leads to buying.

TPB suggest that human behavior decision making is partly under the control of the people concerned. Thus, adding the determinant of uncertain time, uncertain opportunity the so called Perceived Behavioral Control factor such factors can affect indirectly. Wang (2007) suggests that given the differences between a simulated and a traditional marketplace, antecedents and consequences of trust needs re-examination. The findings from research suggest that people are more likely to purchase from the web if they perceive a higher degree of trust in e-commerce and have more experience in using the web. Customer's trust levels are likely to be influenced by the level of perceived market orientation, website quality, technical fluidity, trustworthiness, and user's web engagement experience. People with a higher level of perceived site quality seem to have a higher level of perceived market orientation and trustworthiness.

towards e- commerce. (Corbitt, Thanasankit, Yi, 2003) Purchase decision is often influenced by exciting offers, services, innovativeness, discounts, layout and offerings. It has suggested that psychographic traits affect consumer's likeability and propensity to purchase also called as deal-proneness behaviour. Deal proneness is associated with price consciousness and is also affected by other consumer traits Such as innovativeness, impulsiveness and shopping enjoyment. Deal proneness is domain specific, and consumers respond to certain type of promotions while ignoring others. Deal-prone consumers generate more positive word of mouth than firm's satisfied consumers. Firms should target incentive programmes to loyal consumers, as it is likely to affect sales and add to consumer base. Dynamic deal proneness refers to sensitivity towards features of different types of coupons. It would imply actively searching about different coupons. (Khare) opines that passive deal proneness is characterized by being sensitive to in-store displays. The search is limited to a specific environment like a website offering gadgets, apparel, groceries etc.

Research Objectives: A brief understanding about consumer behavior for online shopping industry is seen to be as need of time. Our research work will focus majorly on how consumers behave in the given scenario. The sample size chosen for our study is 50 which is representative of the large population of consumers who buy online. As only higher NCCS has seen with online shopping, our focus on TG with 20-34 AB. It has considered in link with spread has considered with top 8 metros functioning with online shopping. Target group indexes provides the related target definition to arrive at the right level.

	1	Percentage	Index
	total	Online Purchase	Online Purchase
Total Sample	100%	100%	100
Gender: All Male	52%	54%	103
Gender: All Female	48%	46%	96
Age: 15-19	15%	15%	.97
Age: 20-24	16%	17%	109
Age: 25-34	26%	27%	102
Age: 35-44	23%	23%	101
Age: 45-55	20%	18%	91
NEW SEC: A1	4%	6%	164
NEW SEC: A2	11%	16%	146
NEW SEC: A3	15%	20%	128
NEW SEC: B1	17%	17%	101
NEW SEC: B2	16%	16%	97
NEW SEC: C1	23%	16%	71
NEW SEC: C2	14%	9%	65
Town Class: Top 8 Metros	29%	50%	170
Town Class: 40 Lac+	31%	54%	175
Town Class: 10 - 40 Lakhs	20%	21%	108
Town Class: 5-10 Lakhs	8%	5%	61
Town Class: 1-5 Lakhs	19%	9%	49
Town Class: Less than 1 lac	23%	11%	47

Source -Target Group Index Survey 2019 by IMRB

Data Analysis & Interpretation: Demographic Details:



a. Hypothesis Testing : H01: People are looking only for comfort now-a-days, especially when it comes to shopping.

Calculated value is 0.262 Table value – 7.89 As table value > calculated value, we should accept the null hypothesis. So now a day's people are looking-up for comfort in the shopping.

H02: Product presentation has valued more than anyother thing to get sold.

0	Е	(O-E) ^2	(O-E) ^2/E
22	21.5	0.25	0.012
32	29.6	5.76	0.195
18	17.5	0.25	0.014
23	24	1.00	0.042
			0.262
		1	
0	Е	(O-E) ^2	(O-E) ^2/E
33	39	36.00	0.923
34	36	4.00	0.111
41	43	4.00	0.093
42	41	1.00	0.024
			1.152
		-	-
0	Е	(0-E) ^2	(O-E) ^2/E

0	E	(U-E) Z	(U-E) 2/E
38	42	16.00	0.381
36	44	64.00	1.455
35	41	36.00	0.878
39	40	1.00	0.025
			2.739

Calculated value is 1.152 Table value - 7.89

As table value > calculated value, we should accept the null hypothesis. So, product presentation matters a lot when it comes to the shopping.

H03: Online shopping is self-driven, unlike offline where influencers can make a difference.

Calculated value is 2.739 Table value – 7.89

As table value > calculated value, we should accept the null hypothesis.

So online shopping is self -driven & there are lesser /no influencers for this shopping.

b. Pareto Analysis

To understand for what consumer is looking for.



- This showcase that around 75% of consumers are preferring E-Commerce as Category-Offers, Convenience, Different, Cost Saving.
- Category has seen with convenience, offers & budgeted product selling.
- It is more life-style based approach for e-commerce shopping. Such as busy schedules, working hours & convenient way.
- Brand working is associated with Well presentation, exclusively available, able to distinguish & Trust build by the brand.
- Presentation & Exclusivity drives maximum value in the consumer's mind, when it comes to buying from particular online-portal.
- Still differentiated positioning is something requirement of the hour, to make loyal base & create unique brand identity in the market.
- Cookie driven offering (recommendation by site); payment options seem to be saturated as it is getting all sites choices.



c. Cross-tab Analysis

To grab-up what is getting more established with different consumer demographics with buyer behavior.

1. Online Shopping frequency, age -group, to understand does the buying freq. changes with age-group or not.

	Age-g	group		
Online Shopping freq.	22-30	31-40		
Once a Week	9%	20%		
Once a month	34%	33%		
Once in 3 months	31%	20%		
Once in 6 months	26%	20%		
Once in year	0%	7%		

	Age-g	group
Price Range for Shopping	22-30	31-40
Below 10,000	69 %	47%
10,000-25,000	29%	33%
25,000-50,000	3%	20%

• It showcases that a month to 3 months is freq. is seen to be large chunk opt for, it may be also driven by offers/Bonanza created by each online portal to make-up in quarterly levels.

Purohit & Deokule

• Older age-group (31-40) has smaller chunk which goes for regular for buying online.

2.Online shopping price point considerations – with age –group.

- Below 10K is safest price range, what people are looking for smaller segments more.
- But as a Business practice, we can say that below 25K is range of products covers 90% of young consumers & 80% for older consumer.
- Higher price range is something related to income

range also, higher Age group can be tapped for big price deals also.

3.Price point consideration vs. Time taken for decision making –

- For a mid-range buyer, we can see that it takes majorly 1-6 hrs. to finalize the buying decision on online medium.
- As compared to higher price range where more complexities, specification involved then it takes more times, hence time involvement has seen fragmented & subjective.

	Co	onsideration of Pri	ce
Time taken for decision	Below 10,000	10,000-25,000	25,000-50,000
Less than 1 hr.	25%	27%	25%
1 hr. – 6 hr.	38%	20%	25%
6 hr. – 24 hr.	9%	13%	25%
1 day – 3 days	9%	7%	-
3 days – 1 week	16%	27%	25%
More than 1 week	3%	7%	-



	Segment 1	Segment 2
Buying freq.	0.636	1.356
Time Taken	1.359	0.495
Value Consideration	0.665	1.445
Influence	0.659	0.8826
Impulse Buyer	0.894	1.365
Electronics	1.645	0.956
Age	22-30	31-40
Income	10k-30k	40k-75k

d. Consumer Buying Pyramid-

Awareness – Purchase model will help us understand the consumer journey towards particular brand. As there are two big players in the market Amazon & Flipkart, let see their model in detail.

• There is 100 % awareness about the brand, people often refer this one with category itself.



- In the presence of top 3 is also very high, hardly 5% drop seen in the second level, while for consideration set it goes to 78% for thinking of shopping.
- Consideration may get driven by offers, exclusive availability etc.
- Final buyers will be 36% among all, which is almost becomes half of consideration set. Buying decision has attached with more points.
- It has seen with category level only, as awareness is 100%, continuing with development of category is lead-in for Flip-kart.
- Top 3, which is top of the mind consideration has seen 4% drop only. Where-as in Consideration set for buying has seen 14% drop. Competition offers, fragmented market on categories has made this level drop.
- Buying decision has makes them drop by 50% around, this is sheer outcome of increase in competition, offers & segmented markets.

e. Cluster analysis

From above analysis we have realized that there are

two type of customers exist in the market, we can do segmentation analysis to understand them thoroughly.

- 1. A Young 22-30 age group, looking for offer & consumer who is also tech-savvy.
- 2. A Mid Age-group 31-40, looking for comfort & who is going for higher price range also.

A matrix based on different variables showcases the case for cluster analysis & factors which are having higher weightage.

Limitations

- 1. A major limitation of the project is real time data for Analysis. (Traffic Analysis)
- It would provide how consumer understands, surf & come for the buying of the product. On online medium.
- It will generate more accuracy in results, as it is based on actual /real time data base.

2. Deep Psychographic study for online shopping need to be taken, as it will enhance the level of future workouts.

- Psychographic study will help us to create a rationale behind the various decision taken by consumers for buying product.
- Any Future development will make easy to have deep knowledge about online shopping psychograph.

Recommendations: As analysis of surveyed data, secondary sources understanding & expert review will help us arrive at a common thread consumer behavior which we can propel in-terms of consumer behavior under e- commerce medium. As we have restricted our study to Electronics & Apparel, it would more implied for them. A recommendation would be useful to those who are entering newly in the market & existing once also as they as looking-up for -

- Self-engaging Links –
- More than 90% of consumers are buying the products based on self-assessment, there is no influence of others.
- It makes the consumers to step-up & go for buying without any pre-assumptions of anybody.
- Enhancing user experience –
- Interface use enhancement is a crucial in terms of selection on functional & emotional basis.
- Making user friendly, self-explanatory & well offer description portal to keeping & enhancing the comfort mode.
- Building Loyal customer base -
- As category specific offerings, customer value programmes are taken-up by various brands & also increased competition in the market, makes consumer loyalty programme to enhance the core buyer base.
- Online buying is either by niche or by community buying.
- Making advertising use for making portal into the consideration of top 3 (TOM), so the higher sales could be achieved. Developing Online buying as a ritual –
- As on many occasions in India there is shopping is a

ritual, it can get synchronized with online shopping. Helping & deriving value.

• Creating impulse bid for consumer shopping behavior, as there is strong trend which is making a comfort base shopping a regular.

CONCLUSION

Conclusion will ultimately answer the objective that we are looking for, Consumer behavior has changed, when it comes to online shopping. In modern day in India, we have seen urban life-style has changed, there is generation who is busy with office work, has money to spend on (Urban NI increased by 40% in last decade) , cultural changes has observed by Indian's, the new way of shopping has given birth to it 'E-commerce'. Shopping perception has also observed a change.

Giving the clear sense of following things in online buying will make the suitable on -

3. Steps in making the buying decision, which has become complex & subjective in nature for online buying.

4. Change of Planned to Impulse buying decision in many products.

a. It is self-driven buying behavior; it has lesser impact of externalities.

b. Role of presentation make buyer to buy it, which also could be experience part to make change from planned to impulse.

5. Two type of segments exist; in which we can broadly classify the consumers.

a. Young buyers looking for Tech-savvy products, has mid-price range option.

b. Mid age buyers looking for comfort majorly, has high price range.

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Optimization Hydro-Thermal-Wind-PV Solar Using MOPSO Algorithm Applied to Economic/ Environmental Dispatch

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ABSTRACT

The purpose in this present work exposure the application of MOPSO multiple- objective particle swarm optimization algorithm to solver dynamic economic emission dispatch problems with ramp rate. The proposed MOPSO algorithm is applied in economic emission dispatch to fin the best solutions of hydro plant, thermal units, wind and PV solar generation scheduling powers and then calculate the cost, emission functions for SOx and NOx gas pollution, and combined the three function. The dynamic economic emission distribution (DEED) is an important subject in electrical power systems network. This consists of a valve point effect(VPE), transmission powers losses, a load, an equilibration power system and generator constraints. The proposed algorithm was exanimate on ten unit test power systems. All simulations results are thorough on the MATLAB-Simulinck space.

KEY WORDS: ECONOMIC EMISSION DISPATCH PROBLEM; RAMP RATE; SOLAR POWER; ENERGY STORAGE; WIND POWER; HYDRO PLANT; MOPSO; POWER SYSTEMS; TRANSMISSION LOSSES; VALVE POINT EFFECT.

INTRODUCTION

The role of best optimal dispatch production scheduling of a thermal-renewable power system of generation pointing modest economic and minimization of emission as a benefits is necessary actually in order to swelling the demanded power generation, escalating the total fuel price and high pollution rate. Optimization scheduling of power plant production is of large importance to electric interest systems. With the low misfit cost of power hydroelectric, the problem of minimizing the transition cost of a hydrothermal system basically reduces to that of minimize the fuel cost for thermal plants user the divers constraints on the hydraulic and power system grid.



A coal-fired power plant releases tons of ash, tons of toxic heavy metals, arsenic, mercury, cadmium, uranium, tons of thorium, soot and fine particles that escape to the atmosphere each year. Tons of CO2 and tons of nitrogen oxide (NOX). Thus, everyone is currently oriented towards the use of renewable energies by the integration of these different forms in electrical networks. Electricity production is responsible for 35% of CO2 emissions linked to human activity worldwide. Fortunately, renewable energies, or green energies, have experienced a real boom since the 2000s. These new energy production sectors should in future represent a greater share of use because of the environmental impact of renewable energy.

The Clean Air Act 1990 aims to reduce greenhouse gases and acid rain. It requires that fossil fuel power plants must decrease its (NOx) emission level and (SO2) quantity. Though these approach previous have obtain simultaneously emission and total fuel cost, the scheduling problem is ultimately optimization problem of single objective both inevitable flaws. The results of optimization are critical to the balances which are difficult to be resolved. The Pareto best group cannot be acquired in one test by using different metering. To overcome the disadvantages mentioned above, many



authors have developed strength pareto evolutionary algorithm-2 (SPEA 2) and non-dominated sorting genetic algorithm-II.

Formulation of Problem: NOx emission, SOx emission and cost of generation represent the optimized objective functions simultaneously for EED problem of windsolar-hydro-thermal plants system. while respecting the constraints of the system. The objectives functions and constraints problem given into account in the problem of formulation.

2.1.Objectives

2.1.1. Cost function: Economic dispatch, or modest economic dispatch is to research the generation power that given the minimum of total fuel cost respecting constraints necessary of the system. In comparison of the hydroelectric power station cost, the operating cost of a wind- solar -hydro-thermal system is reduced specially to that of the cost of total fuel cost for thermal power plants with the cost of the PV solar power system and wind power generation units and the PV solar power system. The following expression of total fuel cost is.

$$F_{u} = \sum_{t=1}^{T} \left\{ \sum_{g=1}^{Ng} \left[f_{g,t} \left(P_{g,t} \right) \right] + \sum_{k=1}^{Nw} K_{w,k} * P_{w,k,t} + \sum_{m=1}^{N_{PV}} K_{PV,m} * P_{PV,m,t} \right\}$$
(1)

Equation (2) give The expression of the total fuel cost for thermal plant, taking into count the valve-point effect(VPE).

$$f_{g,t}\left(P_{g,t}\right) = a_g + b_g P_{g,t} + c_g P_{g,t}^2 + \left| d_g \times \sin\left[e_g \times \left(P_g^{\min} - P_g\right)\right] \right|$$
(2)

2.1.2. NOx emission function: In reference, the NOx emissions is given by the following equation:

$$E_{NO_X} = \sum_{t=1}^{T} \sum_{g=1}^{Ng} \left[\alpha_{ng} + \beta_{ng} P_{g,t} + \gamma_{ng} P_{g,t}^2 \right]$$
(3)

2.1.3.Sox emission function: The equation (4) that represent the expression of SOx emission is given by:

$$E_{SO_{X}} = \sum_{t=1}^{T} \sum_{g=1}^{Ng} \left[\alpha_{sg} + \beta_{sg} P_{g,t} + \gamma_{sg} P_{g,t}^{2} \right]$$
(4)

2.2. Constraints of the problem: Depending on the size of the electrical network, in other words its complexity, the study of the switching of units can be conditioned by several constraints. In fact, in this context two constraints to be respected the spinning reserve constraints and demanded power of load.

• Generating unit ramp-rate limits

Violation of unit ramp rates will shorten the life for power production facilities. Thus, the ramp rate limits must be schown when the power demanded for variation of electric charge changes.

$$\left. \begin{array}{ccc} P_{g,t} & - P_{g,t-1} \leq U R_{g} \\ P_{g,t-1} & - P_{g,t} \leq D R_{g} \end{array} \right\} \text{ For } g \in N_{g} et t = 2, 3, \dots, T$$
 (5)

If unit ramp speed limits are considered into account, actual generated power limits (5) can be obtain the variation as equation (6):

$$\max\left(P_g^{\min}, P_{g,t-1} - DR_g\right) \le P_{g,t} \le \min\left(P_g^{\max}, P_{g,t-1} + UR_g\right)$$
(6)

Real power balance equation:

$$\sum_{t=1}^{T=24} \left[\sum_{g=1}^{N_g} P_{g,t} + \sum_{j=1}^{N_h} P_{h,j,t} + \sum_{m=1}^{N_{PV}} P_{PV,m,t} + \sum_{k=1}^{N_W} P_{w,k,t} + P_{bat,t} \right] = P_{Dt} + PL_t$$
(7)

Or the total power losses of the transmission line PLt can be calculated by using B-coefficient stated as equation number (8).

$$P_{Lt} = \sum_{t=1}^{T} \sum_{g=1}^{N_g} P_{g,t} B_{gj} P_{j,t} \quad ; t = 1, 2, \dots, T$$
(8)

The hydroelectric generation is a function of reservoir and discharge water rate given by the following expression:

$$P_{h,j,t} = C \frac{V^2}{1,j} + C \frac{Q^2}{1,j} + C \frac{Q^2}{1,j} + C \frac{V}{1,j,t} + C \frac{V}{1,j,t} + C \frac{Q}{1,j,t} +$$

For the output of power for the kth generated power of wind unit for given speed and time t has the following expression:

$$Pwin = \begin{cases} 0, & \text{for } vwin, t \le v_{in} \text{ and } vwin, t > v_{0} \\ pr\left(\frac{v_{win,t} - v_{in}}{v_{r} - v_{in}}\right), \text{ for } v_{in} \le vwin, t \le v_{r} \\ pr, & \text{for } v_{r} \le vwin, t \le v_{0} \end{cases}$$
(10)

The output power [12] from PV cell has the following equation.

$$P_{PVm,t}(G) = \begin{cases} P_{S}\left(\frac{G^{2}}{G_{std}.R_{c}}\right) & \text{for } 0 < G < R_{c} \end{cases}$$
(11)
$$P_{S}\left(\frac{G}{G_{std}}\right) & \text{for } G > R_{c} \end{cases}$$

• Real power generation limit

119

$$P_{g}^{\min} \leq P_{g,t} \leq P_{g}^{\max}; F \text{ or } g \in N_{g}, t \in T$$

$$P_{h,j}^{\min} \leq P_{h,j,t} \leq P_{h,t}^{\max}; F \text{ or } j \in N_{h}, t \in T$$

$$P_{w,k}^{\min} \leq P_{w,k,t} \leq P_{w,k}^{\max}; F \text{ or } j \in N_{w}, t \in T$$
(12)

• **Constraints of Hydraulic system:** All constraints of the hydraulic equipment include equations of the water balance for each hydroelectric unit in addition to the limits on the storage and rejection targets of the reservoirs :

- Physical limitations on reservoir storage volumes and discharge rates,

$$V_{h,j}^{\min} \leq V_{h,j,t} \leq V_{h,j}^{\max}; j \in N_h, t \in T$$
(13)

$$\mathcal{Q}_{h,j}^{\min} \leq \mathcal{Q}_{h,j,t} \leq \mathcal{Q}_{h,j}^{\max}; j \in N_{h,t} \in T$$
(14)

-hydro reservoir system has the following equation of continuity:

• Energy storage system ESS

Equation (16) represent The maximum discharge and charge and battery capacity :

$$-P_b^{\max} \le P_{bt} \le P_b^{\min} \tag{16}$$

Pbt : positive in discharging P^d.
Pbt: negative in charging P^c.
* If the ESS is charging (Pb(t) < 0)
* If the ESS is discharging (Pb (t) > 0)
* If the ESS is idle (Pb(t) = 0)

Multi-Objective Function: The formulation of optimization in this case of multi-objective function CDEED dispatch is given by equation (17).

$$Min F(P_{gi,t}) = \left[Fu(P_{g,t}), E_{NO_{X}}(P_{g,t}), E_{SO_{X}}(P_{g,t})\right]$$
(17)

Determine the optimal dispatch of active energy production which give the minimization of two contradictory objectives functions of total fuel cost and emissions quantity while srespecting several equality and inequality constraints. The CDEED is considered as an optimization of a single objective function using the weighting method as:

$$Min F = w Fu + (1 - w)(pf_{NO_X} \cdot E_{NO_X} + pf_{SO_X} \cdot E_{SO_X})$$
(18)

Where pf is the price penalty factor is as flows:

$$pf_{i_{NO_{X}}}(P_{ig}^{m}ax) = \frac{F_{ug,t}(P_{ig}^{m}ax)}{E_{NO_{X}}(P_{ig}^{m}ax)} \$ / ton$$
(19)

$$pf_{i_{SO_X}}(P_{ig}^{max}) = \frac{Fu_{g,t}(P_{ig}^{max})}{E_{SO_X}(P_{ig}^{max})}$$
(20)

Where $0 \le w \le 1$ is the weighting factor.

If w = 1, minimizing only the cost.

If w = 0, minimizing only the emission.

If w = 0.5 minimizing simultaneously the economic and emission.

Mopso Approach

4.1. Overview: Several scientific researches use a lot of times Particle swarm optimization and consider them as very efficient and robust methods which can be applied or used for nonlinear optimization problems and more particularly for electrical systems. In fact, these algorithms ignore several conditions such as differentiability and continuity, whether for the objective functions to be optimized or these constraints to be respected. This algorithm is introduced by Eberhart and Kennedy as an optimization tool for non-linear optimization problems.

4.2. MOPSO Algorithm: It is at random, the initialization of all the particles in the research space for the MOPSO approach. A position and velocity are assigned For each particle in the decision research space. The proposed MOPSO approach is well detailed with these different steps in the reference.

4.3. Front pareto and best compromise solution: Decision maker (DM) can assume vague or imprecise objectives for each objective function. Fuzzy sets are defined by equations called functions of membership. The DM is able to give the best evaluation for the function of membership , μ Fk subjectively and is defined as strictly monotonically with decrease and continuity function has the following expression:

Marouani et al.,

$$\mu_{F_{k}}(i) = \begin{cases} 0 , 0 \text{ therwise} \\ \frac{F_{k}^{Max} - F_{k}(i)}{F_{k}^{Max} - F_{k}^{min}}, F_{k}^{Max} \leq F_{k}(i) \leq F_{k}^{min} \end{cases}$$
(21)

The procedure is as follows:

$$F2 = M in E_{m_{it}} (P_{gi,t}) \le \varepsilon$$
(22)

The ε value will be varied from F2Max to F2min and then F1 (cost function) is minimized. The final solution using (DM) can then be found as:

$$\begin{array}{c}
M & a \\
1 & : n \\
\end{array} \begin{pmatrix}
m & in (\mu F \\
1 & : n \\
\end{array} \end{pmatrix} \qquad (23)$$

Where nS number of total solution and nF number of objective functions.

Analysis and Discussion of Results: In this paper, four cases are considered to demonstrate the performance of the proposed method such as:

Case 1: Economic dispatch.

Case 2: NOx emission dispatch.

Case 3: SOx emission dispatch.

Case 4: Combined economic emission dispatch.



All results of simulations are obtained in MATLABsimulinck R2013a using i3-2310M CPU @ 2.10 GHz. This proposed method is applied with size of population as 200 . 600 is the number maximum of iteration. The system power data for all cases are given from. Four reservoir hydroelectric power plants are considered in this system, three thermal plants, equivalent power of wind generation unit, an equivalent PV solar power plant and an equivalent battery energy storage . A 24 intervals by day is the planning period. The valve point effect loading (VPEL) is considered into count. Hydrothermal parameters are more detailed in reference.



Figure 3: Hydro plant discharges (104m3) case 1 (a), case



Sox and NOx coefficients are given in. The rating of wind power generator is pr = 150MW. The cut-in, cutout and rated wind speeds are vin=4m/s, vo=25 m/s and vr=15 m/s respectively. The direct cost coefficient Kwin for the wind power generator is taken 3.25. The rating of solar PV generator is PS=150 MW. The direct cost coefficient Kpv for the solar PV generator is taken 3.5.

The solar radiation in the standard environment Gstd and a certain radiation point Rc are taken as 1000 W/m^2 and 150 W/m^2 . The forecasted wind velocity and solar radiation are taken from.

Figure 5: The ramp up/ramp down values of case 1 (a), case 2 (b), case 3 (c) and case 4 (d)



Table	1. Be	st sch	eduli	ng an	ıd di	spatching	ofg	gener	ratio	n (MW) fo	or case 1	of test sy	stem			
п	pp	Ther	mal u	nit pov	ver ge	eneration				Hydro por	wer generat	ion		PV	Wind	Dhat
н	PD	g1	g2	g3	g4	g5	g6	g7	g8	hl	h2	h3	h4	Solar	wina	Poat
tl	1750	455	450	130	20	50.3259	40	45	35	113.5000	111.2000	65.2784	327.8500	0.0000	0.0000	-93.1543
t2	1780	455	450	130	20	50.3259	40	45	35	66.7348	50.1640	55.2735	327.8500	0.0000	0.0000	54.6518
t3	1700	455	450	130	20	50.3259	40	45	35	69.2867	51.8500	48.7598	326.7162	0.0000	0.0000	-21.9386
t4	1650	455	450	130	20	50.3259	40	45	35	70.9992	53.4640	41.4710	327.8500	0.0000	0.0000	-69.1100
t5	1670	455	450	130	20	77.3516	40	45	35	71.9591	54.5000	38.2778	323.3603	0.0000	0.0000	-70.4489
t6	1800	455	450	130	20	127.3516	40	45	35	73.2429	55.0060	65.2563	304.1431	0.0000	0.0000	62.3855
t7	1950	455	450	130	20	177.3516	40	45	35	74.8164	55.0060	65.2694	327.8500	0.0000	12.3210	65.5504
t8	2010	455	450	130	20	227.3516	40	45	35	76.6334	55.5040	65.1445	298.1661	0.0000	46.6500	120.0000
t9	2090	455	450	130	20	237.1027	40	45	35	78.6879	59.8756	64.8314	298.2524	0.0000	56.2500	85.0073
t10	2080	455	450	130	20	235.5400	40	45	35	80.9089	65.1696	64.3405	298.5837	0.0000	75.4500	81.1576
tll	2100	455	450	130	20	235.5400	40	45	35	83.2384	69.6539	63.6748	299.1853	0.0000	92.5500	116.4466
t12	2150	455	450	130	20	235.5400	40	45	35	84.3106	72.8037	62.9514	300.0476	0.0000	102.9000	69.4525
t13	2110	455	450	130	20	235.5400	40	45	35	85.6290	75.4116	62.3578	301.1590	0.0000	105.4500	-77.7620
t14	2030	455	450	130	20	232.9904	40	45	35	87.1239	78.1588	61.6156	302.4732	60.0000	110.4000	-99.4109
t15	2010	455	450	130	20	232.9904	40	45	35	87.9190	80.3587	60.8740	303.9142	80.4546	87.9000	-29.8977
t16	2060	455	450	130	20	232.9904	40	45	35	88.1261	81.3910	59.9701	305.4883	83.1818	63.7500	-14.6910
t17	2050	455	450	130	20	232.9904	40	45	35	87.8378	81.2864	59.0328	307.1662	77.7273	43.6500	99.3766
t18	2120	455	450	130	20	232.9904	40	45	35	87.2315	80.0795	58.0666	308.9502	70.9091	7.3960	52.2729
t19	2070	455	450	130	20	232.9904	40	45	35	86.4987	79.1976	56.8602	310.8166	76.3636	0.0000	70.1121
t20	2050	455	450	130	20	232.2705	40	45	35	62.5277	59.9444	55.5845	312.7425	81.8182	0.0000	-28.5027
t21	1910	455	450	130	20	182.2705	40	45	35	64.2669	65.9564	54.4635	314.7272	81.8182	0.0000	-80.5014
t22	1860	455	450	130	20	181.5505	40	45	35	66.2982	70.5920	55.3070	316.7537	75.0000	0.0000	-90.9958
t23	1850	155	450	130	20	177 7078	40	45	35	68 5250	73 0307	56 6403	300 6374	80.4546	0.0000	-
624	1800	455	450	130	20	127 7078	40	45	35	70.8447	73 0532	56.0600	200 1615	117 2727	0.0000	03 15/13
Cost	(S/day)	-JJ	NOv	Emise	ion ([on/day]	SO	Emi	ssion	(Ton/day)	15.7334	0.000	277.1015	111.2121	0.0000	-75.1345
4982	90		27.6	394	on (I	Januay	501	187.2	759	(I our day)						

The convergence of objective functions of all cases with iterations using MOPSO algorithm is depicted by Figure.1. It shows that MOPSO converges faster and has got a superior performance. The curve has almost stopped declining since about the 550 th Iterations, it's declines gradually, and it finally achieves the lowest level. Figure 2 (a)–(d) illustrated pareto front and best solution for all case, respectively. It is able to obtain the optimal pareto-front of the all solution, that are well distributed in the search space.. The cost and emission objectives are actually contradictory and non commensurate in nature. In such problems there is no single optimal solution to a problem. The best solution out of the Pareto-optimal solutions is a tedious task. In this paper,

a fuzzy ranking method is used for finding the best compromise solution.

Table	e 2. Be	st schedu	ling and o	dispa	tchir	1g o:	f gen	erati	on (MW) for (case 2 of	test sys	tem			
	nn		Thermal u	nit pov	ver ge	nerat	ion			E	lydro powe	r generation	1	DX Calar	N776-1	Direct
н	PD	g1	g2	g3	g4	g5	g6	g7	g8	hl	h2	h3	h4	PV Solar	Wind	Pbat
tl	1750	299,4152	299,4149	130	20	25	460	45	35	90,6980	66,2000	65.2784	249.37	0.0000	0.0000	-35.3766
t2	1780	299.3701	299.3696	130	20	25	460	45	35	75,4410	49,0000	58,8221	248,6058	0.0000	0.0000	34,3914
t3	1700	299.3939	299.3937	130	20	25	460	45	35	75,7683	50,1640	50,4206	249.3700	0.0000	0.0000	-39,5104
t4	1650	299.3664	299.3661	130	20	25	460	45	35	76.3816	51.2960	49.2708	249.3700	0.0000	0.0000	-90.0509
t5	1670	299.3782	299.3782	130	20	25	460	45	35	76,5683	52.9340	46.8249	249.3700	0.0000	0.0000	-69.4536
tó	1800	326,7483	326.7486	130	20	25	460	45	35	76.4328	57.8209	47.8794	249.3700	0.0000	0.0000	50.1854
t7	1950	367.2091	367.208	130	20	25	460	45	35	75.8246	62.0828	48.2573	251.9118	0.0000	12.3210	67.0004
t8	2010	367.1876	367.1877	130	20	25	460	45	35	75.5910	65.1359	48.9469	257.3005	0.0000	46.6500	120.0000
t9	2090	371.8969	371.9005	130	20	25	460	45	35	75.8431	67.1673	49.3353	262,6068	0.0000	56.2500	92.1174
t10	2080	367.2086	367,2091	130	20	25	460	45	35	76,5029	69.4702	49.3441	267,6977	0.0000	75.4500	86.6361
t11	2100	367.2092	367.2089	130	20	25	460	45	35	77.5578	72.1253	49.0023	272.7105	0.0000	92.5500	117.5388
t12	2150	367.2101	367.2094	130	20	25	460	45	35	78.8815	75.1026	48.6017	277.5559	0.0000	102.9000	66.5220
t13	2110	367.2152	367.2173	130	20	25	460	45	35	80.5094	77.7968	48.1313	282.1581	0.0000	105.4500	-66.5931
t14	2030	358.2016	358.2009	130	20	25	460	45	35	80.8834	79.4939	47.9019	286.5115	60.0000	110.4000	-91.2680
t15	2010	358,1998	358.2007	130	20	25	460	45	35	81.5705	80.9626	48.2393	290.7405	80.4546	87.9000	-27.0551
t16	2060	358.1987	358.1995	130	20	25	460	45	35	82.7148	82.9763	48.2128	294.8213	83.1818	63.7500	-17,7005
t17	2050	358.1982	358.1957	130	20	25	460	45	35	83.4501	84.7835	48.1456	298.5500	77.7273	43.6500	83.5728
t18	2120	358.2016	358.2016	130	20	25	460	45	35	83.8692	85.5297	47.7266	309.5935	70.9091	7.3960	37.5859
t19	2070	358.2074	358.2069	130	20	25	460	45	35	83.0744	84.2795	46.7762	310.5062	76.3636	0.0000	81.4581
t20	2050	358.2058	358.2047	130	20	25	460	45	35	54.7570	49.1257	47.6331	303.7974	81.8182	0.0000	-23.3769
t21	1910	345.8139	345.8121	130	20	25	460	45	35	54.6168	51.5132	49.7135	289.0892	81.8182	0.0000	-56.6231
t22	1860	345.8119	345.8112	130	20	25	460	45	35	54.7050	60.0952	51.9174	268.2824	75.0000	0.0000	-120.0000
t23	1850	343.1922	343.1922	130	20	25	460	45	35	105.9562	80.9790	56.6134	244.6124	80.4546	0.0000	-120.0000
t24	1800	268.6012	268.6008	130	20	25	460	45	35	107.0200	80.9500	59.0053	303.5500	117.2727	0.0000	-35.3766
1.0				Co	st(\$/d	ay)		NO _x I	missi	on (Ton/day)	SOx E	mission (To	on/day)			1
				5.	37240	1			25.8	175		195	.4521			

Table 3. Best scheduling and dispatching of generation (MW) for case 3 of test system

u	DD	1.1		Th	ermal unit j	power	genera	tion		н	ydro powe	r generatio	n	PV	Wind	Dhat
'n	PD	g1	g2	g3	g4	g5	g6	g7	g8	h1	h2	h3	h4	Solar	wind	Poat
tl	1750	50	50	20	130,0000	470	40	223,9319	300	94,3455	67.0229	65.2784	249.3700	0.0000	0.0000	-9.9487
t2	1780	50	50	20	130,0000	470	40	223,9319	300	78,2380	50,1024	46,6694	249.3700	0.0000	0.0000	71.6884
t3	1700	50	50	20	130.0000	470	40	240.8275	300	78.2710	51.2361	45,4993	249.3700	0.0000	0.0000	-25,2038
t4	1650	50	50	20	130 0000	470	40	270 8275	300	77 8388	55 3557	42 4695	249.3700	0.0000	0.0000	-105 8614
t5	1670	50	50	20	130.0000	470	40	300.8275	300	76.9846	59.3841	38.6750	247.5864	0.0000	0.0000	-113.4575
tő	1800	50	50	20	130,0000	470	40	330.8275	300	75.7287	62.3106	38,9801	249.3700	0.0000	0.0000	-17.2169
t7	1950	50	50	20	130.0000	470	40	360.8275	300	75.1310	64.3435	39.9902	249.3700	0.0000	12.3210	88.0169
t8	2010	50	50	20	130.0000	470	40	390.8275	300	75.1255	65.5710	40.5985	249.3700	0.0000	46.6500	81.8576
t9	2090	50	50	20	130.0000	470	40	420.8275	300	75.6783	67.3573	40.9279	249.3700	0.0000	56.2500	119.5891
t10	2080	50	50	20	130.0000	470	40	450.8275	300	76.7489	69.6806	40.9875	249.3700	0.0000	75.4500	56.9355
tll	2100	50	50	20	130.0000	470	40	465.0000	300	78.2267	72.4363	41.1341	249.3700	0.0000	92.5500	41.2829
t12	2150	50	50	20	130.0000	470	40	465.0000	300	80.0093	74.9288	41.3779	249.3700	0.0000	102.9000	76.4139
t13	2110	50	50	20	130.0000	470	40	465.0000	300	80.6720	76.5086	42.0951	249.3700	0.0000	105.4500	30.9042
t14	2030	50	50	20	130.0000	470	40	465.0000	300	81.7382	77.8510	43.6436	249.3700	60.0000	110.4000	-118.0028
t15	2010	50	50	20	130.0000	470	40	444.6615	300	83,1003	79.5671	44.9466	249.3700	80.4546	87.9000	-120.0000
t16	2060	50	50	20	130.0000	470	40	465.0000	300	83.7240	80.7233	46.3704	249.3700	83.1818	63.7500	-72.1194
t17	2050	50	50	20	130.0000	470	40	464.2305	300	84.0245	80.8066	47.5888	249.3700	77.7273	43.6500	-57.3977
t18	2120	50	50	20	130.0000	470	40	434.2305	300	84.1386	79.5897	48.9071	252.216	70.9091	7.3960	82.6129
t19	2070	50	50	20	130.0000	470	40	404.2305	300	84.1728	76.6433	50.2359	257.4446	76.3636	0.0000	60.9093
t20	2050	50	50	20	130.0000	470	40	374.2305	300	54.1800	36.3016	51.2277	272.2420	81.8182	0.0000	120.0000
t21	1910	50	50	20	130.0000	470	40	344.2305	300	54.3018	37.7706	51.7893	271.3174	81.8182	0.0000	8.7722
t22	1860	50	50	20	130.0000	470	40	314.2305	300	54.5202	39.9140	53.5520	278.4032	75.0000	0.0000	-15.6199
t23	1850	50	50	20	130.0000	470	40	284.2305	270	54.7848	48.2396	54.4658	281.9795	80.4546	0.0000	15.8453
t24	1800	50	50	20	127.9714	470	40	254.2305	240	107.0200	80.9500	59.0053	303.5500	117.2727	0.0000	-120.0000
-					C	ost(\$/d	lay)	NO _x E	mission	1 (Ton/day)	SO _x E	mission (T	on/day)			
						58	1800		44	.9267		180.833	33			

Economic, NOx emission, SOx emission dispatch and combined problem objectives are minimized using MOPSO. Hydro, wind, PV solar and thermal production from economic optimization, NOx emission optimization, SOx emission optimization and combined problem are given in tables 1-4, respectively. The optimal hourly plant

discharges of four hydro power plants from economic optimization, NOx emission optimization, SOx emission optimization and combined problem are listed in Figure.3 (a)–(d) respectively. Figure 4 (a)–(d) give the reservoir storage volumes of four hydro plants from economic minimization, NOx emission minimization, SOx emission minimization and combined problem respectively. PV solar and wind power production of total fuel cost for the scheduled day is same for cost optimization, NOx

emission optimization, SOx emission optimization and combined problem.

	DD	Thermal unit power generation										r generatio	n	PV	NT	Die
н	PD	g1	g2	g3	g4	g5	g6	g7	g8	h1	h2	h3	h4	Solar	wind	Poat
tl	1750	236.6894	265.8425	130	20	25	460	45	35	113.5000	111.200	65.2784	327.8500	0.0000	0.0000	-85.3603
t2	1780	236.6894	265.8425	130	20	25	460	45	35	99.2594	90.7390	53.8279	327.8500	0.0000	0.0000	-9.2082
t3	1700	236.6894	265.8425	130	20	25	460	45	35	65.0664	52.3960	46.4538	327.8500	0.0000	0.0000	-9.2980
t4	1650	236.6894	265.8425	130	20	25	460	45	35	68.6134	53.4640	42.2005	327.8500	0.0000	0.0000	-59.6598
t5	1670	236.6894	265.8425	130	20	25	460	45	35	69.9897	53.9860	38.6750	326.2912	0.0000	0.0000	-36.4737
tó	1800	275.8046	305.0018	130	20	25	460	45	35	71.7493	53.9860	64.7960	313.6622	0.0000	0.0000	0.0000
t7	1950	327.3480	356.6032	130	20	25	460	45	35	73.7456	54.5000	65.2563	297.5608	0.0000	12.3210	47.6651
t8	2010	327.3480	356.6032	130	20	25	460	45	35	75.8920	55.3712	65.1999	327.8500	0.0000	46.6500	40.0857
t9	2090	327.3480	356.6032	130	20	25	460	45	35	78.1792	58.3533	64.7985	327.8500	0.0000	56.2500	105.6178
t10	2080	327.3480	356.6032	130	20	25	460	45	35	80.5872	63.281	64.0642	327.8500	0.0000	75.4500	69.8163
t11	2100	327.3480	356.6032	130	20	25	460	45	35	81.6939	66.6819	63.1145	312.6642	0.0000	92.5500	84.3444
t12	2150	327.7906	357.0463	130	20	25	460	45	35	82.8588	69.3762	62.1669	312.8612	0.0000	102.9000	120.0000
t13	2110	327.3480	356.6032	130	20	25	460	45	35	84.1791	72.1722	60.8847	313.3428	0.0000	105.4500	75.0199
t14	2030	327.3480	356.6032	130	20	25	460	45	35	84.7666	74.4896	59.4106	314.0983	60.0000	110.4000	-72.1163
t15	2010	327.3480	356.6032	130	20	25	460	45	35	84.6215	75.6597	57.5969	315.0852	80.4546	87.9000	-90.2690
t16	2060	327.3480	356.6032	130	20	25	460	45	35	84.1039	76.0277	55.5740	316.2361	83.1818	63.7500	-17.8246
t17	2050	327.3480	356.6032	130	20	25	460	45	35	83.3398	75.5839	53.3215	317.5573	77.7273	43.6500	-0.1310
t18	2120	327.3480	356.6032	130	20	25	460	45	35	82.4163	75.6471	50.5341	319.0215	70.9091	7.3960	115.1247
t19	2070	327.3480	356.6032	130	20	25	460	45	35	81.8990	77.6974	47.5996	320.6145	76.3636	0.0000	66.8746
t20	2050	327.3480	356.6032	130	20	25	460	45	35	71.3426	70.2885	49.5071	322.3001	81.8182	0.0000	55.7923
t21	1910	303.8319	333.0607	130	20	25	460	45	35	73.1550	73.6817	51.5782	324.0285	81.8182	0.0000	-46.1542
t22	1860	303.8319	333.0607	130	20	25	460	45	35	74.8908	74.7611	52.6030	307.9488	75.0000	0.0000	-77.0964
t23	1850	303.8319	333.0607	130	20	25	460	45	35	76.9298	74.2461	53.0680	290.1583	80.4546	0.0000	-76.7494
t24	1800	271.5165	300.7089	130	20	25	460	45	35	78.0026	77.6232	56.3262	303.5500	117.2727	0.0000	-120.000
				Cost	(S/day	y)	N	Ox E	nissio	n (Ton/day)	SO _X H	mission (T	on/day)			
					5175	530			25	.2596		188.84	43			

Problem dispatch		Cost (\$/day)	NOx Emission (Ton/day)	SOx Emission (Ton/day)
Economic	Proposed MOPSO	498290	27.6394	187.2759
	NSGA-II [4]	567491	36.0226	194.4046
NOx emission	Proposed MOPSO	537240	25.8175	195.4521
	NSGA-II [4]	582711	35.0342	196.0739
a sector to the sector of the	Proposed MOPSO	572230	44.1082	177.8355
Sox emission	NSGA-II [4]	585235	37.7592	192.8073
Combined Prolem	Drepared MODEO	517530	25.2596	188.8443
	Proposed MOPSO -	Total cost: 7140400 (Ton/day)		
	NSGA-II [4]	575566	35.9916	194.4635
		Total cost : (Ton/day)		

Respect the ramp rate constraint equation (5) to solve DEED with the all cases test systems, Figure 5 (a)–(d) show the result.

CONCLUSIONS AND PERSPECTIVES

In this paper, MOPSO applied for CDEEP the combined problem of economical distribution of dynamic emissions with transmission power loss and VPE. To cope with this non-convex problem, linear approximation is employed to transmission power loss and the non-smooth total fuel cost function, and therefore the classical CEED problem is converted to the MOPSO problem. The property of convergence, the computation efficiency and the economic effect of emission are well demonstrated in our present paper. This allows us to say that this MOPSO optimization algorithm is an efficient and robust method which is capable of solving these examples of nonlinear multi-objective optimization linked to electrical networks incorporating renewable energy, hydro and ESS operation and multi area are a future work.

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On Non – Homogeneous Cubic Equation With Four Unknowns $x^2 + y^2 + 4 (35z^2 - 4 - 35w^2) = 6 xyz$

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ABSTRACT

This paper is devoted to obtain non-zero distinct integer solutions to non-homogeneous cubic equation with

four unknowns represented by $x^2 + y^2 + 4(35z^2 - 4 - 35w^2) = 6xyz$ along with few observations.

KEY WORDS: NON-HOMOGENEOUS, CUBIC WITH FOUR UNKNOWNS, INTEGER SOLUTIONS 2010 MATHEMATICS SUBJECT CLASSIFICATION: 11D09.

INTRODUCTION

The cubic Diophantine equations are rich in variety and offer an unlimited field for research. This paper concerns with another interesting cubic Diophantine equation

with four unknowns $x^2 + y^2 + 4 (35z^2 - 4 - 35w^2) = 6xyz$

for determining its infinitely many non-zero integral solutions.

Notations Used:

- 1. Regular Polygonal Number of rank *n* with sides $m : t_{m,n} = n[1 + \frac{(n-1)(m-1)}{2}]$
- 2. Pyramidal Number of rank n with sides $m: p_n^m = \frac{1}{6} [n(n+1)][(m-2)n + (5-m)]]$
- 3. Pronic Number of rank n : $pr_n = n(n+1)$
- 4. Stella Octangular Number of rank $n: SO_n = n(2n^2 1)$
- 5. Octahedral Number of rank $n: OH_n = \frac{1}{3}n(2n^2 + 1)$
- 6. Star Number of rank n: $S_n = 6n(n-1) + 1$
- 7. Pentatope Number of rank n: $pt_n = \frac{n(n+1)(n+2)(n+3)}{24}$

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Method of Analysis: The homogeneous cubic equation with four unknowns to be solved is

$X^{2}+Y^{2}+4(35z^{2}-4-35w^{2})$	(1)

Introducing the linear transformations

$$x = 2X + 12 z, y = 4$$
 (2)

in (1), it leads to

$$X^2 = z^2 + 35w^2$$
 (3)

We present below different methods of solving (3) and thus, obtain different patterns of integral solutions to (1).

Pattern-I

It is observed that (3) is satisfied by

$$w = 2rs, z = 35r^2 - s^2, X = 35r^2 + s^2$$
(4)

Hence, in view of (2) and (4), the non- zero integral solutions of (1) are given by

126

 $x = x(r,s) = 490r^{2} - 10s^{2}$ y = y(r,s) = 4 $z = z(r,s) = 35r^{2} - s^{2}$ w = 2rs

Premalatha et al.,

Properties:

- 1. $x(r(r+1),r) 35z(r(r+1),r) + w(r(r+1),r) = 25t_{4,r} + 4P_r^3$
- 2. $x(r(r+1), r+2) 35z(r(r+1), r+2) + y(r(r+1), r+2) = 25(\Pr_r)^2 + 12P_r^3 + 4$
- 3. $35\{x(r,r)-10z(r,r)\}$ is a perfect square.
- 4. $6\{x(r,s)-35z(r,s)\}$ is a Nasty Number.
- 5. $x(r,3(r-1)) 35z(r,3(r-1)) + y(r,3(r-1)) + w(r,3(r-1)) = 75t_{4,r-1} + S_r + 3$

Pattern-II Method of factorization

Write (3) as $z^2 + 35 w^2 = X^2 = X^2 * 1$	(5)
Assume $X = a^2 + 35b^2$	(6)
where a and b are non-zero integers.	
Write 1 as $1 = \frac{(1 + i\sqrt{35})(1 - i\sqrt{35})}{6^2}$	(7)

Using (5), (6) in (5) and applying the method of factorization, define

 $\left(z+i\sqrt{35}\,w\right)=\frac{1}{6}\left(1+i\sqrt{35}\,\right)\left(a+i\sqrt{35}\,b\right)^{2}$

Equating the real and imaginary parts, we have

$$z = \frac{1}{6} [a^2 - 70ab - 35b^2]$$
$$w = \frac{1}{6} [a^2 + 2ab - 35b^2]$$

As our interest centres on finding integer solutions, it seen that the values of z, w, X are integers, when a = 7A, B = 7BThus, we have

$$X = X(A, B) = 36 A^{2} + 1260 AB$$

$$z = z(A, B) = 6A^{2} - 210 B^{2} - 420 AB$$

$$w = z(A, B) = 6A^{2} - 210 B^{2} + 12 AB$$

(8) Hence, in view of (2) and (8), the non- zero integral solutions of (1) are found to be

 $x = x(A, B) = 144A^{2} - 5040AB$ y = y(A, B) = 4 $z = z(A, B) = 6A^{2} - 210B^{2} - 420AB$ $w = z(A, B) = 6A^{2} - 210B^{2} + 12AB$

Properties:

1. $x(A, A+1) - 24z(A, A+1) = 1260t_{4,A+1} + 10080t_{3,A}$

2.
$$w(A(A+1), (A+2)(A+2)) - z(A(A+1), (A+2)(A+2)) = 129 pt_A$$

- 3. w(A, A) Z(A, A) is a Nasty Number.
- 4. $z(A,B) + w(A,B) \equiv 0 \pmod{12}$

5. $x(A, (A+1)) + 12[z(A, (A+1)) + w(A, (A+1))] + 420t_{4,A+1} + 9936 Pr_A$

Note: It is worth mentioning here that, 1 may also be represent as the product of complex conjugates as shown below:

$$1 = \frac{(17 + i\sqrt{35})(17 - i\sqrt{35})}{324}$$

$$1 = \frac{(13 + i3\sqrt{35})(13 - i3\sqrt{35})}{484}$$

$$1 = \frac{(35r^2 - s^2 + 2i\sqrt{35}rs)(35r^2 - s^2 - 2i\sqrt{35}rs)}{(35r^2 + s^2)^2}$$

Pattern-III Method of factorization

Rewrite (3) as

$$X^2 - 35w^2 = z^2 * 1 \tag{9}$$

Let
$$z = p^2 - 35 q^2$$
 (10)

where p and q are non-zero integers.

Write 1 as
$$1 = (6 + \sqrt{35})(6 - \sqrt{35})$$

(11)

Substituting (10) and (11) in (9) and employing the method of factorization, define

Table 1. System of double equations						
System	1	2	3	4	5	6
X + z	35w ²	$7w^2$	$5w^2$	w^2	35w	7w
X - z	1	5	7	35	W	5w

 $(X + \sqrt{35}w) = (6 + \sqrt{35})(p + i\sqrt{35}q)^2$ Equating the rational and irrational parts, we have

 $X = X(p,q) = 6p^2 + 210q^2 - 70pq$

 $w = w(p,q) = p^2 + 35q^2 - 12pq$

Thus, the corresponding non- zero distinct integral solutions of (1) are

 $x = x(p,q) = 24p^{2} - 140pq$ y = y(p,q) = 4 $z = z(p,q) = p^{2} - 35q^{2}$

 $w = w(p,q) = p^2 + 35q^2 - 12pq$

Properties:

- 1. $x(p(p+1), 2p+1) 24z(p(p+1), 2p+1) + 840P_p^4 = 840t_{4,2p+1}$
- 2. $2\{z(p,(2p^2-1))+w(p,(2p^2-1))+24SO_p\}$ is a perfect square.
- 3. $35\{w(p,(2p^2+1)) z(p,(2p^2+1)) + 36OH_p\}$ is a Nasty Number.

4. $x(p,(p+1)(p+2)) - 12z(p,(p+1)(p+2)) + 12w(p,(p+1)(p+2)) = 24P_p^3$

Pattern-IV System of double equations Observe that (3) as $X^2 - z^2 = 35w^2$

It can be represented as the system of double equation as shown below: Remarkable Observations:

127

System :1	System:2	System:3	
$x = 980T^2 + 980T + 240$	$x = 196T^2 + 196T + 24$	$x = 140T^2 + 140T$	
<i>y</i> = 4	y = 4	y = 4	
$z = 70T^2 + 70T + 17$	$z = 14T^2 + 14T + 1$	$z = 10T^2 + 10T - 1$	
w = 2T + 1	w = 2T + 1	w = 2T + 1	
System :4	System:5	System:5	
$x = 28T^2 + 28T - 168$	x = 240T	x = 24T	
<i>y</i> = 4	y = 4	<i>y</i> = 4	
$z = 2T^2 + 2T - 17$	z = 17T	z = T	
z = 2T + 1	w = T	w = T	

If the non-zero integer quadrup (x₀,4, z₀, w₀) is any solution of (1), then, each of the following three quadruples of integers based on x₀, z₀ and w₀ also satisfies (1).

Quadruple:1 (x_n, y_n, Z_n, w_n)

$$\begin{aligned} x_n &= \frac{1}{2} \Big[-[38 \times 4^{n-1} + 54(-4)^{n-1}] x_0 + [114 \times 4^{n-1} + 18(-4)^{n-1}] z_0 \Big] \\ y_n &= 4 \\ z_n &= \frac{1}{2} \Big[-3[4^{n-1} + (-4)^{n-1}] x_0 + [9 \times 4^{n-1} + (-4)^{n-1}] z_0 \Big] \\ w_n &= 4^n w_0 \end{aligned}$$

Quadruple:2 (x_n, y_n, Z_n, w_n)

$$\begin{aligned} x_n &= 2(6)^{2n} x_0 + 6 \left[[70 \times 36^{n-1} - 2(-36)^{n-1}] z_0 + [-70 \times 36^{n-1} + (-36)^{n-1}] w_0 \right] \\ y_n &= 4 \\ z_n &= [35 \times 36^{n-1} - (-36)^{n-1}] z_0 + [-35(36^{n-1} + (-36)^{n-1})] w_0 \\ w_n &= [-36^{n-1} - (-36)^{n-1}] z_0 + [36^{n-1} - 35(-36)^{n-1}]] w_0 \end{aligned}$$

Quadruple:3 (x_n, y_n, z_n, w_n)

$$x_{n} = \left[-70 + 72(-1)^{n}\right]x_{0} + \left[420(1 - (-1)^{n}\right]w_{0}\right] + 12z_{0}$$

$$y_{n} = 4$$

$$z_{n} = z_{0}$$

$$w_{n} = -6\left[1 - (-1)^{n}\right]x_{0} + \left[36 - 35(-1)^{n}\right]w_{0}$$

CONCLUSION

In this paper, we have made an attempt to determine different patterns of non-zero distinct integer solutions to the non - homogeneus cubic equation with four unknowns. As the cubic equations are rich in variety, one may search for other forms of cubic equations with multi-variables to obtain their corresponding solutions.

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E-Commerce Shopping Gets Real: The Rise of Interactive Virtual Reality

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ABSTRACT

Virtual Reality is considered to be the technology that will be used very extensively. The paper discusses the idea of the implementation of virtual reality in E-commerce. The shopper can virtually walk through the aisles of the store, stop and examine an item. The photos, textual information, support this examination process, and audio clips that describe the item. Depending on the photos' completeness, the shopper can virtually touch and examine the merchandise from all angles, and the order can be placed into the shopping cart. The paper is an effort to give the customer a more real-world shopping experience without going outside. It also makes shopping online more attractive and reliable. The user can have the store experience by looking for the items from the isles and have a better experience in evaluating the items by having the ability to pick them up like in actual stores.

KEY WORDS: VIRTUAL REALITY, E-COMMERCE, VIRTUAL STORE, CUSTOMER SATISFACTION, SHOPPING CART.

INTRODUCTION

The virtual store's experience is also enhanced by an augmented reality assistant that helps the users by giving them all the information needed in audio form or using its avatar. One primary advantage of having a virtual store is its possibility of the plugin the store in different games targeting the virtual video game players. They could be more interested in the idea of buying products even while playing their favorite game and could order their merchandise from an e-commerce store within the game. The satisfaction from the virtual immersion is enormous as everything can be customized according to the user, like crowd, products, and interaction satisfaction during shopping can be given without any hassle.



2. Concept Discussion: Virtual reality has been one of the emerging technologies that have existed for a long time as a concept. From medieval panoramic paintings to Morton Heilig'sSensorama patented in 1962, the point of virtual reality is to trick someone's brain into believing something is real, even when it isn't. Virtual Reality application has always been in some kind of simulation like flight simulation or in movie watching. These both have existed from the early 1900s, with the first flight simulator built-in 1929 by (Edward & Sensorama 1962), which was used for movie watching.

3. Existing System: The existing system is mostly browserbased with functionalities like Superpose an item from the shopping cart into the Audio/Visual Virtual Tour. So that the shopper can "see' that item on the shelf of the store. The shopper can "pick up that item, examine it by viewing additional images and textual descriptions and pricing data, and even asking a clerk a specific question. Finally, if desired, place the item into their shopping cart.

Figure.1 shows the software stack of the virtual reality shopping software components and will be referenced when discussing the main functions of the virtual reality



shopping software; the main component is the heart of the Virtual Shopping Experience.

- 1. Helps to coordinate all the function and features of the other four components.
- 2. Adds function and feature to provide the complete Shoppers' Virtual Reality Shopping Experience.

To best understand this last component's function and feature, we will consider what must be delivered to the shopper, as viewed by the shopper.

Thevirtual reality shopping tightly integrates the features of the Audio/Visual Virtual Tour Software, Shopping Cart Software, the variety of media data, and optionally the 3-Dimensional (3D) Virtualization Software. By building upon these components in such a way as to add features specific to the Virtual Reality Shopping Experience. One such example is to Superpose an item from the shopping cart into the Audio/Visual Virtual Tour Software.So that the shopper can "see' that item on the shelf of the store. The shopper can "pick up that item, examine it by viewing additional images and textual descriptions and pricing data, and even asking a clerk a specific question. Finally, if desired, place the item into their shopping cart.



4. Proposed System: The proposed system is an updated version of the existing version with a virtual reality headset giving more immersion than the traditional mouse and keyboard.Virtual Reality headset gives the user more unrestricted movement and a 3600 view of the shopping center. The movement allows the user to have a real shopping experience like walking to the products, etc.This architecture can be integrated into any open-world game like GTA to enable users to buy from in-game shops for real life. It allows the companies to sell their merchandise even through in-game shops, which will most certainly increase sales.

Figure 2 represents how the virtual store can be connected to a video game's in-game store. The flow of the ingame shops will be once you enter the shop, the game redirects your avatar to a virtual e-commerce showroom where you can search for the product you want, and an augmented reality character guides you to that product. Once you get to the product, you can try it on, and if you like it, you can proceed to the counter and carry the payment. The payment can be through credit card or through in-game currency you have previously bought, like UC in PUBG. This feature gives the game developers an additional income stream which is beneficial. The seamless transition from the game to the virtual store needs to handle through a gateway that connects the game to the virtual store only when the user enters the in-game store (Christian Peukert et al., 2019).

It allows the game to run more realistically to be affected by the e-commerce site's traffic. The user's cache memory to personalize the user's experience in the software can also be used in the video-game to advertise and make the user aware of the deals even when he is playing. Still, at the same time, there is a need for awareness amongst the developers and e-commerce sites that over an advertisement that affects the users' gaming experience will negatively impact the number of visits to the virtual store by the user.



CONCLUSION

We examined the implementation of Virtual Reality in E-commerce, which would provide users with the immersive experience of real-world shopping experience on a virtual e-commerce platform. Implementing such a system is quite possible as the hardware technology required for such a system is readily available. The software technology required for augmented reality and virtual reality is also available and has been implemented separately. The only implementation that needs to be done is to merge these existing technologies into one. The increasing number of VR users could help test the Beta version of this platform and make it ready for the broader market. The consumer satisfaction is high as during an experiment; the users were more focused on shopping in when virtual environment than in reality because there wasn't any external factor interfering.

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Team Convergence in Prevention and Reduction of Stunting Rate in Malang District, East Java, Indonesia

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ABSTRACT

To reduce the incidence of stunting, the Central Government, through the Regional Government, made an acceleration effort, namely by forming a stunting convergence team at the regional level. This team consists of related agencies (in this study conducted at the village community empowerment service), village officials, and healthcadres. If the convergence of the stunting prevention team is good, then the program can run accordingly so that the stunting rate can decrease. The convergence team was formed starting in 2019, but the stunting rate in Malang Regency is still high. A quantitative study with a cross-sectional approach involving 378 stunting convergence teams in all villages in Malang District. Data analysis using multiple regression. The results showed that all indicators affecting the convergence of the stunting team in Malang Districtwere still low. From the results of regression analysis with a significance value of p-value = 0.001, the value of the beta coefficient of the effect of team cohesiveness on team integration is 0.878, the R-square value is 0.776. This shows that 77.6% of team integration is 0.830, R-square is 0.852. This shows that 85.2% of team integration is influenced by leadership. To realize a good convergence of prevention teams and reduce stunting, team cohesiveness and leadership roles are needed. If team cohesiveness has been created properly and the leadership has played a maximum role, then team convergence will be good, the central government program can run accordingly, so that the incidence of stunting can be reduced.

KEY WORDS: STUNTING, CONVERGENCE, TEAM, COHESIVENESS, LEADERSHIP.

INTRODUCTION

Stunting is a condition in which toddlers have less length or height compared to age. This condition is measured by a length or height that is more than minus two standard deviations from the WHO median growth standard for children. Toddler stunting includes chronic nutritional problems caused by many factors such as socioeconomic conditions, maternal nutrition during pregnancy, illness in infants, and lack of nutritional intake in infants. Toddlers with stunting in the future will have difficulty achieving optimal physical and cognitive development.



Stunting prevalence data according to the World Health Organization (WHO), Indonesia is included in the third country with the highest prevalence in the Southeast Asia / South-East Asia Regional (SEAR). The average prevalence of stunting under five in Indonesia in 2005-2017 is 36.4%. The prevalence of stunting under five in Indonesia tends to be static. The results of the Basic Health Research (Riskesdas) in 2007 showed the prevalence of stunting under five in Indonesia was 36.8%. In 2010, there was a slight decrease to 35.6%. However, the prevalence of short toddlers increased again in 2013 to 37.2%. Based on the results of the 2015 PSG, the prevalence of stunting in Indonesia is 29%. This figure has decreased in 2016 to 27.5%. However, the prevalence of stunting has increased again to 29.6% in 2017.

Convergence Of Stunting Prevention Efforts: Prevention of stunting is carried out through integrated nutrition interventions, including specific nutrition interventions and sensitive nutrition. Global experience shows that implementing integrated interventions to target priority


groups in priority locations is the key to the success of improving nutrition, child development and preventing stunting. Specific nutritional interventions target causes of stunting which include adequate food and nutritional intake, feeding, care and parenting, and treatment of infections / diseases. Efforts to accelerate stunting prevention will be more effective if specific nutrition interventions and sensitive nutrition interventions are carried out in a convergent manner.

Service delivery convergence requires integrated planning, budgeting, and monitoring of government programs / activities across sectors to ensure the availability of any specific nutrition intervention services to priority target families and sensitive nutrition interventions for all community groups, especially the poor.In other words, convergence is defined as an intervention approach that is carried out in a coordinated, integrated, and joint manner on target geographic areas and priority households to prevent stunting. Convergent intervention is carried out by combining or integrating various resources to achieve common goals.

Cohesiveness of the Stunting Prevention Convergence Team: The team's cohesiveness in previous studies was measured by three indicators namely personal attraction, sense of togetherness and group respect. Personal attraction makes it clear that it is part of the element that supports the achievement of cohesiveness in the team. To find out how the personal attraction in the stunting prevention convergence team is to measure the competence of team members, the relationships that exist within the team, the atmosphere created in the team, meetings held by the team, and the feeling of comfort that is felt by the team. The sense of interest among members in the stunting prevention convergence team will trigger the enthusiasm of the members to continue working together in providing services to pregnant women.

Leadership: Leadership is one of the competency dimensions that is crucial to the organization's performance or success. Leadership is an art, because everyone's approach to leading people can differ depending on the characteristics of the leader, the characteristics of the task and the characteristics of the person they lead. Based on the understanding of leadership from some of the expert opinions above, it can be concluded that leadership is closely related to a person's ability to be able to influence others to work according to the expected goals. This study measures the leadership of the Head of the Village Community Empowerment Service in this stunting prevention convergence team. Leadership is an interpersonal influence, which is exercised in certain circumstances, and is directed through the communication process towards the achievement of one or more specific goals. Leadership indicators are:

How To Communicate: Every leader must be able to provide clear information and for that he must have the ability to communicate well and smoothly. Because with

good and smooth communication, of course this will make it easier for subordinates to grasp what a leader wants both in the short and long term. If a leader in transferring information is difficult for his subordinates or employees to understand and understand, it will cause problems. So that the ability to communicate for a leader really plays an important role in facilitating efforts to achieve company goals in relation to company operations

Motivator: A leader in addition to having the ability to communicate well and smoothly, of course, has the ability to provide encouragement or motivate financially or non-financially, that in terms of appreciation or recognition gives very high meaning to employees or subordinates. This will be able to create achievements and an atmosphere conducive to business success, where subordinates or employees will feel very cared for by their leaders who represent the company, with the hope that the achievements achieved so far will receive commensurate awards.

Leadership Style: Not every person or leader is able to lead, because with regard to a person's talents to have the ability to lead are different. This can be seen in the leadership style, whether it has an autocratic, participatory or free of control leadership style. Each has advantages and disadvantages. If someone with an autocratic leadership style, then the control of decision making will be entirely in the hands of the leader. If you use a participatory leadership style, the control of decision making includes employees, while the leadership style is free of control, the decision making is with the employees but is still under the full control of the leadership.

Decision-Making: A leader must be able to make decisions based on facts and regulations that apply in the company and the decisions taken can provide motivation for employees to work better and even be able to contribute to increased work productivity. The decisions that have been taken have been effective in instilling confidence in employees.

Positive Influence: A leader in running an organization or company, although with different leadership styles, of course, must provide a sense of security for employees who work. This fits perfectly with the leadership style through a humane approach, where employees are required to work wholeheartedly to produce good quality products, without any pressure from any party. A good leader will be able to have a positive influence, namely by providing good examples that can be imitated by his subordinates. This study concludes that these indicators are the two indicators used to measure the leadership head of the empowerment of village communities office (EFCO). The first indicator is the positive influence of the head EFCO on the stunting convergence team. The second indicator is leadership ability which consists of:

a. Communication skills of the head of the EFCO with the convergence team

- b. The ability of the head of the EFCO to motivate members of the convergence team
- c. The ability of the head of the EFCO to create a family atmosphere within the convergence team
- d. The way the head of the EFCO makes decisions within the convergence team

METHODS

This study used an analytic observational research design. This research was conducted through a survey method for data collection conducted by question and answer with questionnaires and interviews. This study will describe the situation in a population about the effect of team cohesiveness, organizational context and leadership on the integration of the stunting convergence team in Malang Regency. The research design used a cross-sectional design. The statistical method uses multiple regression analyst or multiple regression. Multiple regression is a regression or predictive model that involves more than one independent variable or predictor.

RESULTS

It shows that 179 teams (47.5%) have less team cohesiveness, while only 93 teams (22.5%) have good team cohesiveness. Next, it shows that 188 teams (50%) rated the leadership as sufficient, while 112 teams (29.4%) rated the leadership as lacking. The last shows that most of the stunting prevention teams have less team integration. This can be seen in the total column for the whole team, showing the largest number of 52.1% in the less category.

The Relationship Between Constructions (Structural Model): The discussion of the relationship between the extracts in the integration of the convergence team to prevent stunting, aims to explain the results of the structural model analysis, especially in the path diagram. Based on the results of the relationship analysis in the path diagram it is concluded that, team cohesiveness and leadership have a significant effect on the integration of the role of the convergence prevention stunting team.

Table 4.1 Cohesivity, Leadership and Integration of Stunting Preventionand Reduction Team's				
Context	Category Total			
	Good	Enough	Less	
Cohesiveness Team	93 (24.5%)	106 (28%)	179 (47.5%)	378 (100%)
Leadership	78 (20.6%)	188(50%)	112 (29.4%)	378 (100%)
Integration team	71 (18.7%)	110 (29.2%)	197 (52.1%)	378 (100%)

Table 4.2 Effect of Team Cohesiveness on Team Integration for Prevention and Reduction of Stunting

Context	Good	Integration Team Enough	Less	Total		
	Cohesiveness Team					
		(test of X ² , $\alpha = 0,05$, p = 0,0001)				
Good	0	40 (33,3%)	80 (66,7%)	120 (100%)		
Enough	20 (10,5%)	150 (79%)	20 (10,5%)	190 (100%)		
Less	0	7 (11,1%)	61 (88,9%)	68 (100%)		
Total	100 (26,4%)	197 (52%)	81 (21,6%)	378		
	Leadership					
		(test of X ² , α = 0,05, p = 0,0001)				
Good	0	20 (22,2%)	70 (77,7%)	90 (100%)		
Enough	0	144 (78,2%)	40 (21,7%)	184 (100%)		
Less	100 (96,1%)	4 (38,4%)	0	104 (100%)		
Total	110 (29,2%)	168 (44,4%)	100 (26,4%)	378 (100%)		

This shows that the effect of team cohesiveness on prevention team integration and the reduction of stunting has a significant effect. This can be seen from the results of the chi square analysis test, which obtained p-value = 0.0001 at α = 0.05. This means that team cohesiveness has a probability to influence team integration. It can be concluded that the better the team cohesiveness, the more team integration tends to increase.

From the test results show the influence of leadership on team integration has a significant influence. This can be seen from the results of the chi square analysis test, which obtained p-value = 0.0001 at α = 0.05, which means that leadership has a probability to influence team integration. It can be concluded that the better the leadership, followed by the increasing integration of the prevention team and the decrease in stunting.

From the test results above, it was found that all indicators of team cohesiveness had an effect on Integration team (p-value <0.05) with an R-square value of 80.5%. The indicator of sense of togetherness has the greatest influence on IRHCP, namely the beta coefficient value of 0.698 and the value of t = 7.427. From the test results above, it was found that all leadership indicators had an effect on the integration of the prevention team and the reduction of stunting (p-value <0.05), with an R-square value of 88.8%. Leadership ability indicators have the greatest influence on prevention team integration and a reduction in stunting, the beta coefficient is 0.810 and the t value = 14.602.

Table 4.3 Multiple Regression Test Results Effect of TeamCohesivity Indicators on Team Integration for Preventionand Reduction of Stunting

Influence Variable	Coefficient Beta	t value	p-value	R-square	
$Cohesiveness \Rightarrow integration team$	0,878	13,126	0,001	0,776	
Leadership \Rightarrow integration team	0,830	14,358	0,001	0,852	

Table 4.4 Multiple Regression Test Results Effect ofLeadership Indicators on Team Integration for Preventionand Reduction of Stunting.

Indicator Cohesiveness	Coefficient Beta	t value	p-value	R-square	
Personal Attraction	0,257	2,883	0,007	1000	
Sense of togethemess	0,678	7,424	0,002	0,805	
Group respect	0,277	2,235	0,009		

Table 4.5 Results of the Path Coefficient between ResearchVariables

Indicator Leadership	Coefficient Beta	t value	p-value	R-square
Leadership ability	0,810	14,602	0,001	0.000
Positive influence	0,585	10,552	0,001	0,000

From the results of regression analysis 1, the value of the Beta coefficient indicates that team cohesiveness has a strong influence on team integration, which is equal to 0.878. The R-square value is 0.776 with a significance value of p-value = 0.001. This shows that 77.6% team integration is influenced by team cohesiveness, and the rest is influenced by other variables not examined in this study. From the results of regression analysis 2, the value of the Beta coefficient shows that leadership has a strong influence on team integration that is equal to

0.830. The R-square value is 0.852 with a significance value of p-value = 0.001. This shows that 85.2% of team integration is influenced by leadership, and the rest is influenced by other variables not examined in this study.

DISCUSSION

Integration of Team: Integration in the team can be carried out well, marked by the existence of responsibility in the convergence team that must be carried out and completed together, the existence of an agreement on common goals in the team that is used as signposts for members in carrying out tasks, the process of delivering information, thoughts, and the ideas conveyed in the team, the existence of cooperation, mutual role play in accordance with the field of expertise in carrying out the work, and the overlapping of jobs that are felt by members of the convergence team.

Integration is defined as working collaboratively and continuously improving teamwork and attitudes from different professional backgrounds. The definition of integration describes two keywords, namely sharing and exchanging information. Assesses integration as the merging of individual and organizational goals into a single goal to be achieved. It is also an alignment of various processes for compatibility with one another[5]. Therefore, integration as working in a coherent way to overcome structural differences. For the stunting Convergence team, the indicators used to measure integration in this team are collective responsibility, common goals, good communication, collaborative roles and not overlapping jobs, it is considered on the basis of theoretical studies (literature review).

The integration of the Stunting Prevention Convergence team strengthens and represents the concept of team performance in the Team Effectiveness Model (Tannebaum et al., 1992) when explaining the phenomenon of how integration occurs in a team consisting of different educational backgrounds and expertise to be able to realize good team performance. Indicators of team integration in this study include collective responsibility, common goals, good communication, collaborative roles and not overlap jobs.

Based on the description, it is known that the integration of the convergence team to prevent stunting in terms of collective responsibility, common goals, good communication, collaborative roles and not overlap jobs is mostly in the sufficient category. An overview of the five indicators of Team Role Integration shows that good communication (good communication) has the largest percentage value compared to other indicators (65%). It shows that communication plays a big role in the success of integration in a team. The results showed that the good communication that occurred in the stunting convergence team was mostly in the sufficient category and a small part was lacking. This illustrates that there is a need for increased communication that occurs within the stunting convergence team. Participatory decision making, the interaction of the head of the EFCOwith the team in meetings, the relationship between the head of the EFCO and the team, the interaction of the team coordinator with team members, and clarity of the obligations of members in the team that are still lacking by most members of the stunting convergence team.

Collective responsibility in the team The convergence of stunting needs to be improved again to achieve good team integration. This includes how team members can jointly be responsible for doing work, how all team members are able to do work according to procedures, how team members want to admit mutual mistakes (without having to blame each other), and how all members manage time according to what set to get the job done on time (Armstrong et al., 2009).

Common goals relate to the agreement of common goals within the team that are used as signposts for members in carrying out their duties. By agreeing on shared goals in the team, member participation in the process of organizational activities will increase. Therefore, all will know well about what needs to be done in relation to the achievement of organizational goals. Seeing the phenomena that exist in the field, a possible strategy for the head of the EFCOis not to always make assumptions. This means that if you are not sure that all team members know what must be the top priority to be resolved, then the leader should ask the team members directly and always provide the information they need. If the leader is not sure that each member of the team knows how to do or complete a task, the leader must inform or show them how to do it.

Communication also needs to be done periodically for monitoring purposes (how far has the task been completed) and evaluating (whether there are errors that need to be corrected in completing the predetermined task). Role collaborative in the stunting convergence team is related to cooperation and mutually carrying out roles in accordance with their respective areas of expertise in carrying out tasks. Collaborative roles in this study include how the control of power between team members, whether team members contribute to each other, whether team members collaborate with each other according to their respective roles, and whether the mobilization of team members' abilities has been maximized.

The results showed that the collaborative role of the stunting convergence team was mostly sufficient and only a small proportion showed good collaborative role. This illustrates that there are still many team members who are too dominant, so that everything is done alone. This condition can also be the opposite, there are team members who are unemployed too much, so that there are irregularities in the team that will gradually make the team ineffective. Thus, each member of the team needs to be given the opportunity to become a 'leader' to demonstrate his expertise in the area of his competence and responsibility. By doing this, team members will feel

Not overlap jobs are related to the absence of overlapping jobs that are felt by members of the stunting convergence team. Not overlap jobs in the stunting convergence team include duplication of work done by team members, is there a similarity in workload among team members, whether team members handle work according to their part, and whether team members have ever completed work that is not their responsibility. The results showed that the division of labor in the Stunting Convergence team was largely sufficient, and a small proportion was balanced between the less and the already good. This illustrates that the division of tasks in the stunting Convergence team is not evenly distributed. Some team members still feel that there is an overlap of work between one another. The division of tasks is absolutely done in the organization so that there is no overlap in the implementation of work. So as not to cause a buildup of work at one point and vacancies at another.

From the five indicators described above, it can be concluded that the achievement of an effective team and a team whose members can be well integrated, it is strongly influenced by the existence of clear principles, goals and objectives, so that team members are consciously united by a shared mission and build a joint commitment. All team members understand and agree with the goals and objectives of the team. To achieve this, the role of the leader or the role of the team coordinator is needed in an effort to always provide guidance and direction to create an atmosphere in a good, solid and well-integrated work team so that better team performance can be achieved (Chapman 2002).

Team Cohesiveness Affects the Integration of the Stunting Prevention and Reduction Team: The results of the analysis show that team cohesiveness has a significant effect on the integration of the role of the convergence team to prevent stunting, the magnitude of the effect value is positive, meaning that the effect is unidirectional, indicating that if team cohesiveness is increased it will increase the integration of the role of the convergence team to prevent stunting. Team cohesiveness in this study is defined as the strength of the bond felt by team members that occur within the team, a sense of dependence between members, a sense of mutual cooperation, which will increase the capacity of members to achieve team goals. This team cohesiveness reinforces the concept of IRHCP from previous research, which explains that to be well integrated team members, there needs to be strong interest and ties in the team. This means that there must be strength for members to remain in the group, this is the power to hold someone in the group and prevent them from leaving the group. Cohesivity can be used as a motivation for someone to stay in the group (Driskell 1987).

The results of the analysis show that team cohesiveness has a significant effect on the Integration of the

Convergence Prevention and Stunting Reduction Team, the magnitude of the value of the effect is positive, meaning that the value of the effect is unidirectional, indicating that if team cohesiveness is increased it will increase the integration of the convergence team for prevention and reduction of stunting. Team cohesiveness in this study is defined as the strength of the bond felt by team members that occur within the team, a sense of dependence between members, a sense of mutual cooperation, which will increase the capacity of members to achieve team goals. Based on the results of the analysis of this study, when the members of the Stunting Prevention and Reduction Convergence team perceive that in the team there is already interest among members of the team and comfort for the team in completing tasks, these two things can increase the unity of the members in the team. They realize that there are similarities between the members of the team. Individuals in cohesive teams are defined as strong feelings of being in integrated teams (Kim et al., 2017).

The literature review results explain that the more cohesive the group, the greater the level of member satisfaction. Members feel safe and protected, communication is more effective, free, open to each other, the easier conformity occurs, the easier it is to submit to group norms and the more intolerant of individual affairs. Good team cohesiveness can also be shown in the form of friendliness between members, they are usually happy to be together. Members also feel willing to accept responsibility for activities carried out to fulfill their obligations. All this shows the unity, closeness, and mutual attraction of group members. The results of this study explain that the indicators that can increase team cohesiveness have high scores in sequence, namely performance of task, sense of togetherness, and group respect.

This shows that to foster the integration of team members in carrying out tasks requires high cohesiveness in the team. Cohesiveness or cohesiveness will increase if in the team there is attraction between members, namely mutual trust and mutual support. This attraction serves to overcome obstacles in achieving goals. When the cohesiveness has been obtained, team members will feel more enthusiastic about carrying out the work in the team. Thus, in the team, considerable interdependence of members will be created, stability among group members, a feeling of responsibility from the results of the group's efforts, reduced absence, and resistance to interference so that maximum results can be achieved.

Leadership Affects Stunting Prevention And Reduction Team Integration: Leadership has a significant effect on team integration. The value of influence is positive, it means that the value of the influence is unidirectional, indicating that the better leadership will increase the integration of the convergence team. In this study, the ability of the head of the EFCO to lead and the ability of the head of the EFCO to have a positive influence were indicators in measuring leadership in the convergence team (Shanock 2006). Leadership is one of the dimensions of competence that is crucial to the performance or success of a team. The essence of leadership is a way to influence others to be effective, but everyone can be different in doing what they receive. Leadership is an art, because everyone's approach to leading people can differ depending on the characteristics of the leader, the characteristics of the task and the characteristics of the person they lead. states that leadership is the process of inspiring all employees to work their best to achieve the expected results. This is important to motivate and coordinate members in the organization in order to achieve goals, the ability to create self-confidence and support among subordinates so that organizational goals can be achieved. It can be concluded that leadership is closely related to a person's ability to be able to influence others to work in accordance with the expected goals, so that in a team, leadership is very important to support the successful achievement of team goals. (Campbell et al., 1990) also states that leadership is an effort to influence many people through communication to achieve goals, how to influence people with directions or orders, actions that cause others to act or respond and cause positive change. Humanistic theory looks at the function of leadership is to organize individuals or groups they lead in realizing their motivation so that they can jointly achieve their goals (Majzoub & Helen 2015).

From the description above in accordance with the results of this study, namely the leadership indicator, the ability to lead is the most powerful indicator that can affect team performance. The ability to lead the head of theEFCO is the interaction between the head of the Dinas and the team members which is marked by the way the Dinas head has changed the behavior of the team member into someone who feels capable and highly motivated, and strives to achieve high quality work performance. The Head of Dinas can change team members so that the goals of his work group can be achieved together.

This is in line with (Chapmann 2002) which states that a good leadership pattern is when the leader is able to approach by doing business by changing awareness, arousing enthusiasm and inspiring subordinates or members of the organization to put extra effort in achieving organizational goals, without feeling pressured or depressed. (Burns et al.,2002) states that leadership is a process of action affecting the activities of an organizational group in an effort to achieve predetermined goals. This leadership approach is carried out by making efforts to change the work environment, work motivation and work patterns and work values that are perceived by subordinates, so that they are better able to optimize performance to achieve organizational goals (Mary Beth 2006).

The second indicator is the ability of the head of officer to have a positive influence. This is also the leadership's strength to influence subordinates in certain ways so that subordinates will feel trusted, valued, loyal and respectful to their leaders so that in the end subordinates will be motivated to do more than expected, depressed so that with their own awareness they build a high commitment to achievement. The success in achieving goals, both as a whole and in various groups in a particular organization, really depends on the quality of the leader, in this case the head of the Public Health Centre. It can even be said that the quality of leadership contained in an organization plays a very dominant role in the success of the organization in the performance of its employees both individually or in teams. This can be interpreted that, if the leadership fails, the employee's performance also fails, on the contrary, if the leadership is successful, the employees will also produce good work as well.

CONCLUSION / DISCUSSION

The integration of the prevention team and the reduction of stunting, which was presented with indicators of collective responsibility, common goal, good communication, collaborative roles and not overlapping jobs in the team, showed sufficient results. Good communication is an indicator that has the strongest influence in the occurrence of good team integration. The local government, in this case, the Village Community Empowerment Service of Malang Regency, must think of the most appropriate way so that communication between team members can be maximized. If this goes well, the teamwork will increase.

Team cohesiveness which is used to strengthen the integration of the convergence team for stunting prevention is represented in the form of personal attraction (attraction between individuals in the team), sense of togetherness and group respect in this team showing sufficient categories. This must be further improved so that the main objective of team convergence in preventing and reducing stunting can be achieved. The leadership that has been done by the head of service is felt by most of the team members is quite good, but not a few who think that the leadership is felt still not good. Leadership is very important to move a team so that it can carry out its duties optimally. With good leadership, it will be able to create good team work results too.

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Social Taboos and Existing Practices Concerning Menstruation in the Nepalikhuti Area of Sivasagar District

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ABSTRACT

Social taboos and practices are very deeply rooted in our society. In Hindu culture, menstruation which is a reproductive health element is considered religiously impure and ritually unclean. This particular paper is completely based on an empirical field study conducted in the Nepalikhuti area of Sivasagar District inhabited predominantly by Nepalese people. This paper looks into traditional practices and beliefs concentrated on "menstrual culture", "pre-puberty rituals" "first puberty rituals" that every young Nepali girl goes through, and "one of the festivals" which is associated with menstruation in the Nepalikhuti area. For this particular paper, I have been kept in front of the experience and perspectives of my respondences while arriving at the understanding whole "menstrual culture".

KEY WORDS: TABOO, WOMAN, SOCIETY, SOCIAL PRACTICES.

INTRODUCTION

The social taboos are created to alienate women from society during their menstruation, to isolate them from socio-religious activities, and to confine them within the domestic domain. The existing taboos made them believe that they are inferior to men and how this simple biological element has been reconstructed by society. The term "taboo" basically associates with anything that is forbidden. Social taboos are sanctioned by our society, social system, social rules, and regulation of course we as common people. Anthropologist (Mary Douglas 2004), defines taboo as, "spontaneous coding practice which sets up a vocabulary of spatial limits and physical and verbal signals to hedge around vulnerable relations. It threatens specific dangers if the code is not respected. Some of the dangers which follow taboo-breaking spread harm indiscriminately on conduct. Feared contagion



extends the danger of a broken taboo to the whole community."

When it comes to the menstrual taboo, there is a legend related to its origin in the Hindu Religion. According to Hindu Religious myths, Indra, who is considered as one of the most eminent deities among all the Vedic God, governs the whole universe especially the natural phenomena such as rains and season. The story narrative reveals that the king of heaven was accused of his sins, that is killing a brahmin (a high caste Hindu) and having illicit sexual acts with women during his quest. Therefore, to turn away from sin, all women were said to be punished through menstruation along with taboos. (Prakash, 2017). According to this mythic context, menstrual blood is considered impure and dangerous because it was the result of Indra's curse.

Objectives: For this particular paper, my genuine attempt to explore the traditional social beliefs, practices, and taboos concentrated on Menstruation among the Nepali community of the Nepalikhuti area. High Nepali Brahmin Caste women such as Uppadhya, Sharma, and then low caste such as Rai, Limbu, Tamang, were selected randomly as a sample for my study.



METHODOLOGY

Methodologically, the study takes a qualitative approach. This particular fieldwork was conducted by me in the Nepalikhuti area, a remote rural village located in Bihubar Siloni Area that comes under Bihubar local Panchayat and is inhabited predominantly by the Nepalese people. This study uses a qualitative descriptive study design.

Celebration of Bel Biya: A pre-puberty Rituals: Bel Bia is basically a unique cultural practice among the Pradhan caste of the Nepali community in the Nepalikhuti area. This particular ritual of "Bel Bia" distinguishes the Pradhan from other caste and has immense social and cultural significance, especially for young girls. This Bel Biya is considered to be one of the holiest and purest rituals among the Pradhan community. This ceremony is conducted before the girl attains puberty and the standard age for performing this pre-puberty ritual is considered from the age of five to seven.

In this ceremony, the virgin girls from the Nepali caste tie a marital knot with a Bel fruit i.e wood apple. Bel is a fruit, which is used for religious purposes but among Pradhans it is considered a sacred fruit. There are some religious as well as cultural beliefs associated to consider bel fruits as sacred ones, one of the reasons is that firstly the wood apple tree is associated with Lord Shiva. Henceforth the fruitwood apple is seen as an image of the deity. Secondly, Bel leaf and bel fruit are mandatory when it comes to worshipping lord shiva. Thirdly, bel fruit will never get rotten easily, the outer layer became hard day by day if it is being kept properly, which also they believe that her future husband will get long life and Bel fruit the symbolic husband is immortal.

Social significances of Bel Biya: In the Pradhan community, this Bel Biya is seen as a first marriage and with a human is a secondary one. The Bel fruit is considered as "Juwai" i.e son in law of family and young girls are supposed to keep the fruits for their entire life. This celebration links the girl with an eternal marriage with a lord shiva but in a form of Bel fruit. The most common reason for this practice is to protect the girl from the awful stigma of widowhood and also to protect the girl from malicious spirits. The Young girl is never considered a widow even after the death of her husband; because her first marriage with Bel is considered permanent and Bel fruit the symbolic husband is immortal. As Leela Dube in her work she has mentioned "what exactly to be a girl" lies in our socialisation process which inform her about her feminine quality and about her gender role in society. These puberty rituals brings consciousness about gender and gender role and by permorning these rituals actually grooms her to become a woman in near future.

Socio-Cultural Practices Concentrate on "First Puberty Rites": When a young girl gets her first puberty, she is restricted to stay in her native home rather she is immediately sent to seclusion on a neighbor or relative's house for week-long twenty-one days. This ritual is

called "Lukuwai thuwa Niyom" in the local language. A separate bed was used to set up on the floor in a different room. No one except her mother, an elder female of the family members is allowed to enter her room during these days. She is restricted to have fruits, non-veg items, and any milk product. The Entry of male members of the family even if father and brother are strongly prohibited. Neither the male voice nor the sight male member should reach by the mensurating girl. She has to be kept away from the sunlight because there is a strong belief associated with it they considered the sun as "lord Surya" and they worship the deity who represents prosperity and luck and wellness therefore in their first period of menstruation they were not allowed to see the sun, because they believe that it might bring bad luck if they came in contact with sunlight.

On the other hand, it's a mandatory restriction that menstruating girls were not allowed to drink milk or any milk products till twenty-one days. There are important religious significances attached to it. All the Nepali community people reside in the Nepalikhuti area, they worship cow as Ma Lakhmi, therefore in the first puberty rites menstruation, they were not allowed to drink cow milk or any milk products. Cows are regarded sacred and venerated in the Hindu religion especially among the Nepali community hence menstruating women are strictly prohibited not only to touch any milk products but also they are not allowed to enter cowshed either.

During the first puberty, the Young girl has to go through a ritual bath at the seven days of her menstruation. She took bath Early in the morning before the sun rises nearby the river Dikhow to fulfill one of the rites of her first puberty. The mother along with a few elder female members of the family escort her on this particular day. In some cases mother brings back her daughter and kept in their own house, sometimes she is sent back to the neighbor's house for another fourteen days. But keeping her in an isolated room with no sight of sun and men for twenty-one days is mandatory in their first puberty rites and which last up to twenty-one days. On the last day, she is given a ritual bath early in the morning which usually marks the end of rites of passage. As Arnold van, Gennep wrote about rites of passage to describe the transition of individuals from one social status to another. This first puberty ritual can also be looked at as a rite of passage because it also initiates the young girl into the categorized social group of fertile, sexually eligible women and these practices and rituals socialize a young girl to become a woman and make her ready for the new phase of womanhood. (Pator, 2019)

Socio-Cultural Practices and Taboos associated with Menstruation:

In the Nepalikhuti area, Menstruation is considered as an impure state called "Bahir huwa", "MC"," bahire niklinchu","bhitor humabo Nuwara" etc are different terminology that local people use while addressing their menstruation. Most Women indirectly express their menstrual status because speaking in public places about menstruation is a social taboo. There are many beliefs

and practices are linked up with menstrual culture. The state of pollution stays with every young girl and woman for the whole menstruating period for five to seven days every month. The performance of taboos is equivalent to abide by the prescribed rules. Young girl or women must stay within the confined room, she is not allowed do to any household activity, because while menstruating if they touch any tangible and intangible items, it automatically becomes impure too. Married women were not supposed to wear vermilion on their forehead till the third day of menstruating days, at the fourth day onwards after the bath she can wear vermilion. she can enter the kitchen and cook meals for the family members after four days because the kitchen is considered as a Goddess Lakhis abode so entering in the kitchen is strictly prohibited till the third days. She is purely forbidden to do any religious activity till her seventh day of the period. The ritual bath on her third day symbolizes that she has cleansed herself from all the polluting dirt.

Festival of Teez and beliefs related to "Menstruation **Culture':** Teej is the festival and ritual especially for the Nepali Hindu brahmin women, celebrated on the bhado mah of Assamese calendar (august in English calendar). It starts from Krishna's Janmashtami up to fourteen days. This festival is celebrated in different regions differently but the mythical aspect of this festival is the same. In Hindu Mythology, it is believed that Goddess Parvati and Lord Shiva were united on this day and it is considered to be an auspicious day and it is supposed that whosoever remembers her on this day will be blessed with a happy married life and all her desires will be fulfilled. Even today, women commemorate this mythological event by observing a 'Nirjala Vrata' (fasting without drinking water) for their husband's well-being and long life. (Ganga, 1999). In this particular festival married daughters and sisters are invited to their parent's home to celebrate Teej festive, in which they do fast, worship Lord Shiva, sing songs and perform dances. The celebration varies due to diverse geographical locations.

Now many questions arise why this festival is related to menstrual culture? It, because there are significant cultural and religious rituals, are attached to the Teez festival in the Nepalikhuti area. During the time of two-week celebration, on the auspicious occasion of Panchami, the fifth-day rituals are purely associated with the menstruation of women. According to the Hindu myth woman's menstruation period is a type of cursed period. In this period if a woman knowingly or unknowingly touches any materials of the house that will be the greatest sin in her life. A woman must celebrate Panchami and do all the rites and rituals to redeem herself from menstrual sin. There is a strong belief among local people of this area that, If a woman does not worship in the Teez Panchami, she can never be redeemed from her menstrual sin in life.

On this day, in early in the morning before the sun rises, devoted women take bath in nearby the Dikhow river, and worship lord shiva. They collect mud from elephant footprints, from the river Dikhow and amla tree, mud with cow dung and apply over their body. This bath should be taken from head to toe applying and washing each body part with the collecting mud separately. They build a Shiva Linga in the bathing place. Along with the bathing processes, the rituals of Panchami are over. The significance of bathing is believed to have made the menstruated body a holy one. There are local herbs call "Dattoiun", women during the Panchami have to wash their teeth with Dattiun 365 times and by each 365 Dattiuns, they have to chew to redeemed their menstrual sin.

Rituals of Purification: Before the beginning of, any ceremony whether it Bel Biya, the first rites of puberty, or Teez festivals young girls and women must be purified with sacred products of the cow such as cow dung, cow urine, and the holy water of the nearby river, and tulsi petals are sprinkled over her head, to remove all her past menstrual sins. River Dikhow plays a very significant role among the Nepali community because every ritual or festival either took place nearby the river or water is one of the mandatory products for purification. During the first puberty rites, young girls must offer prayers to the river as "Ganga ma" ask for misery for polluting her water while bathing and washing menstrual cloths. River Dikhow plays a very significant role in terms of the purification of women because most of the rites and rituals took place nearby the river bank. Women's menstruation and menstrual practices were not only regarded as a rite of passage marking adulthood but also as a "rite of passage to the spiritual" and important to the balance and well-being of the community and earth itself. (Markstrom, 2008).

CONCLUSION

Construction of menstruation culture are built by our surrounding socio-cultural environment. Although there are many cultural representations of blood, ranging from family and kinship, to violence and war, menstrual blood is almost always positioned negatively. (Bramwell, 2001). Menstrual practices will remain in our society because firstly, A section of women particularly those who belong to the upper caste, themselves considered that these social practices and rituals are necessary to maintain their culture in the purest form and to balance the caste hierarchy and The brahmin caste, has another way of explaining the need for the existence of such taboos i.e. its preserve their cultural belief and practices and they wanted to teach next generation to continue this culture Secondly, other lower castes such as Rai, Limbu, Thapaa, for them it's just a biological process that every woman go through for a certain period, its cultural shock to see other castes maintain their menstrual culture.

They never practice such pre-puberty, Teez festival related with menstruation, their belief and practices are only confined to not participate any religious activities. For them, it's a society and upper caste people that such practices and beliefs are being created otherwise it's just a normal biological fact that every woman goes

Dutta & Saikia

through. Thirdly, this culture of menstruation supported by own societal norms, religion, caste system, these traditional cultural beliefs system, and practices has influenced women's life and their participation and has also augmented the position of the caste hierarchy system in the mindset of Nepali society. After the fieldwork, I observe that religion and culture can never be placed in any isolation form, it goes together and hands in hand. The taboos and social practices come over a celebration for Nepali community people in the Nepalikhuti area.

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Kyasanur Forest Disease: A Tropical Disease of the Southwest India

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ABSTRACT

In 1957, the unexpected epizootic outbreak of an unknown virus in the vicinity Kyasanur forest of Shimoga district's Sagara taluk, led to the fatality of a set of mammals, including humans. The disease is called Kyasanur Forest Disease [KFD] and the causal organism is Kyasanur Forest Disease Virus [KFDV], a flavivirus. KFD is classified as a tick-borne viral hemorrhagic fever, reporting 400 to 500 cases per year with a mortality rate of 2-10%. The virus exhibits genetic and clinical similarity with documented Alkhurma virus in Saudi Arabia, Russian encephalitis, Osmak hemorrhagic fever, documented in China as Nanjianyin virus. During year 2010, it open casted around the Egypt-Sudan region and It was found that this fever was also carried by arachnoid of Ornithodorids and other genera, and which parasitise sheep and camels. Despite the similarity with other viruses, KFDV remains endemic to Southwestern parts of India, especially to the Karnataka region of Malandu. however, having observed at recent cases reported in states such as Goa, Kerala, Maharashtra and Tamil Nadu, the health and science departments have been keen to conduct further research on KFDV. The proposed research work is an attempt to spread the evidence-based knowledge and awareness of the disease and related research in the field.

KEY WORDS: KYASANUR FOREST DISEASE (KFD), KYASANUR FOREST DISEASE VIRUS (KFDV), VIRAL HEMORRHAGIC FEVER.

INTRODUCTION

Human beings have always been affected by external forces and mainly by microorganisms, in the terms of health issues and to the extreme cases of death. These minuscule giants have a stronghold on the governance of the quality and the life span of most life on this planet. The facts about the human life, bacteria, virus, fungi, and protozoans play a vital role in the diseases and infections causation. Passim the history of mankind, viruses have



been an almost undefeatable antagonist, whose regional and global outbreaks have claimed uncountable lives and the most recent of infectious virus being the coronavirus [Covid-19]. Currently with the advent of modern technology and scientific knowledge, it is known that there are probable about 219 species of viruses that cause diseases and show pathogenicity in human beings. The unpredictable nature, the high rate of mutation and adaptability, the cross-species contamination serve to the better nature of the viruses and these factors play an important role in causing setbacks in developing vaccines or cures to the respective diseases (Annet Oliveira et al., 2019).

The Kyasanur Forest Disease (KFD) is a tropical disease that originated in India's Western Ghats. The disease is caused by an arbovirus called KFDV that belongs to the family Flaviviridae and spreads via ticks. This disease is also called Monkey Fever due to it being the



first epizootic outbreak found among Kyasanur Forest monkeys in the year 1957. Prior to the advent of the viral disease in the monkeys, there found to be no evidence of any viral disease with the said set of symptoms in the human population but after the infection spread amongst the monkeys, the virus crossed the species border and affected the human population in the villages surrounding the forests exponentially. KFD is described as a viral hemorrhagic fever that also exhibits some neurological features. The virus spreads out in the targeted population through the bite of the infected Ixodid tick of the genera Haemaphysalis.

Approximately 400-500 cases with a fatality rate of 2-10% have been recorded annually since the outbreak. The Haemaphysalisspinigera tick is the virus reservoir that infects certain primates in the Malenadu region. The Shimoga District, Tirthahalli, Hosanagara and Sagara taluks were considered the disease's most affected regions. Monkeys, rodents and shrews are the common hosts for KFDV. Human beings serve as ultimate or deadend hosts. The symptoms of KFD include high fever, headaches, myalgia; severe cases show bleeding from nasal cavity, throat and gastrointestinal tract as well. While the virus shows significant fatality rates there is no global spread of the virus for reasons unknown (Ashok Munivenkatappa et al., 2018). Semnopithecus entellus and Macaca radiata wild monkeys are more susceptible to KFDV infection, and the infection spreads by contact with these dead infected monkeys as well as other dead infected primates. The virus has now been recorded in other South Indian states like Tamil Nadu. Goa, Maharashtra and many other states of India like Gujarat, Rajasthan, West Bengal and in Andaman-Nicobar Islands.

History: The first outbreak of Kyasanur forest disease commonly termed "the monkey fever" was seen in Kyasanur Forest in Shimoga district, India dated 1957. Numerous sick and dead monkeys, more likely termed Nonhuman primates (NHPs) were found dead in the region . It was considered a febrile disease, a human epidemic in the same year at the primary health care center, Ulvi of Sagara taluk, Shimoga district. Many historical studies say the virus epidemic started in early 1956. Serological studies initially indicated that the novel virus is linked to the arbovirus complex of Russian spring-summer encephalitis (RSSE), currently referred to as the Tick-borne encephalitis (TBE) sero-complex of Flaviviruses, in effect associated with neurological disorders. Clinical descriptions of KFD and Omsk hemorrhagic fever (OHF) show many similarities but not with neurological abnormalities in terms of hemorrhage (Bhatia et al., 2020).

A 1995 viral outbreak in Saudi Arabia's Jeddah province, named Alkhurma Hemorrhagic Fever Virus (AHFV) had similar symptoms of KFDV. Although several studies suggest that both KFDV and AHFV were first found in Africa and migrated to other parts of the world via migratory birds to India, Saudi Arabia, Sudan-Egypt border and China; diverged about 700 years ago, thus remaining geographically separate. Although the virus has been considered as endemic to the south-western part of the country, in a specific district of Karnataka, several cases have recently been recorded in other districts such as Uttara Kannada and Chamarajanagar, as well as in other neighboring states such as Kerala, Tamil Nadu, Goa and Maharashtra. Following the initial identification of the disease, there have been several fatal cases recorded in both humans and monkeys annually.

Causes: KFD is an arboviral disease, spreading through vectors of the arthropod. The causative agent is the KFDV which belongs to the Flaviviridae family. The RNA virus KFDV measures between 40-60 nm in diameter. The KFDV genome consists of 10,774 single-stranded, positive-sense RNS nucleotides, encoding a single polyprotein of 3416 residue length which is post-translationally cleaved into three structural (C, prM / M, and E) and seven non-structural (NS1, NS2a, NS2b, NS3, NS4a, NS4b, and NS5) proteins. The viral genome exhibits considerable similarity of more than 90% AHFV and OHFS.

The virus transmission is primarily through the forest's contaminated tick bite. Two major tick families are found in this temperate region; Argasidae is the soft tick family and Ixodidae is the hard tick family. They each contain about 100 and 700 varieties. Tick transmitting the KFDV comes under the hard tick type that belongs to the genera Hemaphysalis, spiningera genus; altogether, the KFDV has been isolated from 16 different tick genus. The tick has a life span of 3 blood meals. The larvae hatch out of the egg and feed for several hours to days on the first host, fall off and mold into the nymphal stage. The nymph begins to search a second host. Usually, the first and second hosts belong to the same species but may sometimes differ. For several days, the nymph feeds on the second host leaves, it and molds into an adult tick. The adult ticks now find a host for the third meal and feed on blood. During this phase, the adult tick's mate on the host, the female takes more blood after the mating and drops off to the ground and lays a gelatinous mass of eggs in a sheltered area containing several thousand eggs. The eggs hatch and follow the same four-stage life cycle and 3 meals in blood. The H.spinigera tick is used as a KFDV reservoir [Fig 1].



146

Ticks that are hard to kill the virus's reservoir and vector are both Haemaphysalis spinagera. Humans may contract the disease directly from infected ticks or indirectly from infected monkeys and small mammals. Larger animals may become infected, but they play a minor role in disease transmission to humans. It is widely seen that various wildlife play the role of host to many disease-causing organisms and the statistics that few of these disease-causing microorganisms can cause undesired effects in humansare medium to high. The wild Semnopithecus entellus monkeys and Macaca radiata are more prone to the virus infection. In these monkeys the epizootic leads to fatality. For humans, any direct interaction with an infected monkey or its dead body brings the disease. The bite of the specifically infected tick also triggers the infection of every primate of humans. But there is no record of KFDV transmission from humans to humans till date (Dodd et al., 2011).

The risk factor recorded in the Western Ghats region is currently high. The risk of infection is seen in villages that have forest areas where mainly agriculture is practiced. The local people and forest officers are also at risk because of more land and animal contact. These animals live in the surrounding village areas and are at risk of infection with KFDV. It is observed that women are the most susceptive to the disease whereas the children are the least to be affected by this virus.

Clinical Features of the Disease: KFD is categorized by the International Classification of Diseases-10 (ICD-10), 2017, into group A98.2, which comes under other viral hemorrhagic fevers. KFDV shall have an incubation time of 3 to 8 days. This is also a biphasic condition where about 20 percent of the individuals affected show the onset of the disease in the 2nd phase and 80 percent of them display the signs only in the first phase. Since the disease was characterized by biphasic anatomy, the first step (3-4 days) involves a sudden onset of high fever of around 400C or 1040F and chills. The primary symptoms are general body pain in the neck, upper as well as lower back areas and headache. Gastrointestinal symptoms such as pain in the belly, vomiting, diarrhea, and dehydration are accompanied symptoms. It also detects conjunctival inflammation of both the sclera and the palpebra. Lymphadenopathy and hepato-splenomegaly are also documented in some cases but are non-specific features (Jana Sirmarova et al., 2018).

Throughout this process, the hemorrhagic manifestations are identified after the onset of the above-mentioned primary symptoms, starting with oral mucosal inflammation and non-tender maculopapular eruptions on both soft and hard palate, showing no allergic symptoms. Nearly every case includes ocular manifestations such as conjunctival congestion. In nearly 63 percent of cases, extreme discharge is involved, in 13 percent of cases, Retina and Vitreous humor are involved. Hematemesis is reported in 8 percent of cases, epistaxis in 2 percent, bleeding in rectum in 2 percent. Patients usually pass step one within 14 days. Patients can suffer from muscle twitching, coarse tremors, paraesthesia and generalized trembling due to weakness in the recovery time and will not be able to perform any physical activities.

Phase 2 symptoms are classified as anomalies in neurology. Only among 20% of cases, it is published. This process includes fever with prevalent neurological symptoms such as drowsiness, intermittent disorientation, confusion, occasional seizures and loss of consciousness. The clinical symptoms found are Kernig symptoms and irregular ankle reflexes. No mention is made of meningitis and encephalitis. While the risk of fatality is around 2-10%, many patients return to normal mental and physical orientation unless there are serious hemorrhagic conditions. Fatality is more likely in the elderly and patients with comorbid illnesses, liver and drinking disorders (Devendra et al., 2012).

Pathology: Despite there being a huge number of cases affected by the virus being observed annually, the exact pathogenic mechanism or the host-to-parasite interaction is not known. There are many theories and speculations as to this infection being something more than just a simple acute febrile illness. The proposed mechanism of the disease is the onset of multiple pathological pathways that lead to multiorgan illness [Fig 2].



The study of the cellular mechanism of the infected system shows the virus upon entering the system nullifies the immune system of the host by targeting the IFN response and thereby inhibiting the JAK-STAT pathway. This mechanism is said to help the viral particles to replicate indefinitely and without any hindrance from the host immune system. Several theories state that the viral replication machinery aids in the viral particle to easily bind to the cell surface and thereby easily manipulating the cellular- cytoplasmic pathways that further weaken the host cell. Therefore, it is understood that the disease begins at the expense of partial destruction of the host's immune system. Following the uninterrupted replication of viral particles, there is an unnatural level of viral titer value and this is understood to be one of the many factors contributing to the expression of viral hemorrhagic fever along with several other disease symptoms.

Mythreyi R et al.,

This proposed theory of mechanism is observed in many viral infections that follow a similar set of symptoms like Ebola found in Africa, Lassa viral diseases. In all these diseases, the infected APCs behave like a carrier of the viral particles and this helps the spread of the particles to regions like the spleen, liver and many organs that are rather immunologically well protected. This mechanism explains the pantropic nature of the virus [Fig 3].



As mentioned above gross and microscopic examination of fatal cases of KFD have found evidence of a mostly non-specific disease process, displaying prominence and excessive liver and spleen macrophages and lymphocytes. There was significant mild parenchymal degeneration in the liver and kidneys as well as signs of spleen erythrophagocytosis. In most cases, the typical reporting was focused on necrosis in the liver and tubular damage in the kidney. Often the cervical and axillary lymph nodes get enlarged. Some cases have been recorded with hemorrhagic pneumonia. In certain cases, neurological symptoms such as aseptic meningitis are found along with cerebral edema is identified or partial infiltration of inflammatory cells. No report concluding encephalitis, meningitis and CSF abnormality as KFD pathological evidence. The interaction between the viral particles and their host is not well investigated and this is due to incomplete knowledge that we have in terms of the genomic makeup of the virus as well as the pathogenic and defense mechanism of the virus. To further investigate the pathogenicity and the mechanism of the establishment of the disease, several animal studies have been carried out in mice and bonnet macaques.

Genome and Phylogeny: KFDV is a Flavivirus which belongs to the pathogen community Biosafety level-4 (BSL-4). The viral genome consists of the positive-sense, single-stranded RNA measuring around 11 kb in length. This RNA encodes a single 3416 amino acid Polypeptide. These 3416 aa polypeptides are post-translationally cleaved into 10 proteins, including 3 structural proteins and 7 non-structural proteins as mentioned earlier. Capsid protein C which binds to the cell membrane and collects the viral RNA into a nucleocapsid forms the core of a mature virus particle that plays an important

role in virus budding. The protein can induce genome penetration into the host cytoplasm following hemifusion induced by the surface proteins during virus entry. The protein can migrate to the cell nucleus where host functions are modulated and by interfering with host Dicer, it inhibits RNA silencing. The structural protein E proteins play a significant role in the infection of all the flaviviruses (Joel & Maslow 2019).

It binds to host receptors of the cell surface and mediates fusion between viral and cell membranes. In the endoplasmic reticulum the envelope protein is synthesized in the form of a heterodimer with protein prM. They play a role in virion budding in the ER, and the newly developed immature particle is covered by 60 spikes composed of a heterodimer between precursor prM and protein envelope E. The protein E forms dimers on the surface of the matured virions when the physiological pH is available; while the immature particles are covered by the protein heterodimers PrM-E. PrM serves as a chaperone for protein E during the assembly of the intracellular virion by masking and inactivating the protein E fusion peptide. The PrM covering immature particles avoid irreversible inactivation, as the virus is transported through the acidic compartments of the trans-Golgi network, thus preventing disastrous activation of the viral fusion. Pr peptide prevents premature fusion activity of envelope proteins in trans-Golgi by binding to envelope protein E at pH6.0, which is dissociated from E dimers after virion release in extracellular space. Small protein envelope M plays a role in budding viruses. Exerts cytotoxic effects by activating an apoptotic mitochondrial pathway via M ectodomain and displays viroporin activity [Fig 4] (Kapoor et al., 2009).

Figure 4: Flavivirus organization, and structure. Picture courtesy: Theodore C. Pierson and Michael S. Diamond, 2020.



Flavivirus encodes a single open reading frame which is translated into a polyprotein at the ER and then cleaved by viral and host cell proteases. The structural component E proteins contribute to the virulence of the virus and are characterized by elongated three-domain structures connected by a stem and two antiparallel transmembrane domains to the viral membrane. The E protein domains are shown in red, yellow, and blue, respectively (DI – III). The M protein, which also has two transmembrane domains attached to the viral membrane, is shown in purple. C, the distinct arrangement of E proteins is shown on the immature (left) and mature (right) forms of the virion [Fig 5] (Lindqvist et al., 2018).

Figure 5: Homology model structure of the ectodomain (aa 1-394) of KFDV E Protein. Arrow indicates the position of fusogenic motif.



The non-structural NS1 protein (also observed in TBE) has immune evasive functions. NS1 protein induces oxidative stress and activates defense against antioxidants. NS1 protein includes the immune evasion, pathogenesis and replication of viruses. When the polyprotein has been cleared, three destinations are targeted: the process of viral replication, the membrane of the plasma and the extracellular compartment. It is necessary for viral replication needed to shape the complex replication and to recruit other non-structural proteins to the membrane structures derived from the ER. This is excreted as a hexameric lipo-particle that plays a part against the immune response from the host.

It binds to macrophages and dendritic cells of the host and prevents signal transduction coming from Toll-like 3 (TLR3) receptors. NS2a protein is a component of the complex for viral RNA replication that functions in the assembly of virions and antagonizes the immune response of the host. The N terminal of NS3 protein has a serine phosphate domain, requiring for its activity the membrane-bound NS2B protein cofactor and an ATPdriven helicase and RNA triphosphatase at its C-terminal end. NS4A Controls NS3 helicase activity on the ATPase. NS4A allows for energy conservation by NS3 helicase during unwinding (Michael et al., 2012).

NS4B induces the development of ER-derived membrane vesicles where viral replication occurs and inhibits interferon-induced STAT1 phosphorylation and nuclear translocation by blocking the IFN-alpha / beta pathway. Translocation of STAT2 is inhibited at the nucleus after treatment with IFN-alpha. Peptide 2k acts as an NS4B signal peptide and is necessary for the latter's interferon antagonism operation. NS5 protein replicates the viral (+) and (-) RNA genomes and performs cytoplasm-capping of genomes. NS5 is responsible for the methylation of viral RNA cap at N-7 guanine and at 2'-O ribose positions. This also is responsible for preventing the establishment of cellular antiviral state by blocking the signaling pathway of interferon-alpha / beta (IFN-alpha / beta), in addition to its function in RNA genome replication. Inhibits phosphorylation of the host TYK2 and STAT2 and thus prevents activation of the JAK-STAT signaling pathway. NS5 is the enzyme replicator with methyltransferase and RNA polymerase activity [Table 1](Pragya et al., 2020).

Based on the 48 whole genome sequences, the phylogenetic analysis identified a large community with good bootstrap support, consisting of the recent 2006 to 2017 strains. Although distinct, the older KFDV stresses from 1957 to 1972 did not form a homogeneous cluster. The overall nucleotide divergence across all KFDV strains based on the full genome was 2.24 percent, whereas it was 2.76 percent between the two groups. The average diversity of amino acids between all KFDV strains based on the complete genome was 0.75 percent, while 0.86 percent was between the two classes. The highest nucleotide difference between the two groups was observed in the capsid gene (3.27%), followed by the gene E (3.22%) and the gene NS2 (2.91%).

Table 1. Primers used for diagnostic nested reverse transcription-PCR and genotyping of KFD Virus, India.					
Gene	Primer	Genome location	Primer sequence	Product bp	Туре
PreM-env	KFD-EF2	459-478	TGGTGTTCTCGCGACAGTT	780	Genotyping
	KFD-ER2	1258-1238	TCTGTCACTCTGGTCTCGCTT	780	Genotyping
	KFD-EF3+	606-628	TCATTCGAGTGTGTGTCACCATT	780	Genotyping
	KFD-ER1+	701-678	TTCCGTATTCCAGTGACACTCGCT	780	Genotyping
NS5	KFD-F3	9422-9441	GGCTGAGTCATGGACATCAT	642	Genotyping
	KFD-R4	11046-11063	TCCACTCGTGTGGATCCT	642	Genotyping
	KFD-F4+	9660-9680	TGAGACCTTCTGACGACCCCT	642	Genotyping
	KFD-R3+	9801-9819	TCCTTATCGTCAACTCAT	642	Genotyping

In capsid protein (3.17%), followed by prM (1.66%), and NS2 (1.4%), the highest percentage of amino acid variation between the two classes was noted. The amino acid substitutions that delineated the two classes were C: N56S; prM: F130L and NS1: S271N, NS3: G221R. A

comparison of the source species-wise divergence in the different genes showed that the highest nucleotide divergence (2.39%) between human and tick species was observed, followed by that between human and monkey (2.23%) and monkey and tick (2.06%) respectively. The maximum nucleotide variations in the capsid gene were reported in all three species followed by the gene E and the gene NS2, respectively. Consideration of the expanded data collection of 76 E-gene sequences showed that the relative variance of nucleotides and amino acids was 2.61 % and 0.33 % (Tove Hoffman et al., 2018).

The above evolution tree shows the full genome phylogeny of the AHFV and KFDV and is based on the Bayesian coalescent analysis. The analysis shows those eons before the current period, both the virus had a common ancestor which then separated to evolve into the current KFDV and AHFV strains. It can be concluded that even though these two viruses show genetic similarity, these two viruses are not responsible for each other's evolutionary existence. This analysis tree shows us that the evolutionary roots of such viruses are deeper than our superficial understanding and need more research and understanding. The specific color-coordinated strains denote the effect the virus has ona certain host; the different strains show different host specificity. The green-colored strains show human host specificity, the blue color strains show tick pool specificity, and the orange strains show non-human primate host specificity (Zaki et al., 1997).

Viral Replication: The first step of virus replication begins when the virus binds to the cell receptor that has asparagine-linked sugars with several cell-specific intercellular adhesion molecules and is taken up into the cell by endocytosis mediated by the receptor. The attachment is mediated on the host cell via viral E protein and entry receptors. The entry receptor for TBFVs has not been identified, but attachment to heparan sulfate and glycosaminoglycan is predicted to play a role during binding and entry, which are present in abundance on many cell types of both vertebrates and ticks. Subsequently reaching the cell, the virus is transported to endosomes where the acidic condition of these vesicles contributes to the reorganization and conformation of the E protein, resulting in the fusion of the viral and endosomal membrane and the release of the viral capsid into the cytoplasm.

Once inside the cell the viral genome codes for single open reading frames of mRNA that are flanked with highly untranslated regions [UTRs] that play various important functions in the maintenance of the viral replication and weakening the host immune system. Once the open frame enters the cytoplasm, multiple viral polyproteins are produced and these then target the endoplasmic reticulum organelle which favors the safe transport of the new viral particles. This step of the viral particles invading the ER is found to be an important step in the further synthesis of the components of the viral coat like NS1, NS2A, NS2, NS4A, and NS5 There are various changes in the biochemical metabolic nature of the host cell aided by the virus to create a favorable climate to produce the flavivirus replication complexes. These changes include the increase in the level of cholesterol and fatty acids, manipulation of the host enzymatic systems.

The viral protein's transmembrane domain is recognized as a signal peptide and recruits the vRNA / ribosomes / nascent polypeptide complex into the ER membrane where it is translocated co-translationally into the ER membrane. The nascent polypeptide is then processed into structural and non-structural (NS) viral proteins using the cellular and viral proteases. Several viral proteins, such as NS2B, NS4A, and NS4B, incorporate and modify the ER membrane to create a vesicular membrane structure, with a narrow pore connecting the vesicle's interior to the cytoplasm. These vesicles are the site where replication complexes (RC) and RNA replication can be produced. Following RNA replication, on the cytoplasmic side of the ER membrane, genomic RNA is proposed to exit the vesicle through the vesicular pore and is packaged into the NC by C protein. This acquires the lipid envelope along with E and prM proteins, which are aligned with the ER membrane, during the budding phase of NC from the cytoplasm into the ER.

The mechanism ensuring the effective integration of NC with the E and prM protein into the ER membrane is poorly understood. The subsequent budding into the ER lumen, the immature virions are transported to the extracellular medium in a COPI and COPII-dependent manner through the cellular secretory pathways. The immature virion has E and prM heterodimers that completely cover the lipid bilayer to form a spiky proteinaceous coat. The E protein is glycosylated during conveyance through the Golgi. The Golgi's acidic condition causes conformational changes in the proteins E and prM, which reveals a cleavage site on prM. PrM cleavage by the cellular protease furoin contributes to the development of a mature virion. Exocytosis then releases mature virions which completes the viral life cycle [Fig 6].



According to a study carried out in the Sindhudurg district of Maharashtra, India, on 72 individuals infected with KFD for 17 months by collecting their serum samples, KFD viral positivity was observed from the 1st to the 18th day after the start (POD). Positivity of anti-KFD virus (KFDV) antibodies IgM 4 to 122 POD and anti-KFDV IgG antibodies 5 to 474 PODs were

observed. The study showed KFD viral RNA to 18 PODs, IgM antibodies to 122 PODs, and IgG to the last sample collected. An algorithm for exact laboratory diagnosis of KFDV infection was recommended based on our study. A sample collected between 1 and 3 POD may be tested using KFDV real-time reverse transcriptase-polymerase chain reaction (RT-PCR) tests; between 4 and 24 POD, the combination of real-time RT-PCR and anti-KFDV IgM enzyme-linked immunosorbent assay (ELISA) tests may be used; between POD 25 and 132, anti-KFDV IgM and IgG ELISA are recommended.

Diagnosis: KFD's early diagnosis is presently not a feasible feat, and this is attributed to the surface level understanding that we have about the virus and the tick mediated disease. The alleged case's blood serum was injected into the mice and kept under observation. The alleged cases are first seen for the presence of indicators like the presence of the infestation of infected vectors or infected monkeys, the history of the incidence of virus, and favorable climate for their replication. In the suspected case, the pathology and fatality display were used to confirm KFDV infection. Now, molecular methods such as PCR, RT-PCR are used to diagnose the disease in the early stages, since the technology has been developed. Serological monitoring is conducted in later stages using the Enzyme-Linked Immunosorbent Assay (ELISA).

The method of diagnosis is by using various biochemical and enzymatic assays like antibody binding ELISA, IFN α - ELISpot, virus neutralization or bactericidal immunoassay, biochemical -cellular methods that target certain antigen or derives proteins. Simple detection of pathogens from the blood sample or through tissue culture can also be used for the diagnosis. For any diagnosis to be useful, the reports must be backed with appropriate clinical assays that are sensitive and specific that are usually approved by WHO and FDA. That being said, there are only a few tests for emerging infectious diseases like KFD that have been titled with the Emergency Use Authorization [EUA].

There are various organizations and coalitions like the WHO, FDA, the Coalition for Epidemic Preparedness Innovations {CEPI} that work hard in establishing speedy response mechanisms, backup plans, and on-site diagnostic tools. The dire necessity of such mechanisms is seen in situations like the recent and ongoing pandemic COVID-19, where the lack of immediate action and the inadequate reaction has put the entire world on halt and the loss of lives is simply not to be accepted in the good grace of any consciousness.

Vaccination: Kyasanur Forest Disease is an animal to human infecting disease which is caused by a flavivirus called the Kyasanur Forest Disease Virus. Due to the incomplete information, we have on the virus and thereby its mechanism of pathology, we do not have a well-defined treatment course. The onset of 2015 saw the large-scale public vaccination plan of the people residing near hot zones of infection like Maharashtra, Karnataka, Goa, and others to reduce the disease from causing a fatality. In India, the vaccination initiation is a very important player in the control of the disease and the course of vaccination is carried out by vaccinating the people in two doses with less than 1-year time gap. The two-course dose system is employed due to the short period of immunity provided by one dose on children and adults. For practical purposes, annual booster doses are advised for about 5 years of period to ensure maximum protection .

The emerging and emergent nature of this virus makes the synthesis and mass production of a vaccine acts a challenge. Along with this challenge, the cost and commercialization of vaccines drive a stake against the balance to the clinical and health of the public issue of the disease. These challenges may be tackled by developing plans and understanding more about the socio-economic scenario of the targeted area and by following novel and innovative technologies like mobile laboratories. Understanding the rate at which the virus and the mode of contamination and spread is the key participant in deciding the fate of the vaccine production. The production and distribution of vaccines are handled through the Institute of Animal Health and Veterinary Biologicals in Bangalore, Karnataka. The vaccine was produced by using formalin-inactivated tissue culture of the organism that was taken from the previous infected human or primates. This mode of the vaccine was synthesized after many failed versions of the mouse brain and chick embryo based KFDV that were formalin inactivated. The reason for these vaccines to be scrapped was due to their lack of effectiveness or their lack in instigating a strong immune response.

The general role of vaccines is to function as a booster of the immune system and to provide a safe method of the system to recognize and become customized to the pathogen and thereby reducing the fatality factor of the disease. The introduction of vaccines against KFDV into the host causes the immune system to produce antibodies against the inactivated pathogen and in turn produce memory cells to the cell receptor of the pathogen. This is important in the effectiveness of the vaccine as these memory cells are the cells that produce active antibodies when the real pathogenic virus enters the body and henceforth produce a full-fledged protective response. As aforementioned, some studies have shown that once infected with the viral particles, there is a cellmediated cytoplasmic cascade mechanism of antibody production.

The initiation of IFN 1 production by the infected cells further pushes the production of antiviral chemicals. Both these mechanisms allow the biological system in attaining adaptive immunity against the virus. On the one-week post-infection mark, the production of antibodies aiding in complement fixation and blood coagulation is seen to increase. The onset of the second week is characterized by the production of antibodies that nullify the viral particles and the virus- antibody titer reaches the peak by the third-week timestamp. All these are achieved by the immune system along with antibodies

Mythreyi R et al.,

neutralizing the E glycoprotein that is presented in the viral coat of the flavivirus which weakens and prevents the virus from attaching to the cell surface and stopping any further infection of healthy cells. The first diagnosis needs two series of dosages. This complicated vaccination schedule restricts vaccine absorption such that the priming sequence and first booster were provided by just one-third of subjects. The vaccine efficacy for fully vaccinated individuals was only 62 percent compared to 95 percent as originally reported, with major vaccine deficiency occurring the year after immunization.

CONCLUSION

Infections and diseases have always been ever-present either seasonal or annual in their pattern of presentation. With the advent of modern medicine and technology, humans are on an ever-changing path in finding cures and vaccines against such diseases. Studying nature and taking inspiration from nature herself to overcome problems has always been a long-time mechanics by which humans have devised and derived cure for diseases; although there are many cases where we do not succeed in establishing an upper hand over the disease and there are many case scenarios where researchers and scientists are still in the initial path of making vaccines.

The time that modern human has spent on Earth is relatively shorter than the time that certain microorganisms have existed. Thus, it can be easily concluded that we do not have all the information and understanding on these microorganisms. The fact that the rate of useful mutation and circumstantial evolution is faster and more visible in microorganisms and thereby with the advent of antimicrobial 'antibiotic' and 'vaccines' have pressured the microorganisms to evolve into a more virulent and dangerous strain that has more fatality percentage. The modern age of technology-aided with the help of science brought about more ways in which we could discover and analyze different species around us gave us the perception that there is a rise in the rate of virulent microorganisms while the truth is they were around from time immemorial and we were simply slow in discovering the required vaccine or ignored.

Viruses are one of the most confusing microorganisms that human beings have faced and that is credited to both their physical makeup that is simply made of an external protein coat and internal genetic material and their mystique nature of cellular interaction with the host. As previously mentioned, there are about 219 virus species that make humans their host and the first one of such viruses to be discovered was the yellow fever virus in the year 1901, and that began the era of viruses. Though viral diseases are fewer than bacterial, fungal, or parasitic diseases that affect mankind, the effect at which viral diseases affect human beings are simply incomparable to its contenders. This can be seen in the case of the latest and on-going global pandemic COVID-19.

One such recently discovered strain of the human infecting virus is the Kyasanur Forest Disease Virus.

KFD is an emerging viral disease transmitted by ticks and infected monkeys in India. The recent onset of the disease in other parts of India, such as Maharashtra, Goa, Tamil Nadu, and Kerala, has made it clear that the virus is spreading to other parts of India other than Karnataka, where the disease was first detected. This is considered a viral hemorrhagic fever with some or more characteristics of neurological disorders. The disease has a 2-10% fatality rate and causes it. The virus shows genomic similarities but stands differently from fewer other viruses. Today, the vaccine's output has been drastically reduced from 95% to 62%, which demonstrates the need for further work in the field and the production of vaccines.

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A Review on Facial Emotion Recognition and Classification Analysis with Deep Learning

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ABSTRACT

Automatic face expression recognition is an exigent research subject and a challenge in computer vision. It is an interdisciplinary domain standing at the crossing of behavioural science, psychology, neurology, and artificial intelligence. Human-robot interaction is getting more significant with the automation of every field, like treating autistic patients, child therapy, babysitting, etc. In all the cases robots need to understand the present state of mind for better decision making. It is difficult for machine learning techniques to recognize the expressions of people since there will be significant changes in the way of their expressions. The emotions expressed through the human face have its importance in making arguments and decisions on different subjects. Machine Learning with Computer Vision and Deep Learning can be used to recognize facial expressions from the preloaded or real time images with human faces. DNN (Deep Neural Networking) is one among the hottest areas of research and is found to be very effective in classification of images with a high degree of accuracy. In the proposed work, the popular dataset CK+ is analysed for comparison. The dataset FER 2013 and home-brewed data sets are used in the work for calculating the accuracy of the model created. The results are obtained in such a way that DCNN approach is very efficient in facial emotion recognition. Experiments and study show that the dataset, FER 2013 is a high-quality dataset with equal efficiency as the other two popular datasets. This paper aims to ameliorate the accuracy of classification of facial emotion.

KEY WORDS: FACIAL EMOTION RECOGNITION (FER), DEEP CONVOLUTIONAL NEURAL NETWORK (DCNN), OPENCV (OPEN-SOURCE COMPUTER VISION LIBRARY), VGG 16.

INTRODUCTION

Humans use a facial expression for non-verbal communication to show their emotional states. By observing someone's face, we can assume their emotion. However, FER (Fasel & Luettin, 2003)is still a challenging research area in various applications related to computer vision. But undoubtedly the application includes FER



for security (Butalia, et al., 2012), FER for mindset identification (Mandal, et al., 1998), FER for psychology aid, crime detection (Polikovsky, et al., 2009), Intelligent Tutoring System (Kumari, et al., 2015), Driver Fatigue Detection (Zhang & Zhang, 2006), Music based on Mood analysis (Dureha, 2014). Emotion refers to the internal feelings of human, through which they communicate their emotional states and intentions. The goal of this work was to classify the human emotions. The Conventional feature extraction and classification has complex computations for achieving high recognition rate. The proposed method used deep learning model to classify facial emotions from the dataset or real time image. The deep learning technique outperforms other conventional methods by its capability of handling large dataset and capability of faster computation. Deep learning consists of neural



network model, in which the connected neurons will act as inputs and outputs. This model is aimed to test and train the proposed system. The paper is organized as follows.

Section I describes the introduction part of Facial Expression Recognition, Section II describes the Classes of Emotion and its description, Section III will help us to learn about Conventional approaches to FER, Section V deals with the study of FER using Deep Learning approach, Section VI deals with Results and Conclusion and finally, references are included.

II. Major Classes of Emotion: Emotion is the primary motivation for every human being. Each emotion has its specific distinctive signals in brain. The changes in neural stimulation results in activation of emotions. Emotions are dependent on the situation and present condition of a human. Emotions get normally reflected on human face in the form of various expressions. The basic expressions on the face are happy, anger, fear, sad, surprise and disgust (Darwin, 1872) (Ekman, et al., 1971) (Albert, 2008). Each emotion has got its characteristics (Shoayuan, et al., 2019) (Lucey, et al., 2010). The basic expressions that are mentioned shall be depicted as shown in Figure:1.



III. Steps of Fer in Conventional and Deep Learning Approach: The first step in FER is image pre-processing, one can follow any of the processing techniques like Wavelet Transform (Haiyang, 2011), Discrete Cosine Transform, Colour Normalization Methods, Binarization (Anitha & Radha, 2010), Histogram Equalization (Anila & Devarajan , 2012) etc. The second step is Detecting face, that is to locate one or more faces in the given image and the identified face is bounded within a square box. In face component detection step, we detect the ROI for eyes, eyebrow, nose, cheeks, mouth forehead, ears etc. Various feature extraction techniques can be used for extracting features from ROIs.

The techniques include Local Binary Pattern [LBP] (Ojala, et al., 1996), Principal Component Analysis [PCA] (Turk & Pentland, 1991), Linear Discriminant Analysis [LDA] (Belhumeur, et al., 1997), Local Gradient Code [LGC] (Tong, et al., 2014), Independent Component Analysis [ICA] (Bartlett, et al., 2002), Local Directional Pattern [LDP] (Jabid, et al., 2010) etc. After feature extraction classification can be done. The classifiers classify the features based on the classification methods used. Traditional Classifiers like Euclidean Distance, N Neighbourhood etc can also be used for classification. The most popular methods used are Hidden Markov Model (HMM) (Kumar & Gupta, 2015), Neural Network (NN), Support Vector Machine (SVM) (Eschbach, et al., 2014), AdaBoost etc.

Figure 2 shows the flow of Facial Emotion Recognition. The data is collected from the publicly available datasets like CK+, JAFFE etc or sequence of images can be given as input. The pre-processing step includes removal of noise from the image, Face Alignment, Data Augmentation, Normalization etc is done. Later it is trained and tested.

Deep Learning Based Facial Emotion Recognition Approach: From this section, different approaches towards FER based on Deep Learning can be learned. (Chen, et al., 2017) (Kumar, et al., 2019) proposed a new CNN structure for FER, and they used CK+ and JAFFE databases for experiments. The detected faces are cropped using OpenCV library and the facial features are extracted with CNN using deep learning. LENet, the CNN network structure for FER is introduced with two pooling layers, four convolution layers and 2 fully connections layers (Shamsolmoali, et al., 2018). The model is trained and tested over CK+ Database and for validation JAFFE database is used. The feature is extracted using Deep Neural Network and used SoftMax for classification.

(Sun, et al., 2018) introduced a method for Facial Emotion Recognition, they divided face into three active regions, and these active regions are optimized. CNN is trained for all the three active regions and is trained to extract the facial features and classify the expressions. The experiments were done over 3 databases CK+ (University, 2021), JAFFE (Openaire, 1998) and NVIE (Wang, et al., 2010). The Speed of recognition is done in 0.01 Seconds. (Kumbhar, et al., 2017) proposed a methodology for tracking and detecting faces from a real-time HD Video. The Open libraries that are provided by Open CV (Open-Source Computer Vision Library) are used for tracking and detecting faces. The feature is selected with the help of HAAR classifier and trained. They implemented this on Raspberry -Pi.

The proposed work mainly makes a study and an analysis on the accuracy rate obtained towards the different data sets trained and tested. The commonly used Viola – Jones Algorithm (Wang, 2014) is used for face detection in the experiment. The major step includes i) Image Pre-Processing ii) Feature extraction from the Grayscale facial Images iii) Feature extraction from LBP facial images iv) Weighted fusion of different outputs. In the Pre-processing stage, face is detected from the benchmarked facial emotion dataset or from a live capture. The next stage is rotation correction, this issue can be resolved by applying the rotation transformation matrix as follows:

 $(Rx', Ry', 1) = [Rx Ry 1] \begin{bmatrix} Cos\theta & Sin\theta & 0\\ -Sin\theta & Cos\theta & 0\\ 0 & 0 & 1 \end{bmatrix}$

where (Rx, Ry) represents the original coordinate in face input image and (Rx[^],Ry') is the (x, y) coordinates after Rotation Transformation, θ represents the rotation angle. Rotation angle formed by making the line segment between the centre of eyes to the horizontal axis. LBP (Chan, et al., 2007) (Turabzadeh, et al., 2017) (Shan, et al., 2009) helps to identify the properties of individual parts of the input image. (Ojala, et al., 2002) introduced LBP algorithm as a combination of structural and statistical implementation on texture images with monotonic grayscale. Figure 3 illustrates the basic functioning of LBP.

LBP descriptor is used for capturing texture information of the given image and is calculated by comparing its value with adjacent pixels. The left part of the figure illustrates the actual pixel values and right part indicates the corresponding LBP coding, and the central pixel is calculated with binary coding.

After the encoding of pixels are completed, LBP can be calculated with the equation.

$$LBP(gp_x, gp_y) = \sum_{p=1}^p S(g_p - g_c) * 2^p$$

where gp and gc indicate the values of adjacent pixel and central pixel. LBP value of each pixel must be calculated based on the equation to generate the LBP Face image.



The figure 4, depicts the LBP texture descriptors of facial emotion happy, the output image shows more accurate values than that is obtained from grayscale.

Figure 4: Illustration of LBP	the input	image converted into
	L&P Image	

Datasets Used in Detail: Huge amount of labelled data is required to train a neural network. The popular datasets Cohn-Kanade (CK+) consists of 8363 images for testing and training.

The proposed system used the dataset FER 2013 to train models. The dataset consists of 35887 images, out of which 28709 labelled images belong to training set and the other 7178 images belong to test set. Table 2 gives the count of each emotion.

Table 1. Dataset Description			
Base	Number of images		
Training	CK+	8000	
	FER 2013	28709	
	Home brewed	100	
Testing	CK+	150	
	FER 2013	7178	
	Home brewed	23	

Table 2. Count of Emotions in the FER 2013 Dataset			
Sl. No	Type of Emotion	No: of images in dataset	
1	Нарру	7215	
2	Surprise	3171	
3	Fear	4097	
4	Disgust	436	
5	Neutral	4965	
6	Sad	4830	
7	Angry	3995	

Deep Convolutional Neural Network Model: The model is based on Sequential (DCNN) Model and has got 6 convolutional Layers with of batch normalizations applied in between, 3 layers of MaxPooling is added along with 4 dropouts and 2 dense layers. The Activation function used here is ReLU (Agarap, 2018). Batch Normalization is included to make the training faster. It also makes the complex networks simple and allows higher learning rate and easy initialization of weights. The ReLU (Rectified Linear Unit) activation function makes the evaluation quicker and increases the non -linearity in the images. The main advantage of using ReLU is that it does not activate all the neurons simultaneously. That is the neurons will get deactivated only if the result of linear transformation is less than zero. The ReLU function is computationally more efficient than Sigmoid function.

The dimensionality of the images is reduced with the help of MaxPooling, which will help to reduce the size drastically. It is done by unifying he pixel neighbourhood to a single value. Visualization of the out puts of convolution layer and extracted feature maps of a home-brewed image is shown in Figure 6a and Figure

Jaison & Deepa

6b. The overfitting of training data is reduced by adding Dropout functions. The flatten layer is added to convert the image into 1Dimensional Array. That is the output from convolution layer was a 2D matrix. The features that are send to fully connected layer will generate the result.



The Dense function is used to connect neurons in each layer. The output layer includes techniques like Dense and SoftMax (Chen, et al., 2018). SoftMax is a combination of multiple sigmoid, and here we use SoftMax for classification. The function also represents the probability for a data point of individual classes. The input images are trained in such a way to identify faces and classification of facial expression into various classes like Happy, Angry, Sad, Neutral, Disgust, Fear and Surprise. There are a total of seven steps included in the training process. This includes loading the dataset, pre-processing image, augmenting the feature vector (data), building and compiling the feature model, training and storing the model generated and finally validating the model. In the Real Time face detection, the image acquisition is done using a camera. From the captured image, the face is identified and bounded in a box and converted into binary pattern to specify as the feature vector and stored. The Local Binary Pattern Histogram (LBPH) helps in the detection of face using Viola –Jones Algorithm. The image pixels are stored with the threshold value for feature vector. These facial feature vectors are added with weights to form a neural network model.

Here the network architecture model used for facial expression and classification is VGG 16 CNN Model which is shown in Figure 7. Visual Geometry Group (VGG) was proposed by (Simonyan & Zisserman, 2015). The image is passed through various convolutional layers arranged in a stack. All the hidden Layers are equipped with ReLU (Rectified Linear Unit Activation function). The spatial pooling is carried out by five Max-Pooling layers. Three Fully – Connected (FC) Layers, in that the first two have 4096 channels and the third consists of 1000 channels.

RESULTS AND CONCLUSION

FER 2013 dataset was found to be as good as other popular datasets in accuracy rate and performance. The best activation function seems to be ReLU [Rectified Linear Activation Function], which is the default activation function helps any model to learn faster and there is no issue of vanishing gradient problem like other activation functions. For Classification, Viola-Jones Haar Cascade classifier works well with OpenCV. So, a combination of the above three will help in developing a better FER System. Even though in the architecture the actual input to first convolution layer is 224X 224, in the proposed work it is taken with a resolution of 48 X 48. The detected faces, which are rotation rectified in the input images are rescaled and reduced to 48X48 to make uniformity to all the images that are being trained and tested. The reduction in image area will help in accelerating the speed of FER. But sometimes it may result in losing facial information, that are acquired from LBP images. The comparison of face emotion recognition rate obtained in the proposed model with the State- of -art is shown in Table 3.

Table 3. Comparison of Emotion Recognition rate obtained in the proposed model with state-of-art literature. Data Set Method Accuracy CK+ (Shan, et al., 2009) 89.1 six classes (Jeni, et al., 2012) 96.0 six classes Proposed method 89.0 FER 2013 Proposed Method 95.0 Home-brewed Data set Proposed Method 97.0

The proposed work involves three different phases as Face Detection, Face Recognition and Emotion Classification

Each phase is explained below for better understanding. Facial Expression recognition is built with CNN model where the facial features are extracted and classified based on VGG 16 model. The proposed work involves three different phases, in the first phase the image will be captured by a camera, and reads the image based on Open CV HAAR cascade detection and Viola Jones Algorithm. The RGB image that is captured is processed and converted into matrix whose values ranges from 0 to 255. In the second step, the trained model generated is tested to recognize the human face, here the image resolution is adjusted to perform computation easy as per CNN model. In the third phase classification of emotions are done. The plot of featured images from the dataset is as shown in figure 8. The real time emotions classified in the proposed work are angry, sad, neutral, happy, disgust and surprise are shown in figures 9- 14. The emotion, fear cannot be predicted fine in the work.



Figure 9: Face Emotion classified from the image is Anger



Figure 10: Emotion is detected as Sad





Figure 12: Two faces are identified in a single frame, with emotion detected as neutral.



Figure 13: Emotion detected as Surprise



Figure 14: Untrained image-Emotion detected as Surprise.



Figures 15 and 16 shows the confusion matrix obtained over the datasets FER 2013 and Home-brewed dataset. Figures 17 and 18 shows the accuracy and loss rates obtained in 50 epochs.

In the proposed work Convolutional neural network is implemented for Real time Facial Expression Recognition

Jaison & Deepa

, and the model has been tested over a public dataset to assess the proposed model. A larger dataset FER2013, helps to improve model accuracy. The illumination and lighting conditions play an important role in image detection. In perfect laboratory condition (camera in the eye level, perfect lighting, subject with expression on face) the proposed work is compared with the Stateof-art literature and an accuracy of more than 90% is achieved, any deviaiton from the above condition results fall of accuracy. The CNN model used can vary in the number of layers included, but it is found that there is no deviation from achieved accuracy ,as the number of epoch increase, it results in higher accuracy rate, but higher number of epochs may result in overfitting also.



Figure 16: Confusion Matrix during training on Homebrewed dataset



Facial Emotion Recognition is always a growing research area since it requires more and more accuracy in real-time image sensors. Effective Real-time monitoring will help in building very efficient applications that help to track lost objects, identify a person from a crowd in a dynamic environment. The emotion of a student undergoing digital learning can be predicted easily through this work. Open CV works better in developing real-time applications in IoT and found to be more productive and has high performance for face detection.



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Jaison & Deepa

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Sustainable Development Coal Mining Management (Case Study of Coal Mining Licensing Problem in South Kalimantan, Indonesia)

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ABSTRACT

Previous research has examined the sustainable development system for mining governance with the issuance of Law no. 4 of 2009 concerning Minerals and Coal hopes that mining governance based on the concept of sustainable development and eco-development will run well, but quality deterioration always occurs. On the one hand, coal mining exploitation activities can provide economic benefits and on the other hand, cause negative impacts in the form of damage and pollution to the environment so as to result in losses to local governments and the community. To control and organize good mining with a licensing system, a concept of sustainable development policy through technological engineering has been developed. The article uses normative legal research through a statutory approach and a case approach in discussing the coal mining crisis in South Kalimantan. The results of the study as new findings in this article found that the concept of sustainable development, which is a government policy in the context of exploiting coal mines, has not been able to reduce the negative impacts arising from mining activities. The issued mining activities were carried out through technological engineering in order to pursue economic growth, it was also unable to solve the increasingly serious devastating environmental problem as happened in South Kalimantan Province.

KEY WORDS: MANAGEMENT, COAL MINING, SUSTAINABLE DEVELOPMENT.

INTRODUCTION

George W Rock Pring stated that "two very significant developments are occurring in the mining industry and related government resource programs worldwide. One is positive, the other problematic. Working together, these two trends have the potential to change dramatically the way in which mineral resource companies, the Governments of resource-based economies, and indeed the world function in the 21st century". One of the greatest challenges facing the world today is the integration of economic activity with the environment, social concerns,

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and an effective system of government. This is in line with the philosophical doctrine of Pancasila which aims to prosper the people by living a balanced, harmonious and harmonious life which is stated in legislation as law so that environmental integration, social care and government systems are effective.

In the field of exploiting natural resources, it is not carried out solely for economic purposes but must also be integrated with environmental preservation, social awareness and effective governance. One of the potential natural resources in Indonesia, especially in South Kalimantan Province, is the natural resource of coal. The Indonesian Coal Mining Association states that coal production in 2006 was around 193.54 million tons, of which 145 million tons were exported to Asia, Europe and other countries. Then in 2007, national coal production reached 225 million tons, of which 150 million tons will be exported. Data in 2007 also shows



that Indonesia has coal resources of 90 billion tons and reserves of 18.7 billion tons that can be used for at least 110-120 years. Indeed, one side has a positive value to meet domestic and foreign energy needs and as an Indonesian coal export commodity that continues to increase, this is also the case with South Kalimantan which is the second largest contributor to national coal after East Kalimantan.

The potential of natural resources in the form of coal mines owned by the South Kalimantan area is quite large with good quality and its existence is almost spread throughout the districts (Banjar, Tanah Laut, Kotabaru, Tanah Bumbu, Hulu Sungai Tengah, Hulu Sungai Utara, Hulu Sungai Selatan, Tapin and Tabalong). So that in some areas, the mining sector has become a mainstay sector in increasing local revenue. However, on the other hand, there is a problem, namely because it is a non-renewable resource, meaning that once dredged mining material will not recover to its original state. Exploitation of mineral resources that does not comply with good mining principles does not provide benefits to the government or society.

Quoting data from the Central Statistics Agency (BPS) of Tanah Bumbu Regency and the Office of Investment and One Stop Services (PMTSP) of South Kalimantan Province, out of 160 companies that have Mining Business Permits (IUP) in South Kalimantan which produced 61,717,236 tons of coal. The largest portion is produced by Tanah Bumbu Regency with 24,312,169 tonnes, or around nearly 40 percent of the total production of all IUP holders in South Kalimantan (Abdurrahman 2003).

As a province that is rich in natural resources, especially mining products, South Kalimantan (Kalsel) is also inseparable from environmental problems. Of a number of mining companies operating in this province, not all companies, both large and small, are willing to take responsibility for improving the environmental area in which they operate. In fact, quite a number of excavated ex-mining locations are not closed by mining companies. Although there is no definite data on the number of victims in South Kalimantan Province as a result of this, referring to JATAM data, it appears that South Kalimantan Province is the second province that has the most mining holes in Indonesia after East Kalimantan Province, with 814 mine pits. The mining pits are spread across eight districts. The largest mining hole is in Tanah Bumbu Regency with 264 mine pits, followed by Tanah Laut Regency with 223 mine pits, and followed by Banjar Regency with 117 mining holes.

Therefore, Law no. 4 of 2009 concerning Mineral and Coal Mining which replaced Law No.11 of 1967 concerning Mining Principles as a basis for exploitation of mineral and coal resources designed to pursue economic growth without damaging the environment. This is as stated in Article 3 of Law no. 4 of 2009 that in order to support sustainable national development, the objective of mineral and coal management is in letter e to increase the income of local, regional and state communities, and to create jobs for the greatest welfare of the people. Article 4 paragraph (1) Law no. 4 of 2009 has recognized that Minerals and coal as non-renewable natural resources are national assets controlled by the state for the greatest welfare of the people (Badan Pusat 2020).

So there are two opposing sides, namely some that are beneficial for the welfare of the people and there are also those that are detrimental because coal is a non-renewable natural resource, thus it is vulnerable to environmental damage. Even so, generally coal producing regions still take alternatives to utilize coal mining to support their economy. Indeed, there are one or two regions that do not tinker with these natural resources, such as the Hulu Sungai Tengah Regency by the Regional Government and its people, but the central government actually grants mining business permits to a company, but on the other hand there are also local governments that have given mining business permits withdrawn on the grounds that it can damage the environment (Penanaman 2020).

RESEARCH METHODS

The research method used in this paper is normative legal research, which examines the issue of coal mining from a legal perspective in depth on the established legal norms. The approach taken in this writing is a statutory approach, this approach is to clarify issues concerning the consistency of the philosophical basis, ontological basis and ratio legis / legal logic regarding the concept of sustainable development in the Mineral and Coal Law. And the case approachin discussing the turmoil of coal mining in South Kalimantan (Garrett Hardin 2017).

ANALYSIS AND DISCUSSION

Legal Basis For Mining Management: So far, we can review the impact of mining on the environment from two aspects, namely positive and negative impacts. The positive impact, be it coal, gold or diamond mining activities carried out by the people can increase the income and standard of living of the community and create jobs. The negative impacts of mining activities are as follows:

- a. Damage to the landscape due to ponds / hole basins that were not reclaimed.
- b. The source of water pollution is both high turbidity levels and mercury content in gold mining by the people.
- c. Causes of erosion and sedimentation, as well as damaging watersheds and water systems.
- d. The occurrence of wasteful use of mineral resources.
- e. Prone to mining accidents.
- f. Threatens forest and aquatic ecosystems.
- g. There is no entry of state revenue.
- h. Inhibiting the entry of private sector investment.
- i. In mining areas the people are generally prone to security stability.

With the enactment of Law Number 4 of 2009 concerning Mineral and Coal Mining, the contract regime has changed to a licensing regime. Changes in the status of the Contract of Work (KK) and Coal Mining Concession Work Agreement (PKP2B) into Mining Business Permits will make the government the absolute owner of natural resources and public law applies, where the licensor, namely the government, can at any time revoke mining business permits according to sanctions. sanctions made based on law. The positive impact, the status of KK / PKP2B to become IUP is that the change in working relationship with the contract regime will end up becoming a licensing regime. This means that it is no longer a civil relationship, but the absolute government as the owner of natural / mineral resources in accordance with Article 33 of the 1945 Constitution.

In Law no. 4 of 2009 that the Coal Mining Concession Work Contract and Work Agreement must be changed to a Special Mining Business License within 1 year from the enactment of the Law. Even in Law no. 3 of 2020 concerning amendments to Law No.4 of 2009 still provides guarantees for these KK and PKP2B. Implementing regulations of Law no. 4 of 2009 is PP No. 22/2010 concerning Mining Areas and PP No. 23/2010 concerning the Implementation of Mineral and Coal Mining Business Activities with four changes, PP No. 24 of 2012, PP. 1 of 2014 concerning the second amendment, PP. 77 of 2014 concerning the Third Amendment, PP. 1 of 2017 then PP No. 55 of 2010 concerningGuidance and Supervision of the Implementation of Mineral and Coal Mining Business Management. On the basis of Law No.4 of 2009 and its implementing regulations are in order ensure the effectiveness of the implementation and control of mining business activities in an efficient, effective and competitive manner, so there are several principles to be adhered to, namely:

- 1. Principles of Mining Area auction. There is a provision on the auction of mining areas, in which every company or party that will carry out mining exploitation, especially coal, in order to obtain a mining permit must go through an auction process. This method is seen as a progress in the national mining business world. There are several advantages to the licensing system through the auction mechanism, namely:
- a. Pressing the emergence of a mining permit mafia. There is a practice of buying and selling mining permits carried out by certain individuals who only pay a fee for permits to obtain a number of permits, but not for business, but for resale. The auction mechanism is expected to be effective in suppressing the practice of buying and selling mining permits that have been happening so far. There is a practice of buying and selling mining permits, not a few parties who originally intended to do business in the mining sector have become victims of a large number of financial frauds.
- b. Filter media. Only companies that are really

ready financially, and really intend to carry out mining business activities will participate in the auction process, so the auction mechanism is a natural process for companies that only intend to experiment or only act as license brokers.

- c. Increase State income. Through an auction, the State will receive two benefits at the same time, firstly, obtaining revenue for the State treasury, second, obtaining a qualifying company that is ready to carry out mining business activities.
- d. More accommodating, namely by the inclusion of regulations that favor the interests of the people,
- e. The strategic technical considerations of a mining material are more determined based on considerations of national interests, not on the type of minerals. That is, whether a mining material is technically, economically, in interest, and in terms of state defense and security, its existence is strategic and vital, then management becomes the authority of the State / Government.
- f. There is a clear division of management authority between each government action.
- g. There is an integrated management effort, from exploration to post mining.

In line with that, in accordance with what is stated in the general explanation of Law No.4 of 2009 is trying to accommodate the problems that have been developing, as well as adjusting to the development of changes in mining development, both National and International. The thought of accommodation of problems and developments is contained in the following main points of thought:

- 1. Minerals and coal as non-renewable resources are controlled by the State and their development and utilization are carried out by the government and local governments together with business actors.
- 2. The government then provides opportunities for business entities with Indonesian legal status, cooperatives, individuals, and local communities to carry out mineral and coal exploitation based on permits, which are in line with regional autonomy, granted by the government and / or local governments in accordance with their respective authorities.
- 3. In the context of implementing decentralization and regional autonomy, the management of mineral and coal mining is carried out based on the principles of externality, accountability and efficiency which involve the government and regional governments.
- 4. Mining businesses must provide economic and social benefits for the maximum welfare of the people.

Problematic Mining Business Permit Issuance Cases: This case started when the Minister of Energy and Mineral Resources (ESDM) issued Decree No. 441.K / 30 / DJB / 2017 dated 4 December 2017 concerning the

Muhjad & Hadin

Adjustment of the Phase of the Coal Mining Exploitation Work Agreement (PKP2B) of PT Mantimin Coal Mining (MCM) to the Production Operation Activity Stage, covering three locations in Hulu Sungai Tengah Regency (HST), Balangan and Tabalong with a total area of 5,908 hectares. for mining in the area of Hulu Sungai Tengah Regency covering East Batangalai District. Mining Business License (IUP) is valid until 2034.

The issuance of the IUP from the Minister of Energy and Mineral Resources has drawn criticism from the wider community. The reason is for the Hulu Sungai Tengah Regency Government (HST) itself considers something strange because there has never been a process in the HST Regency Government, suddenly the IUP of the Minister of Energy and Mineral Resources appears, and for the public they consider the issuance of this IUP from the Minister of Energy and Mineral Resources threatens the preservation of the natural environment of HST Regency surrounding areas. So that there was a wave of rejection from various walks of life.



In the IUP crisis of the Minister of Energy and Mineral Resources, there was a controversial statement from the Director General of Mineral and Coal of the Ministry of Energy and Mineral Resources, Bambang Gatot Ariyono, who emphasized that even though the Minister of Energy and Mineral Resources has issued Decree No. Mantimin Coal Mining (MCM) Becomes a Production Operation Activity Stage, but there is no environmental impact analysis (Amdal), so companies are not allowed to carry out production operations or mining activities. There are only Amdal in the Tabalong Regency area. while in HST it does not have an Amdal, so the company is not allowed to carry out mining. The head of the South Kalimantan (South Kalimantan) Environment Agency, Ikhlas Indar, has not yet made an EIA for coal mining activities, Ikhlas Indar, that PT MCM's Amdal document for carrying out production operations in the HST Regency was not issued. so that the company cannot operate. There has indeed been an EIA submission since 2010, but it has not been endorsed by his party. This is also related to the reason that the river there is the intake of the PDAM, so it is feared that the river water resources there will be polluted due to mining.

What's interesting about this case is in Law no. 32/2009 concerning Environmental Protection and Management states that business permits are issued after being granted an environmental permit, while environmental permits are issued after EIA approval. Thus the statement by the Director General of Mineral and Coal at the Ministry of Energy and Mineral Resources Bambang Gatot Ariyono that there is no Amdals yet but issuing an IUP means that the Minister of Energy and Mineral Resources violates Law No. 32 of 2009 which can qualify as a criminal offense (Article 101 of Law No. 32 of 2009).

The Department of Energy and Mineral Resources of South Kalimantan Province gathered a number of parties who contravened the coal mining exploitation plan of PT Mantimin Coal Mining (MCM) in Hulu Sungai Tengah Regency. The Ministry of Energy and Mineral Resources of South Kalimantan invited the South Kalimantan Forum for the Environment, Dayak Kalimantan Bersatu, and other technical agencies. On that occasion the Head of the Mineral and Coal Sector of the Ministry of Energy and Mineral Resources of South Kalimantan, Gunawan Harjito, said that the Ministry of Energy and Mineral Resources had already issued an Amdal permit, an Environmental Management Plan, and an Environmental Monitoring Plan on 26 December 2000. These three permits were signed directly by the Secretary General of the Ministry of Energy and Mineral Resources at that time, Djoko Darmono.

This environmental permit applies to the PT MCM PKP2B working area in Tabalong and Hulu Sungai Utara Districts (currently part of it is part of Balangan Regency), namely the Upau Block covering an area of 4,545 hectares. Quoting a copy of the letter, the process of transporting coal from the Upau Block passes through a special dock in Paser Regency, East Kalimantan. The Amdial Permit at that time was sectoral from the Ministry of Energy and Mineral Resources Number 537/26 / SJN.T / 2000, while for the Batutangga Block in HST Regency covering an area of 1,964 hectares, PT MCM has not yet obtained an EIA permit because the South Kalimantan Provincial Government has never issued an EIA permit. The chronology and the results of the decision from the first level to the cassation will be explained using the table below along with the picture of the dispute area:

The legal considerations of the Supreme Court cassation panel of judges are more to the facts and conditions in South Kalimantan, which have karst areas, must be protected. The judge assessed that some of the MCM mining areas are located in karst areas as geological protected areas. If this area is exploited, it has the potential to damage the function of the natural aquifer, which functions as a reservoir and channel of water for the surrounding area. And when PT. MCM can take external legal measures, namely through the mechanism of reconsideration to the Supreme Court, the Supreme Court reaffirms the cassation decision on the grounds that the environmental damage was severe if this permit was granted. The case of PT. Mantimin Coal Mining (PT. MCM), of course, the attraction of the central and regional authorities in relocating the governance of natural resource permits still needs to be studied empirically. In fact, the evaluation of regional authority in natural resource management has not yet been completed as stipulated in the Regional Government Law, Law Number 3 of 2020 concerning Amendments to the Minerba Law (the new Minerba Law) has been reenacted, which draws mineral and mining governance to the center like the model in the New Order era.

Table 1. The area of the permit being contested Source: Walhi South Kalimantan			
Legal effort	The result		
February 28, 2018, Walhi sued SK number 441.K / 30 / DJB / 2017 at the Jakarta State Administrative Court. After that the trial took place and was scheduled. 13 July 2018 a local examination was carried out with the Jakarta State Administrative Court Judge, Walhi, and the Nateh Village Community, Hulu Sungai Tengah. The ESDM Ministry and PT. MCM was not present at the trial.	October 22, 2018, the Jakarta Administrative Court decided on the lawsuit by Niet Ontvankelijke Verklaard (NO). The judge stated that it was not the PTUN's authority to try case number 47. Even though the trial had been going on for eight months.		
November 2, 2018, after the Jakarta Administrative Court decided NO for the lawsuit against SK number 441.K / 30 / DJB / 2017. Walhi filed an appeal to the Jakarta State Administrative High Court (PTTUN).	March 20, 2019, PTTUN Jakarta decided to reaffirm the decision of the Jakarta State Administrative Court number 47 / G / LH / 2018 / PTUN-JKT dated 22 October 2018. With a decision letter dated March 14, 2019 number 28 / B / LH / 2019 / PT.TUN.JKT.		
April 2, 2019, Walhi registered an appeal to the Supreme Court on the Jakarta PTTUN decision number 28 / B / LH / 2019 / PT.TUN.JKT dated March 14, 2019.	October 15, 2019, the Supreme Court decided to grant the cassation, according to the publication on their website, the verdict reads cassation, canceled judex facti, adjudicated the lawsuit itself, canceled the object of the dispute. The object of the dispute being sued is SK ESDM number 441.K / 30 / DJB / 2017 concerning the granting of a coal mine production operation permit for PT MCM.		



The Case of Problematic Mining Business License Revocation: The Governor of South Kalimantan, Sahbirin Noor, has revoked 425 Mining Business Permits (IUP) from a total of 789 IUPs as a result of the evaluation of the Ministry of Energy and Mineral Resources in the mining sector in South Kalimantan Province. It is estimated that the number of healthy mining companies

that meet the government's clean and clear (CnC) requirements is only 100 companies. Furthermore, this revoked mining permit area will be turned into a mining area through an auction mechanism.

In addition, to restore the post-mining area of the hundreds of IUPs, the South Kalimantan Provincial Government will also demand the withdrawal of the reclamation guarantee fund from the Regency Government or the company if it has not been paid to the local government. His party will implement the obligation to pay royalties and other obligations of the company before the coal is shipped. It is recorded that royalty funds deposited to the state treasury after the IUP control policy reached Rp. 6 trillion. This amount is almost the same as the amount of royalties collected from hundreds of mining companies before IUP control. The case that attracted public attention was South Kalimantan Governor Sahbirin Noor revoked the coal mining business license (IUP) of three subsidiaries of PT Sebuku Iron Lateritic Ores (SILO) Group, in the Pulau

Laut area, Kotabaru Regency. There are 3 Decrees of the Governor of South Kalimantan regarding the revocation of IUP Production Operations, namely:

- 1. South Kalimantan Governor Decree No. 503/119 / DPMPTSP / 2018 dated 26 January 2018 the revocation of IUPOP for PT Sebuku Batubai Coal covering an area of 5,140 ha in Pulau Laut Utara and Pulau Laut Tengah Districts
- 2. South Kalimantan Governor Decree No. 503/120 / DPMPTSP / 2018 dated 26 January 2018, revocation of IUPOP for PT Sebuku revocation of IUPOP for PT Sebuku Sejaka Coal covering an area of 8,140 ha in Pulau Laut Timur District.
- 3. South Kalimantan Governor Decree No. 503/121 / DPMPTSP / 2018 dated 26 January 2018, the revocation of IUPOP for PT Sebuku Tanjung Coal covering an area of 8,990 ha in Pulau Laut Utara and Pulau Laut Tengah Districts.

The reasons for the revocation of the IUP, apart from the results of academic studies, were also driven by the aspirations of various elements of the Kotabaru community who strongly objected to the existence of mining on Laut Island and Kotabaru Regent Regulation Number 30 of 2004 concerning the prohibition of coal mining activities on (Pulau Laut, Kotabaru Regency which was published by the Regent. H. Sjachrani Mataja on December 29, 2004), as well as recommendations from the leadership of Muhammadiyah Kotabaru in 2010, and the Community Communication Forum for the Sea Island Rescue Movement of Kotabaru Regency on November 30, 2014, to groups of fishermen and fish traders.

After various demonstrations and the rejection of mining on Pulau Laut grew tighter, the Provincial Government of South Kalimantan together with the Chairperson and Deputy Chairperson of the Kotabaru DPRD and the Kotabaru Regency Government held a meeting on September 13, 2017 which basically supported and recommended the Pulau Laut without coal mining. Agus Andriono, The chairman of the NGO, Gepak Kotabaru, approved the South Kalimantan Governor's decision to revoke the Coal Production Operation Mining Business License (IUPOP) belonging to PT. SILO Group, because in addition to the impact of natural damage that will be caused, this will certainly trigger horizontal conflicts, between people who are pro and contra about the existence of coal mining activities on the sea island. We will of course continue to oversee this decree and ensure that mining activities carried out by PT. SILO Group has completely stopped and Mining Free Sea Island is a reality.

Sjachrani Mataja, the former Regent of Kotabaru who issued the IUP, emphasized that at the time of issuing the IUP there was an MoU between PT. SILO Group with the Regent of Kotabaru that the issuance of IUP is required, among others, to build a bridge between Pulau Laut and Kalimantan Island, not selling coal outside, and others, it turns out that this agreement was not kept by PT. SILO. However, PT. SILO argued that it had been amended at the time of Regent Irhamni. Managing Director of PT SILO Hendry Yulianto said the agreement amended at the time of Regent Irhami Ridjani was legitimate, because the regional head who made the agreement represented the regional government. Meanwhile, Director of Walhi Kisworo Dwicahyono said that if the agreement is changed, the company's Production IUP in Pulau Laut will be canceled. But strictly speaking, the agreement is actually odd, Finally this case was resolved through the State Administrative Court through decision number 5 / G / 2018 / PTUN.BJM which granted the Plaintiff's Lawsuit in its entirety, Declaring the Decree of the Governor of South Kalimantan Number 503/121 / DPMPTSP / 2018 concerning the Revocation of Mining Business Permit for Coal Production Operations PT. Sebuku Tanjung Coal in Kotabaru Regency (KTB. 1007IUP0P0095) dated January 26, 2018. Seta obliged the Defendant to revoke the Decree of the Governor of South Kalimantan Number 503/121 / DPMPTSP / 2018 concerning the Revocation of the Coal Production Operation Mining Business Permit of PT. Sebuku Tanjung Coal in Kotabaru Regency (KTB. 1007IUPOP0095) dated January 26, 2018.

Coal Mining and Sustainable Development: Many questions arise in the community whether coal mining activities cannot meet the standards of sustainable development as referred to in the concept of Our Common Future by the World Commission on Environment and Development, 1987, namely development that can meet the needs of the present generation without sacrificing the ability of future generations to meet their needs, which is operationally poured out through the control instrument in licensing.

Legally, historically, MPR Decree No. IV / MPR / 1999 regarding the 1999-2004 GBHN explains the condition of natural resource management that "the concept of sustainable development has been put in place as a policy, but in practice so far, natural resource management is uncontrolled with the result of environmental destruction that disturbs conservation. natural; This expression shows the recognition from the highest institutions of our country that the sustainable development in the management of natural resources has not yet been carried out. The same is stated in the preamble to MPR Decree No. IX / MPR / 2001 which states that the ongoing management of agrarian / natural resources has resulted in a decrease in environmental quality, inequality in the structure of control, ownership, use and utilization as well as causing various conflicts. Then it is also stated that the laws and regulations relating to the management of agrarian or natural resources are overlapping and contradicting each other.

Thus the management of coal natural resources has not met the standards of sustainable development, even Sonny Keraf stated that why the paradigm does not work, especially why ecological crises continue to occur, because this paradigm reaffirms the ideology of developmentalism. What was accomplished at the Earth Summit in Rio de Janeiro ten years ago, is nothing but a compromise proposing redevelopment, with the main

focus being economic growth. As a result, during the last ten years, there have not been many changes experienced by all countries in the world in order to correct their economic development which remains the same, namely control and exploitation of natural resources with all their negative impacts on the environment, both damage to natural resources and environmental pollution. Even though sustainable development is at its lowest point, according to Martin Khor, there are also signs of its revival as a paradigm. The limitations and failures of globalization have caused negative reactions from some parts of the community which in turn may have an impact on changes in a number of policies. With the emergence of pro-sustainable development forces in governments in developing countries (NSB), they have become more aware of their rights and responsibilities to rectify various problems that exist today, including changing a number of regulations in the WTO. The World Summit On Sustainable Development-WSSD (World Conference on Sustainable Development) provides an excellent opportunity to refocus people's attention and strengthening efforts.

In relation to the implementation of sustainable development in Indonesia, the assessment of D. Pearce & G Atkinson should be noted in their writing "A Measure of Sustainable Development". The two authors assess that Indonesia's development is still not sustainable. This is because the depreciation of Indonesia's natural resources is 17% of the GDB, while the investment is only 15%. Development is only considered sustainable in utilizing natural resources through technological engineering and art, so that if we consume added value, it is possible to save 17% or even more for an investment. So it is clear that the ability of human resources to provide "added value" to development support resources through the application of science, technology and art is the key to whether the development being carried out is "sustainable" sustainable, sustainable or not.

Thus, even though formally it is clear that the development carried out in Indonesia must be in the form of Sustainable Development and Environmental Friendly but still only in the form of das solen and through legal instruments it is hoped that it can be realized at the basic sein level. However, this success still depends on many factors, apart from juridical, political and cultural factors, including the condition of the human resources who are responsible for it. It is an irony in modern times like today in our country, Indonesia, a country that is rich in energy sources where electricity is still out. The abundance of Indonesia's natural wealth is not managed properly and responsibly, which makes the population of this country poor. In fact, this natural wealth has become a natural resource curse (Resources Curse) and cannot be enjoyed cheaply / for free by the people who are mostly poor.

Just look at the fact that not all people have easy access to energy sources.Exploiting natural resources on the pretext of development is not the welfare received by the people, but rather the suffering felt by the people. The wealth of natural resources that are owned and contained in the bowels of the Indonesian earth which are abundant and of various types is a gift that should be grateful and of course maintained continuously from irresponsible human greed and his mind only wants to exploit it without considering sustainability and environmental harmony. The choice of our Government by exploiting natural resources to finance development is a wrong choice. We all know that coal SDA is a nonrenewable resource, which one day will run out and at the same time bring severe environmental damage. D. Pearce & G Atkinson D. Pearce & G Atkinson wrote that the negative impacts of natural resource exploitation can be avoided if engineering technology is used. This opinion which I disagree with. How can an environment that was destroyed by exploitation be returned either by technological engineering or by technological engineering the exploitation of natural resources does not destroy the environment. Evidence has shown that technology has not been able to restore nature to what it used to be due to exploitation.

Pay close attention to what happened in South Kalimantan Province in ex-mining areas, based on the Greenpeace research report that the extensive coal mining activity in South Kalimantan Province is because one third of South Kalimantan has become a coal mining area. has damaged water sources, endangers the health and future of local communities as well as strong evidence that coal mining companies have dumped hazardous waste into rivers and community water sources, violating national standards for waste disposal in mining. All samples taken were also detected to contain heavy metal concentrations. Leakage and the potential overflow of water from ponds contaminated with hazardous waste in coal mining concessions pose a danger to surrounding swamps, creeks and rivers.

In this regard, Greenpeace issued several recommendations and demands. First, coal mining companies that profit from dirty and illegal mining activities, must be legally and morally responsible for restoring the environment from their illegal activities, for reducing waste from water bodies, or the company's license must be revoked. Second, companies found to have broken the law must be held responsible for financing cleanup operations, even if their mining permits are completed or revoked, because the acid mine drainage problem will persist for decades (Kumparan 2018).

The government must not give a coal mining company a "license to poison" the environment and people of South Kalimantan. Third, The relevant government authorities must monitor and carry out more in-depth investigations of coal mining companies that violate national standards, and pollute the environment. Law enforcement must be tightened, sanctions must be tightened, and regulatory loopholes must be closed. Therefore, proper management of sustainable coal mining needs to be implemented by taking into account:

Muhjad & Hadin

- 1. In terms of limited quantity and quality of coal sources,
- 2. Location of coal mining and its influence on community growth and regional development,
- 3. Environmental carrying capacity and
- 4. Environmental, economic and social impacts of the community due to the coal mining business.

The research results show that the sustainability score, for the social and environmental dimensions, is still below the sustainability score, for the economic dimension it is above the sustainability score. Viewed in the field, it can be said that the impact of environmental damage due to coal mining activities is very worrying even though PAD and the economy of the communities around the mine have increased. However, when measured from its prospective analysis, it can be concluded that coal mining activities are more detrimental to both material and non-material things to the community in general from environmental damage such as floods, air pollution, water and soil. Therefore Hardin suggests "so the tragedy of the commons as a cesspool must be prevented by different means, by coercive laws or taxing devices that make it cheaper for the polluter to treat his pollutants than to discharge them untreated (Michael Tost et al 2018).

CONCLUSION

Coal mining has two sides, one side provides economic benefits and the other side has a negative impact on the environment which results in losses for local governments and society. Controlling coal mining through licensing instruments has not been able to direct mining activities that provide economic as well as environmental benefits to the government and surrounding communities. The concept of sustainable development, which is a government policy in the context of exploiting coal mines, has not been able to reduce the negative impacts arising from mining activities. Serious environmental damage has occurred in South Kalimantan Province due to coal mining activities.

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Interactive Teaching Methods as Pedagogical Innovation

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ABSTRACT

The transformations taking place at the global level bring changes to all spheres of human activity, including the educational system. Traditional learning forms that put the focus on the teacher while students are the passive participants of the educational process nowadays gave way to more effective interactive learning methods that fully engage students into the educational process. The article analyzes the changes taking place in the sphere of education today. After all, the orientation toward new goals of education requires a change in the methods and forms of the organization of the educational process. The author of the article cites a number of reasons, because of which interactive training becomes more widespread and relevant in the field of education. Next, different definitions of the concept of interactive learning are considered from the point of view of different authors. The similarities and differences in the understanding of this concept are described in more detail by different authors, the stages of interactive learning, its features are described. The article deals with the concept of interactive learning from different sides, in order to reveal its essence. The article emphasises the relevance of the use of interactive forms of education, analysing the concept of interactive learning.

KEY WORDS: INTERACTIVE LEARNING, BRAINSTORMING, ICT, ROUND TABLE, SIMULATION GAMES, ROLE-PLAYING GAMES, PROJECT METHOD, ACTIVE LEARNING, CASE STUDY, PROBLEM LECTURE, DIDACTIC GAMES, EDUCATIONAL PROCESS.



INTRODUCTION

The thoughts of the overwhelming majority of scientists and teachers have long been focused on the fact that the future of our civilization is closely connected with ensuring the development of the intellectual and creative potential of citizens and especially young people of school



age. The acceleration of scientific and technological progress and the information revolution in modern society requires new approaches to training and education of the young generation. Traditional pedagogical approaches to the organization of the educational process more and more often do not satisfy the needs of both teachers and schoolchildren for effective and intensive knowledge of the world especially in relation to physics. Such knowledge forms a holistic scientific picture of the world, develops the personality of a graduate of a comprehensive school, who must continue his/her studies in a higher educational institution or realize himself in the chosen field of professional activity.

In these circumstances, the formation of motivation for teaching physics to students is one of the global problems of the modern school. Its relevance is due to updating the content of training, the significant development and implementation of active teaching methods through innovative technologies and especially information and communication technologies (ICT). A significant strengthening of the role of each student's independent (individual) work in the process of his/her education is generally aimed at the implementation of the subjectsubject approach in the organization of the educational process, on whose conscious understanding the learning achievements depend to a large extent. Therefore, the school is designed to teach each student the independent development and assimilation of the necessary information. New innovative teaching technologies are a combination of new systems and data processing methods, which are holistic training systems.

In modern conditions of numerous reforms, modernizations and updates, much attention is paid to the content of education and the technological basis of education, which has not been reformatted for centuries, is practically ignored. As a result, the quality of education is constantly deteriorating, as evidenced by the data of international studies PISA, TIMSS, PIRLS, TALIS, etc. In this regard, the issues of restructuring traditional pedagogical technology of the group method of teaching (GTM) and mastering the new and latest pedagogical technology of the collective method of teaching (CMT) are of particular relevance.

With the introduction of a competent approach to training, the urgent task of higher education is to develop students' applied skills. The question of activating students' independence and proactiveness is one of the most important problems of modern methodology of teaching special disciplines, pedagogy and psychology. Productive work of students in the higher educational institution should form not only solid knowledge, but also the ability to use them in various situations, independently acquire knowledge, shape experience in solving problem situations. The development of independence and proactive attitude does not happen by itself, it is the result of purposeful interaction and organization of the pedagogical environment, i.e. the use of pedagogical technology. The key ones are related to the use of active or interactive learning methods.

Aims of the Study: The aim of this article is to study the learning methods that turn the classes in the higher educational institutions into more effective and productive for students. The methodological framework includes the following methods: theoretical, analysis of pedagogical and psychological literature on the studied problem; analysis, synthesis, generalization, classification of information; empirical methods.

RESULTS AND DISCUSSION

The activation of the educational process is interpreted as the construction of such learning process, which involves the organization of the educational process on a scientific basis, creating conditions for creative thinking, research work of students, generates students' interest in their future specialty, etc.

In this regard, among the requirements for university teachers are the ability to work under new conditions, effectively use interactive methods, the ability to correctly convey their thoughts, prove their point of view and capacity for dialectic argumentation.

The success of the educational process for students is ensured by the implementation of:

- interactive methods;
- relationships between teachers and students based on partnership and cooperation.

Given these features, an important issue today is the training of future teachers in accordance with the requirements of modernity. The paradigm of education at the world level requires the focus of education on the result, on the student's personality, the construction of learning methods based on interpersonal relationships. The fact that Kazakhstan has chosen a democratic path of development increases the role of society in decisionmaking. In this area, methods that increase student activity are called interactive. These methods, which seem simple at first glance, have their own peculiarities and difficulties. This contributes to the situation when all students are involved in the cognitive process, having the opportunity to evaluate their knowledge and express their attitude to the studied objects. As emphasised Krusche with co-authors (2017) "interactive learning tightens the relationship between content delivery and problem solving in class by integrating multiple, small units of content delivery and content deepening through exercises (Abykanova 2020 et al).

In the course of dialogue-based training, students learn to think critically, solve complex problems based on the analysis of circumstances and relevant information, weigh alternative opinions, make thoughtful decisions, participate in discussions, and communicate with other people. To do this, the classes are organized in pairs and groups, research projects, role-playing games are used, documents and various sources of information are processed, and creative works are used. The student becomes a full participant in the educational process, student's experience serves as the main source of educational knowledge (Abykanova et al., 2020).

These behaviours are not learned by memorizing and rapidly and automatically reassembling them into a whole. Instead they must be constructed by learner's own attempts to use personal experiences and past learning to bring meaning to and make sense out of the content provided. According to Gleason and colleagues, it is important for teachers to make a transition of their concept of learning from simple knowledge acquisition, with learners memorizing by rote, toward more consequential knowledge construction with application of skills. Extending learning to include knowledge and skill applications can require a substantial change in how teachers both understand and approach the teaching-learning process. This transition moves from an instructor-centred and often lecture-based teaching format toward a learner-centred teaching format that may include discussion and case-based applications.

The functions of a teacher in higher education are not limited to the mere transfer of scientific knowledge (using passive teaching methods), they also include the choice of an optimal teaching strategy, the use of modern educational technologies aimed at creating a creative atmosphere of the educational process. Interactive learning process often involves the use of educational information technology (EIT) tools to facilitate the students' engagement and upgrade the overall process. EIT should be understood as an application of information technology to create new opportunities for transferring knowledge (teacher's activity), perceiving knowledge (student activities), assessing the quality of education and, of course, the comprehensive development of student personality during the educational process. Moreover, the main goal of educational informatisation is to train students for full and effective participation in the everyday social and professional fields of life in the information society.

Interactive learning technologies imply such an organization of the learning process in which it is impossible for a student not to participate in a collective, complementary process of learning based on the interaction of all its participants. Students use personal and social capability to work collaboratively with others in learning activities, to appreciate their own strengths and abilities and those of their peers and develop a range of interpersonal skills such as communication, negotiation, team work, leadership and an appreciation of diverse perspectives (Bidabadi et al., 2016).

The main requirements for successful learning with interactive technology are as follows:

- Positive interdependence: group members should understand that shared learning activities benefit everyone;
- Direct interaction: group members should be in close contact with each other.
- Individual responsibility: each student must master the proposed material, and each is responsible for

helping others. More capable students should not do other people's work.

- Developing teamwork skills: students must master the interpersonal skills necessary for successful work, such as interviewing, assigning, and scheduling tasks.
- Performance evaluation: during group meetings, it is necessary to allocate special time so that the group can evaluate how well it is working.

The difference between interactive learning methods and traditional learning methods is the use of life experience, the disclosure of personal and professional abilities through the analysis and systematization of information. In the traditional system, instruction was teacher-centred and the students' needs and interests were not considered. This is when students' instruction must change into a method in which their needs are considered and as a result of the mentioned method active behaviour change occurs in them. Modern higher education training involves not only students' acquisition of knowledge and the formation of professional skills, but also the development of creative and communicative abilities of the individual in the process of active cognitive activity. The practical application of problem-based and developmental learning has led to the emergence of socalled active methods that combine means and forms of learning that stimulate cognitive activity and create conditions for creativity and collaboration between teachers and students (Abykanova et al., 2020).

If the classical teaching method allows evaluating theoretical knowledge more accurately, the interactive one requires evaluating the correct construction of the speech, reasoning, possession of the categorical apparatus, the desire to identify the content of concepts, the ability of students to think logically, make decisions, and offer alternatives that were previously ignored. An important factor is taking an active part in the discussion and preparing the final report on the issue under discussion. Through interactive methods, students master the following knowledge, qualifications, skills and abilities:

- development of critical thinking and reflective reasoning abilities;
- analysis and evaluation of own ideas and actions;
- independent understanding, comprehensive analysis and ability to select/filter information;
- independent formation of new knowledge;
- participation in discussions, defending own opinion;
- making decisions and solving complex issues.

Therefore, in the process of interactive learning, students should be prepared for the following actions:

- collaboration;
- activity in terms of perception, communication and sociality.

In the process of interactive learning, students learn to formulate their opinions, correctly convey their thoughts,

Bakytgul et al.,

justify their opinions, conduct a discussion, listen to others, respect and consider other opinions and points of view (Dvulichanskaya 2011).

Interactive training includes the following types of work:

- 1. Brainstorming: a flow of questions and answers, or suggestions and ideas on a given topic, in which the analysis of the correctness is made after the activity.
- 2. Interactive lesson with the use of audio and video materials, ICT. For example, online tests, working with electronic textbooks, training software, and training websites.
- 3. Round table (discussion, debate): a group type of activity that involves a collective discussion of problems, suggestions, ideas, opinions by students and a joint search for solutions.
- 4. Business games (including role-playing, simulation games, etc.) are a widespread method that can be used even in elementary school. Business role-playing game is a specific type of human interaction that is aimed at simulation of a set reality providing its participants with the necessary freedom of actions within this reality. During the game, students play the role of participants in a particular situation, trying on different professions.
- 5. Aquarium is one of the types of business game that resembles a reality show. In this case, the given situation is played by 2-3 participants. Other students stay watching and analyse not only the actions of the participants, but also the options and ideas proposed by them.
- 6. Project method implies the independent development of a project by students on the topic and its subsequent defence.
- 7. Presentations are the easiest and most accessible method to use in the classroom. The method implies a demonstration of slides prepared by the students on a particular topic.
- 8. Case study have been used as learning method since the last century. It is based on the analysis of simulated or real situations and the search for a solution. There are two approaches to creating cases: American school offers a search for a single correct solution to the problem; European school, on the contrary, welcomes the diversity of solutions and their justification.
- 9. Problem lecture, in contrast to the traditional one, implies knowledge transfer that takes place in an active form. That is, the teacher does not present previously prepared statements, but only puts questions and indicates a problem. The rules are drawn by the students themselves. This method is quite complex and requires students to have a certain experience of logical reasoning.
- 10. Didactic games, unlike business games, are strictly regulated and do not involve the development of a logical reasoning to solve the problem. Game methods can also be referred to as interactive learning methods. It depends on the choice of game. Thus, popular games-adventures, performances,

quizzes, humour games are techniques from the array of interactive methods, as they involve interaction of students with each other. The didactic games integrated into the lessons bring variety, joy, prevent monotony and boredom, the integration of the game as an active-participative method in the teaching-learning-evaluation process determines a greater efficiency of the lessons, reflected in the results of the students. to the development of the inventive and creative spirit, of the thought and imagination, of the interest for lessons. The basket method is based on simulating the situation. For example, a student should act as a guide and conduct a tour of a historical museum. At the same time, student's task is to collect and convey information about each exhibit (Gagach 2012).

Conducting an interactive lesson requires following a particular algorithm:

- Preliminary methodological preparation. The teacher selects a topic, situation, identifies concepts, terms, documents to be learned, and selects the appropriate form of conducting an interactive lesson that is most effective for certain group on a given problem.
- Conducting a lesson. Such a lesson includes an introduction, the main part and summing up. The teacher informs the topic and purpose of the lesson, students get acquainted with the problem situation, the goal of which is to achieve its solution, under the conditions and rules of working in groups. Since conducting such an activity should take place after the basic concepts and definitions of a given topic were learnt, based on the knowledge base available to students, the teacher should seek to the assimilation of the conceptual framework, establish the connection between the new material and that was previously learned. The lesson should be lively and interesting, but at a high methodological level. Dialogue and cooperation are the main key concepts at this stage. The lesson is conducted according to a pre-developed scenario. The specific content of an interactive lesson is determined by its type and form.
- Summing up the lesson. This stage begins with self-evaluation of students' activities, reviewing the responses of other students, and emotional evaluation of the lesson. Then the evaluation part is carried out (the attitude of participants to the content aspect of the methods used, the relevance of the chosen topic, etc.). This reflection ends with general conclusions made by the teacher.
- Thus, interactive learning methods based on interpersonal relationships meet the paradigm of modern education aimed at "personal development". At the same time, interactive methods not only form the activity of perception and personal significance in learning, but also develop them.

CONCLUSION

Nowadays, higher education training should provide not only for students' passive acquisition of knowledge and the formation of professional skills, but also for the development of creative and communicative abilities of the individual in the process of active cognitive activity. The practical application of interactive learning involves active methods that combine means and forms of learning that stimulate cognitive activity and create conditions for creativity and collaboration between teachers and students. The conducted analysis showed that interactive learning methods greatly contribute to the development of student's independent thinking activity and lay the ground for the student-teacher or student-student collaboration, and thus bringing educational process closer to the every-day communicative reality of the future specialists when they will be required to seek solutions through teamwork. During such interactive classes, students share their knowledge and opinion, jointly developing the right solutions. The interactive learning forms increase students' motivation and thus enhances the productivity of the educational process. Therefore, successfully combining the traditional and interactive learning methods increases the involvement of students into thelearning process and contributes to the development of students' independence.

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Finely-Grained Real-Time Facial Emotion Recognition Towards Neural Network

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ABSTRACT

Over the past assorted decades, one of the most agile spheres of research is the emotion recognition. The grounds of this study is to come forward with finely grained real-time learning model of emotion recognition comprising of phases like feature extraction, subset feature and emotion classifier. Haar Cascade technique is being used for identifying the input figure to identify the characteristic values. This work also aims to classify human emotions like fear, neutral, angry, surprise, happy and sad by using two classifiers; Long Short Term Memory (LSTM) and Convolutional Neural Network (CNN) by deploying a finely grained real time emotion recognition algorithm using virtual markers. Initially, Haar Cascade was used for eyes and face discernment, then Neighborhood Difference Features (NDF) were extracted and virtual markers are being positioned on designated places on identified face using VGG16 approach. The facets are validated using cross-validation and forwarded to CNN and LSTM classifiers. Experimental results of loss function, confusion matrix, classification report of training and testing had proved that the model proposed give consistent output with the real time facial expressions.

KEY WORDS: DEEP LEARNING (DL); CONVOLUTIONAL NEURAL NETWORKS (CNN); INTERNET OF THINGS (IOT); FACIAL LANDMARK; VGG16; LONG SHORT TERM MEMORY (LSTM).

INTRODUCTION

The recognition and classification of human emotion has recently been a hot topic, worldwide. The emotional and mental state of a human can be identified by the expressions on his face. While communication, a human expresses numerous emotions which vary in complexity and intensity thus may have different meaning. Broadly, the main categories of human emotions are angry, fear, happy, neutral, sad, surprise and disgust. Moreover, the mixed emotions can also be expressed by the permutation of these basic emotions. Recognizing facial emotions



can bridge the communication gap among human and machine (Busso et al., 2004).

The introduction of the Internet of Things (IOT), smart environment at various places like hospital, cities, hotels and smart cities has laid much importance on automatic emotion detection. Presently, there are number of Natural Language Processing (NLP) based Intelligent Personal Assistants (IPA's) which are in use worldwide such as Alexia, Siri, Cortana etc. Facial Emotion Recognition (FER) has number of application areas such as identification of anti-social elements, detecting the drowsiness of drivers in real time, in helping the medical practitioners to analyze the synthetic human expressions and identification of mental disorder, video surveillance, security systems, auto face capturing and many more.

FER is a challenging issue to be solved in the computer vision community, thus it is very essential to deploy a system which categorizes human emotion with high accuracy and minimum loss in feature extraction. The pipeline of our proposed framework is depicted in Figure



1, which explains the part of the training and testing phase and how the facial expressions are categorized into different emotions. The continuing part of the paper comprises of section 2 which discuss the recent related work. Proposed approach along with methodology has been presented in Section 3. Section 4 explains the experimental setup done for evaluating the model followed by result analysis and lastly section 5 concludes with the work done (Puri et al., 2005).

PROPOSED METHODOLOGY

A finely-grained facial emotion recognition system has been proposed where the emotional state of the user is being monitored in real-time. Each image goes through the preprocessing steps of the module and after completion of all the steps it gives recognized emotional state of the user as the output. The proposed framework comprises of robust features which filters irrelevant and redundant information from the identified face. It is also expandable to classify complex emotions. The proposed model can be divided into three modules, listed below:

- Haar Cascade Face Detection
- Neighborhood Difference Features Extracted
- VGG16 Emotion State Classification



In the first step, categorical data containing the labeled images of seven basic human emotions is being collected and for that purpose we have used FER2013 dataset for training and testing the model. Secondly, we have preprocessed the data by balancing the unbalanced data, rescaling, resizing the images, normalizing, and adding data- argumentation; that is the process of adding modified copies of already existing data like randomly rotating images at a particular angle, cropping them, shear shifting and flipping images. The pre-processed data is then split into two parts testing and training part. The training part is of 75% ratio and the testing part is in the ratio of 25%. Then we have performed Data Standardization by converting the structure of disparate data into a data format common to all images in the dataset. After splitting the dataset and performing data standardization we have developed Convolutional Neural Network model (Chowdhury 2013).

Figure 2 shows the self descriptive flow diagram for real time facial expression recognition. For detecting the emotion on the face of a person in real-time, the real time images as input has been taken from the live camera and their coordinates are extracted. Further, for face detection Haar-Cascade technique is being used. On successful face detection, the image is converted into grayscale. A rectangular frame is created over the face of the person using the Region of Interest (ROI) extracted coordinates. The processed image is fed to the model for classification of emotions. The image in the ROI is then rescaled and resized using cv2 in accordance to the shape and size acceptable by the CNN model. The model then categorizes the image into one of the seven emotion categories and the emotion having maximum probability is stored in result and the result is displayed on the label (Howarth & Jaokar 2019).



Algorithm 1 : Real Time Facial Emotion Detection Input : face_image Output : Emotion

Begin

Step 1: model = model_from_json() Step 2: model.load_weights() Step 3: input image from the camera Step 4:detect face in image Haar-Cascade.detectMultiScale() if face_image.sum()!=0: goto step 5. else: goto step 3. Step 5:image = image_to_grayscale() Step 6: create ROI for (a,b,c,d) in face: where a, b, c and d are the face coordinates draw_rect ((a,b),(a+c, b+d)) image_resize() Step 7:model.predict() output Step 8: result = max(prediction) Step 9:putText(prediction_label) Step 10: end

Proposed Algorithm: A finely grained algorithm for real time facial emotion detection has been explained in this section. The inputs are the various expressions expressed on the face. As an output, this algorithm will classify the emotion on the input image (H.C.Lu et al., 2007).

According to this algorithm, the real-time images are taken as input from the camera. Using Haar-Cascade, if the frame identifies any image then that image is converted to grayscale for training else the frame reidentifies for an image. After converting an image into grayscale, create a rectangular ROI box which is created around the face on camera frame. The obtained image is then passed to the model for making the predictions on seven different emotions. The model then produce the probability values of all the identified emotions with maximum probability among the seven different classes will be displayed as the output on the label.



Model Definition: Convolution Neural Network: The mathematical operation is used on two functions, namely f and g and produces a third function (f*g) which explains the procedure of modifying the shape using other functions known as convolution. It is mainly used in digital signal processing, functional analysis, matrices, image and signal processing. It is a sliding window function applied onto matrix. The convolution is applied to images for transformation; represented in matrix as shown in Figure 3. A digital image is stored as matrix of numbers where all the numbers signifies the brightness of a single pixel; ranging from 0 to 255. According to the RGB channel, the colour picture comprises of three matrices associated with three colour channels i.e. red, green and blue. In the images, the convolutional neural network is used to look for different patterns using mathematical multiplication. Two matrices are taken as image matrixes are multiplied to obtain a signifying feature. A filter or a kernel corresponds to a feature that is

being looked in an image like horizontal or vertical edge detection filters, shape detection, colour detection etc. This kernel is applied to image and subsequent feature map values (Hupont et al., 2013).

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$$G(x, y) = (f * h)[x, y] = \sum_{j} \sum_{k} h[j, k] f[x - j, y - k]$$
(1)

where, G is the output matrix or image, f is an input image, h is kernel and the index of resultant matrix is marked with x and y. The kernel is placed on the image over the selected pixel; which is multiplied pair wise and finally summed up. Then, the next pixel value is selected and so on this process is repeated till last image.

h, w =
$$\left(\frac{g_h - k_h + 2p}{s} + 1\right)$$
, $\left(\frac{g_w - k_w + 2p}{s}\right)$ (2)

where, w represents width of an image h represents height of an image, k is kernel g is input image p is padding size s represent stride

Model Evaluation And Results

3.1. Loss Function: Typically, a neural network is trained using the stochastic gradient descent method and perfect weights for model is calculated using back propagation method of error algorithm. The model with a given set of weights is used to make prediction. The errors for those predictions are calculated. The gradient evaluation seeks to change the weights so that the model gives minimum error. The error function or loss function is used in model optimization which is needed to minimize over the iterations of back propagation. The loss function used in model compilation is the categorical cross entropy, as it is a categorical classification task. The binary cross entropy is calculated.

$$loss = -\frac{1}{N} \sum_{i=1}^{N} y_i * \log(y_i') + (1 - y_i) * \log(1 - y_i')$$
(3)

Where vi' is ith value of model output, vi is corresponding true value and N is the total number of values. To calculate binary cross entropy loss function consider a model using sigmoid function in output which predicts the following values

y'i = [0.8, 0.4, 0.1] yi = [1, 1, 0]

According to the above formula the loss would be

 $loss = -(1^*log(0.8) + 0^*log(0.2) + 1^*log(0.39) + 0^*log(0.6)$ $+ 0^{*}\log(0.1) + 1^{*}\log(0.9)$ = 0.541/3

= 0.18

Categorical Cross entropy can be calculated as follows:

$$loss = -\sum_{i=1}^{N} y_i * \log(y'_i)$$

Figure 4: Model Evaluation 113/113 [========================] - 4s 38ms/step - loss: 1.1666 - accuracy: 0.6658 final train accuracy = 91.03 , validation accuracy = 66.58

For the dataset taken, the accuracy obtained in 60 epochs. We have achieved an accuracy and loss of 91.03% and 0.373 on the training dataset, and 66.58% and 1.667 on the testing dataset as shown in Figure 4. So, the model is analyzed based on the two factors i.e. model loss and model accuracy for each epoch for training and testing data. The analysis has been depicted graphically in Figure 5 and Figure 6. The system has the capability to detect the face landmarks in real time. The various facial features are then identified by change in these landmark points whenever the person facing the camera expresses any emotion. The system calculates the landmark variations and predicts the emotion on the face.

3.2. Confusion Matrix for Training and Test Set: The confusion matrix represented in tabular form describes the performance of a classification model or classifier on the data for which the true values are already known. It will tell on how many images of a particular class the model makes a particular prediction and how many of them are correct and incorrect. For training set, the model was able to make 518 correct predictions out of 3995 images in class anger, 51 in disgust and so on. Table 1 shows the confusion matrix for training set and Table 2 shows the confusion matrix for testing set.





Table 1. C	Table 1. Confusion matrix for Training set							
	Angry.	Disgust.	Fear.	Нарру.	Neutral.	Sad.	Surprise.	
Angry	518	51	533	1045	726	648	438	
Disgust	80	9	54	103	71	68	51	
Fear	604	56	539	1048	720	674	456	
Нарру	984	107	954	1847	1319	1207	797	
Neutral	666	66	633	1269	869	886	549	
Sad	637	67	671	1222	901	733	559	
Surprise	424	48	426	828	605	511	329	

(4)



Table 2. C	Table 2. Confusion matrix for Test set							
	Angry.	Disgust.	Fear.	Нарру.	Neutral.	Sad.	Surprise.	
Angry	133	12	96	253	187	169	108	
Disgust	12	6	11	30	21	19	12	
Fear	131	9	123	259	212	166	124	
Нарру	223	18	209	450	349	324	201	
Neutral	177	10	160	281	253	229	123	
Sad	194	12	146	287	235	220	153	
Surprise	112	11	101	211	169	115	112	

Table 3. Classification Report for Train set						
	Precision	Recall	F1-Score	Support		
Angry	0.13	0.13	0.13	3995		
Disgust	0.02	0.02	0.02	436		
Fear	0.14	0.13	0.14	4097		
Нарру	0.25	0.26	0.25	7215		
Neutral	0.17	0.18	0.18	4965		
Sad	0.16	0.16	0.16	4830		
Surprise	0.10	0.10	0.10	3171		
Accuracy	0.17	28709				
Macro avg	0.14	0.14	0.14	28709		
Weighted avg	0.17	0.17	0.17	28709		

Table 3. Classification Report for Train set						
	Precision	Recall	F1-Score	Support		
Angry	0.14	0.14	0.14	958		
Disgust	0.01	0.01	0.01	436		
Fear	0.15	0.12	0.13	1024		
Нарру	0.25	0.25	0.25	1774		
Neutral	0.18	0.21	0.19	1233		
Sad	0.18	0.18	0.18	1247		
Surprise	0.13	0.13	0.13	831		
Accuracy	0.18	7178				
Macro avg	0.15	0.15	0.15	7178		
Weighted avg	0.18	0.18	0.18	7178		

3.3 Classification Report for Training and Test Set: The visualizer of classification report depicts the F1, recall, precision, and supports score for designed model. The visualization of classification metrics per class basis has been done in classification report. It provides a deeper intuition of the classifier behaviour over global accuracy, which can mask the number of functional weaknesses in one class of multiclass problem (Karen & Andrew 2015).

In FER 2013, support for class disgust is very low (436) whereas for class happy is as high as 7215 images. The imbalanced support in the training data indicates the

structural weaknesses in the model. Table 6 shows the classification report for training set and Table 7 shows the classification report for testing set.

CONCLUSION AND FUTURE WORK

In this paper, the limitations of existing emotion recognition system have been analyzed. Considering the limitations of the existing model, a new model has been proposed and implemented for emotion recognition on the basis of facial recognition in virtual learning environments, at the same time their efficiency and accuracy are also considered. HAAR Cascade technique is used to extract facial features and Region of Interest (ROI) identifies all kinds of emotions through the CNN model, and achieved a combination of efficiency and accuracy. It is applicable to real time images.

The application of emotion recognition in virtual learning environments is one of the most researched topics. This system also aims to assist the Intelligent Personal Assistants (IPAs), medical practitioners and physically disabled people. In addition to this, it will be beneficial to the researchers and scholars to explore new dimensions in this field. For future work, techniques can be used to extract more features from Residual Network, Dense Net and Inception Network.

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Fusion of Medical Images Using Adaptive Pulse Coupled Neural Networks Based on QCSA Optimization

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ABSTRACT

The goal for fusion of image is to incorporate descriptions of the same scene from multiple images. A new image that is more appropriate for human and machine interpretation or more image-processing tasks such as segmentation, extraction of features and object detection is the result of image fusion. In this article, fusion of MRI and CT images are proposed and new model is designed to approach the fusion based on neural networks and Optimization technique which works better and gives good results. In this a paper, an adaptive pulse coupled neural networks (PCNN) is used to determine the right parameters, these parameters are optimized using Quantum Cuckoo Search Algorithm (QCSA). The reliability and accuracy of the image is increased by performing optimization technique. The fitness function of the proposed optimization technique is defined using image entropy (EN), average gradient (AG) and spatial frequency (SF) of image for finding the optimal solution. Various parametric values are being tested to show that the suggested QCSA-PCNN is superior compared with other current technique like QPSO-PCNN. The PSNR obtained using QPSO-PCNN is 40.82, the proposed QCSA-PCNN the Peak signal to noise ratio (PSNR) value is 43.79. The QCSA-PCNN method has good Structural Similarity Index (SSIM) with 0.99 compared to QPSO which has 0.96. The experimental results are conducted using MAT Lab method.

KEY WORDS: IMAGE FUSION, PULSE COUPLED NEURAL NETWORKS, FITNESS FUNCTION, QPSO, QCSA.

INTRODUCTION

Image fusion is a method for using image processing techniques to merge multimodal images. Specifically, the goal is to combine diverse and complementary evidence in order to boost the details visible in the photographs and to maximize the clarity of the interpretation (Shih-Huang 2010, Vasuki et al., 2012). Complementary input from multiple modalities is required because of the introduction of new diseases. For scanning of sensitive tissues, such as the brain technology used are MRI and CT scans which are helpful in obtaining the depth of problem involved.



The best information on denser tissue is provided by CT and better soft tissue information is provided by MRI (Mamatha et al., 2012). These complementarities have contributed to the belief that integrating photographs obtained with multiple medical instruments would yield an image that can contain more data than individual images. The accuracy of result can be high by merging of two images i.e. MRI image and CT image (Sekhar et al., 2011). The fusion of images is closely connected to many various areas of image processing, such as Images acquired form satellite, dense areas, and highly recommended in medical field. Initially the research on image fusion is performed for satellite imaging, based on the results obtained the field of research is extended for medical imaging.

With each fusion process, different methods are classified into a spatial domain (such as Principal Component Analysis (PCA), Hue Strength Saturation (HIS) and Brovey Transform) and a transform domain (such as Discrete Wavelet Transform (DWT), Curvelet Transform (CT),



Non-sampled Contoured Transform (NSCT)) (Shavetha et al., 2014 & Kaur et al.,2016). The multi-resolution single value decomposition (MSVD) was introduced by (Kakarala et al., 2001) from the principle of singular value decomposition.

The MSVD transformation allows it possible to decompose the picture into sub-bands of low pass and high pass. MSVD is used and thanks to the multi-resolution property for various multi-resolution signal and image manipulation, such as image fusion (Goutam et al., 2015 Et Varsha et al., 2014) and image de-noising (Malini et al., 2015). The MSVD dependent picture fusion method is suggested in (V.P.S Naidu, 2011) this gives a reliable finding that is better than wavelets. It is very simple to implement, very easy to quantify, and has no defined range of fundamental vectors, such as the wavelet and the Discrete Cosine transformation (DCT). The Pulsecoupled Neural Network (PCNN) is a biologically guided neural network. It has the global binding and pulse synchronous character of neurons. In recent literature, several image fusion algorithms based on the PCNN model have been created in several works that provide good results (M Subashini et al., 2014).

Intelligent optimization algorithms have been implemented by several researchers to improve PCNN parameters, and many adaptive PCNN models have been suggested, such as PCNN (Wang et al., 2015), PSO-PCNN (X Z Zu et al., 2011), QPSO-PCNN (S F Ding et al., 2012), MDE-PCNN (Ziang et al., 2012), and FOA-PCNN (Zhoa et al, 2014). The above processes, though, have their own shortcomings and need to be solved. For example, to enhance the search effectiveness and generalization ability, the fitness function of these optimization algorithms should be changed. In this article, the algorithm for Quantum Cuckoo search optimization is considered and assessed. The presence of cuckoo quest has two phases: one is the development process and the other is the refining phase in which it is possible to achieve the optimal solution.



MATERIAL AND METHODS

PCNN Models: One of the common models which are considered for various image processing applications are PCNN. Some of the applications are segmentation of image, de-noising of image, attribute detection, recognition of pattern, fusion of images etc. (Subashini et al., 2014) The PCNN model consists of two points of distinction. The first one is that neurons tend to pulse together with similar intensities correlated with each community of spatially linked pixels. Secondly, depending on the value of threshold, this decreases the other neurons exponentially. There are three sections to the PCNN model: input receptive field, connecting modulation and generator of pulse, as seen in Fig. 1 of Wang et al., 2015.

The receptive area is the portion of the input that consists of the linking and the feeding networks, two forms of inputs. The distinction among the inputs lies in the truth that external stimuli are provided to the linking connections. Moreover, they have a continuous reaction time that is higher than the feeding ties that receive external and local stimuli. The following equations given below describe the model of PCNN for nth iteration:

$$F_{ij}[n] = e^{(\alpha_F \delta_n)} F_{ij}[n-1] + S_{ij} + V_F \sum_{kl} M_{ijkl} Y_{kl}[n-1]$$
⁽¹⁾

$$L_{ij}[n] = e^{(\alpha_L \delta_n)} L_{ij}[n-1] + V_L \sum_{kl} W_{ijkl} Y_{kl}[n-1]$$
⁽²⁾

 F_{ij} [n] is said to be the initial feeding compartment of the neurons i and j. L_{ij} [n]Is the output of the compartment linking S_{ij} is the stimulus of input image pixels in positions of i and j. Y_{kl} Indicate the neurons output based on the previous iteration [n -1];

 $M_{_{ijkl}}$ and $W_{_{ijkl}}$ are the Gaussian weight functions that are constant with the distance;

The voltage i.e. inherent of the network is termed as $\rm V_{_F}$ and $\rm V_{_I}$

The internal state of neurons are created by combining the states of two compartments and the activity of neuron U_{ij} [n] is evaluated using equation (3) which is given below,

$$U_{ii}[n] = F_{ii}[n](1 + \beta_{ii} L_{ii}[n])$$
(3)

 β is the coefficient of linking

To produce pulsating output 'Y' the internal state of the neuron is compared to a threshold θ_{ii}

$$Y_{ij}[n] = \{ \begin{array}{c} 1, U_{ij}[n] > \theta_{ij}[n] \\ 0, Otherwise \end{array}$$
(4)

When the pulsating output is greater than the threshold value, the neurons will improve, which directly leads to

increase in threshold value. The threshold value gradually decreases until the next neuron gets fired. In this process the threshold value is said to be dynamic. The process is described by,

$$\theta_{ij}[n] = e^{(-\alpha_T)}\theta_{ij}[n-1] + V_{\theta}Y_{ij}[n-1]$$
⁽⁵⁾

Where V_{θ} is represented as a large constant greater than the average value of U_{μ} .



Ouantum Cuckoo Search Algorithm: In standard cuckoo search (CS) all the cuckoos have indistinguishable pursuit practices. Thus, all the people of the populace have a similar system to compute the new update. It depends on the worldwide best arrangement and the current one. Along these lines, the calculation may trap in neighborhood optima prompting untimely assembly. Anyway in quantum cuckoo search (QCS) non homogeneous update is performed by choosing arbitrarily one update of three ones with a similar likelihood of appearance. The first is the update given in standard CS. While, the two different ones are motivated from the quantum hypothesis.

The quantum hypothesis has acquainted new ideas with old style material science. In any case, the most principal condition of the quantum hypothesis is the Schrödinger condition, created in 1926 by the Austrian physicist Erwin Schrödinger. It has significant applications in material science and different fields. The condition is a sort of differential condition known as a wave condition, which fills in as a numerical model of the development of waves. The time-subordinate Schrödinger wave condition for a particle decides how the wave capacities develop through reality and it is represented by the following condition:

$$jh\frac{\partial}{\partial t}\Psi(r,t) = \left[\frac{h^2}{2m}\nabla^2 + V(r,t)\right]\Psi(r,t)$$
(6)

where, j is imaginary unit, h is the reduced Planck constant, $\Psi(r,t)$ is the wave function of the quantum system at position and time, is particle's mass, () is the potential and is the Laplacian operator. In QCS,

each cuckoo is viewed as a particle traveling in an N-dimensional Hilbert space with a given energy, and in this way its condition is described by a wave work that relies solely on the circumstance of the molecule. In the long run, the condition of the molecule is calculated using the Monte Carlo backwards shift. The way to approximate the condition of the molecule in quantum mechanics is solved by falling the quantum state to the conventional state. The solution of |X| isgiven by:

$$|X| = \frac{L}{2} ln\left(\frac{1}{\eta}\right) \tag{7}$$

A random number uniformly distributed on (0, 1) is η and ln is the natural logarithmfunction.

By putting
$$L = 2\delta |\bar{x} - x_i| ln \left(\frac{1}{\eta}\right)$$

The current position x_i and the mean position x^- of the population of size n is calculated by:

$$\bar{x} = \sum_{j=1}^{n} x_j \tag{8}$$

The first new update is given by the following equation:

$$x_{i+1} = \bar{x} + \delta * (\bar{x} - x_i) * \ln(1/r)$$
(9)

Where δ is a control parameter, and r is a random number taken from a uniform distribution interval of [0, 1]. In order to ensure that there is no significant fluctuation across the world's best nest (x_b), the second latest upgrade is based on the equation (10) given below,

$$x_{i+1} = \bar{x} + \delta * (x_b - x_i) * exp(r) \tag{10}$$

Proposed PCNN-QCSA Image Fusion: Three parameters $\alpha\theta$, β and V θ are important for obtaining the results of image fusion in PCNN model. The figure 3 shows the process of proposed methodology in which the optimization technique i.e. QCSA which is used to optimize the PCNN model to achieve optimal solution for the parameters evolved in PCNN. The Cuckoo is initialised for defining the spatial solution x ($\alpha\theta$, β and V θ) and the best cuckoo need to identify which is given as x_b ($\alpha\theta$, β ,and V θ) for configuring the best optimal solution of parameters in PCNN.

Possible parameter configuration schemes, which establish an answer space for boundary improvement are depicted in our proposed interaction. Cuckoo in the population is partitioned into m gatherings in the wake of delivering an underlying cuckoo arrangement space, and each gathering is subject to each other. Beginning with the underlying arrangement, the cuckoo initially plays out an intra-class enhancement through a neighbourhood search in every classification, continually refreshing their own wellness esteems. The proficiency of the entire cuckoo populace is advanced in N emphases of neighbourhood improvement with the upgrade of the nature of cuckoos on the whole classes.

Kavita et al.,

In consistence with the characterized law, the cuckoos of the population are then intertwined and pulled together and neighbourhood advancement inside the gathering is done until the last states of emphasis are met. Finally, the global optimal cuckoo population solution is defined as the optimal configuration of the PCNN parameters. Using the optimum parameter setup above, the final fusion picture is thus obtained.



RESULTS AND DISCUSSION

Fusion performance using QPSO and QCSA is obtained and separate parametric values are also determined, taking into account various combinations of CT image and MR image. In this experiment, picture sharpness, reciprocal knowledge, standard deviation (STD), spatial frequency (SF) are used as the standard for estimating the output of various methods for the purpose of objectively judging different methods. Structural similarity (SSIM), image entropy and Mutual Information (MI) have also been used to approximate the efficiency of various methods. The amount of knowledge that the picture holds is defined by image entropy. The standard deviation reflects the pixel gray level distribution of the image. The smaller the standard deviation is, the greater the comparison. The level of similarity between the groundtruth image and output image is defined as Structural similarity (SSIM) was proposed by (Wang et al., 2004). The results are performed on various set of images.

Image2: In this condition we consider different image to test the level of accuracy of the obtained results. The

more the test cases the better the illustration of proposed methodology.



The overall performance of the proposed methodology is shown in terms of PSNR (Peak Signal to Noise Ratio) and SSIM (Structural Similarity Index). These parametric values are evaluated using QPSO-PCNN and QCSA-PCCN methods. The proposed method shows good results in terms of both PSNR and SSIM as shown in table 5.

Table 1. Parametric Values evaluated for	Image1								
Parameters/ Technique	Sharpness	STD	Entropy	Spatial Freq	SSIM A	SSIM B	MI_A	MI_B	MI_F
Proposed QCSA	14.55	57.3	7.09	89.8	0.68	0.74	7.08	6.73	2.09
QPSO	7.76	65.1	6.34	23.5	0.75	0.70	3.79	3.28	0.58
Laplacian	7.083	56.99	4.52	19.63	0.75	0.66	0.95	0.90	1.86
Approach									
(P J Burt et al., 1983)									
Dual channel PCNN (Y.D Ma et al., 2008)	1.025	15.35	3.96	6.63	0.66	0.671	0.89	0.84	1.73
MDE PCNN (G Y Wang et al., 2015)	3.87	34.85	4.53	10.26	0.75	0.674	1.71	1.00	2.72
EL-DC-PCNN (Y Li et al., 2014)	3.89	35.65	4.53	9.99	0.75	0.670	1.72	1.00	2.72



Table2. Parametric Values evaluated for	Image2								
Parameters/ Technique	Sharpness	STD	Entropy	Spatial Freq	SSIM A	SSIM B	MI_A	MI_B	MI_F
Proposed QCSA	15.8	76.5	6.33	62.9	61.5	0.64	6.34	5.68	4.86
QPSO	8.2	60.35	4.65	25.2	76.7	0.67	2.77	1.77	1.09
Laplacian Approach (P J Burt et al., 1983)	8.124	57.67	5.18	20.14	0.78	0.55	1.04	0.68	1.73
Dual channel PCNN (Y.D Ma et al., 2008)	1.082	16.28	4.15	7.23	0.514	0.85	0.87	1.03	1.90
MDE PCNN (G Y Wang et al., 2015)	4.43	35.65	5.28	10.80	0.749	0.67	1.20	1.38	2.58
EL-DC-PCNN (Y Li et al., 2014)	4.88	36.34	5.35	10.87	0.795	0.56	1.89	1.03	2.93

Kavita et al.,



Table 3. Parametric Values evaluated for	image3								
Parameters/ Technique	Sharpness	STD	Entropy	Spatial Freq	SSIM A	SSIM B	MI_A	MI_B	MI_F
Proposed QCSA	19.04	81.3	6.18	105.4	0.82	0.99	6.18	5.57	5.81
QPSO	7.12	68	5.66	22.8	0.79	0.58	3.23	2.15	1.15
Laplacian Approach	8.21	57.67	5.18	20.16	0.78	0.55	1.04	0.688	1.738
(P J Burt et al., 1983)									
Dual channel PCNN (Y.D Ma et al., 2008)	1.102	16.28	4.15	7.23	0.51	0.85	0.87	1.035	1.908
MDE PCNN (G Y Wang et al., 2015)	4.63	35.93	5.41	11.80	0.76	0.566	2.08	1.055	3.143
EL-DC-PCNN (Y Li et al., 2014)	4.96	36.42	5.42	11.03	0.78	0.56	2.11	1.065	3.15



Table 4. Parametric Values evaluated for	Image4								
Parameters/ Technique	Sharpness	STD	Entropy	Spatial Freq	SSIM A	SSIM B	MI_A	MI_B	MI_F
Proposed QCSA	20.8	84.7	19.6	19.6	0.76	0.99	6.7	3.9	6.1
QPSO	5.55	63.3	25.88	25.8	0.79	0.59	3.6	2.4	1.3
Laplacian Approach	6.123	55.6	3.56	19.87	0.938	0.66	0.99	0.65	1.64
(P J Burt et al., 1983)									
Dual channel PCNN (Y.D Ma et al., 2008)	1.968	14.7	3.18	6.84	0.746	0.763	0.84	0.85	1.69
MDE PCNN (G Y Wang et al., 2015)	3.30	33.6	3.72	11.10	0.89	0.737	1.276	1.046	2.32
EL-DC-PCNN (Y Li et al., 2014)	3.35	34.7	3.9	9.48	0.87	0.735	1.277	1.10	2.37

 Table 5. Comparison of PSNR and SSIM

Different images/ Parameters	PS	SNR	SS	SIM
	QPSO	QCSA	QPSO	QCSA
Image 1	40.82	43.79	0.96	0.99
Image 2	41.37	42.30	0.96	0.99
Image 3	40.67	40.37	0.96	0.99
Image 4	41.9	44.9	0.95	0.99

CONCLUSION

To improve the human visual perception the images need to be enhanced. One of the promising techniques is image fusion method, which helps in producing a new enhanced image. The image fusion was carried over for multimodal images obtained from CT and MRI scans. One of the most effective techniques for fusion of medical images is PCNN. To obtain quantitative analysis of image fusion effects important assessment parameters need to be considered. The parameters are image entropy (EN), average gradient (AG) and spatial frequency (SF). The comparative study of image fusion techniques helps in selecting the best fusion approach and hence PCNN-QCSA achieves better visual concept of the fused image. The parameters tested show that PCNN-QCSA is strong relative to PCNN-QPSO. The final fusion performance is proved to be best in terms of PSNR and SSIM. The proposed PCNN-QCSA gives 99% SSIM and 44.9 PSNR value, this leads the proposed methodology to be used in wide range of medical applications.

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The Empirical Study of Association of Capital Structure and Profitability of Telecommunication Firms

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ABSTRACT

The study tries to evaluate the capital structure practices carried out by Tele Communication companies listed on BSE/ NSE. Debt equity ratio, Interest coverage ratio, current ratio as independent and return on net worth as dependent are the selected variables undertaken for the study. The study tries to undertake the data evaluation of selected variables for the tenure of ten years i.e. 2010-2019. The author used descriptive, regression and co-efficient of correlation for analysis. The research indicates that there is debt equity ratio has significantly positive relationship with profitability and Interest coverage ratio; current ratio has insignificantly positive relationship with profitability.

KEY WORDS: CAPITAL STRUCTURE, RETURN ON NET WORTH.

INTRODUCTION

Capital is huge part of the corporate activities, which are determined by the nature of the firm and size. Capital will increased by the difference sources. If the firm manage the capital structure very well, then it will increase huge profit of the firm and they will able to give dividends to their shareholders. Equity and debt are sources of finance for corporate company. Marketing is huge problem of capital structure for the particular company. It is basically worried about how the company chooses to partition its cash flow into two expansive segments, a fixed segment that is reserved to meet the commitments toward obligation capital and a leftover segment that has a place with value investors. Capital structure should be observed that it is effect on value of the company. If the capital structure can influence on value of the firm, then increase its market value. Though, capital structure is contradictory theories on the association with the value



of firm. The conservatives trust that capital structure influence the firm's value but there are some many differences of the traditional theory. In the capital market has no tax and argue that capital structure result is not significant. Modigliani and Miller inverse their place when they consider business firm taxes.

Litrature Rivew: (Kavitha 2014) analysed the 21 firms over a time period of ten years with span of 2002-03 to 2011-12 has been taken for analysis pharmaceutical firms. They had taken financial leverage as dependent variable and size of firm, business risk, liquidity, earning rate, tangible, debt service capacity, non-debt tax shield and degree of operating leverage as independent variable. Research used Karl Pearson's correlation, descriptive statistics, and regression coefficient for analysis. It was notice that factors are significantly affect to the financial leverage in these firm and insignificantly affect the risk, liquidity, non-debttax shield and degree of operating leverage.

(Jana Stekla, Marta Grycova 2016) analysed the 1572 firms over a time period of six years with span of 2009 to 2013 has been taken for analysis in agriculture holding companies. They had taken short term debt to total assets, long term debt to total assets, total debt to total assets, sale growth and firm size as independent variable and return on equity as dependent variable. They were using



descriptive statistics, correlation analysis and regression analysis. the result indicating that there is adverse association among short term debt to total assets, long term debt to total assets, total debt to total assets and return on equity.

(Sujeewa Kodithuwakku 2018) analysed the performance of ten Regional Plantation firm for a period of 7 years i.e. 2009 to 2015. The components considered are total debt to equity, debt to total assets and interest coverage ratio. Researcher used descriptive statistics and Ordinary Least Squire regression model. It was notice that the debt to equity ratio has negative association with share price. Further notice that the interest coverage ratio has positive association with share price. It was point out that there insignificance influence between the debt to total assets and share price. Narinder Pal Singh, Mahima Bagga (2019) the study has been evaluates the 50 nifty firms registered on NSC for the period of ten year i.e. 2008 to 2017. They had taken return on assets and return on equity as dependent variables and total liabilities to total assets and total equity to total assets. They used descriptive statistics, correlation and multiple panel data regression models for analysis. They studied the separate impact of the total debt and total equity ratios on return on assets and return on equity. It was concluded that there is positively important effect of company's profitability.

Ms. Shireen Rosario and Dr Kavita Chavali (2019) analysed the performance of 22 firms over a time period of 12 years with the span of 2006 to 2017 has been taken for analysis in hotel industry in India. They had taken debt to equity ratio as dependent variable and net profit, return on capital employed, return on equity, return on assets, interest coverage, debt to total assets, short term debt to total assets and long term debt to total assets as independent variables. They were using descriptive statistics and correlation analysis. Results are indicating that debt variable has positive relationship with profit. It was point out that there is also negative relation between debt variables and rest of the other variable. (Gallegos Et Gonzalo (2020) analysed the ownership structure of public firm over a time period of ten years i.e. 2005 to 2015. The variables consider are Return on assets, Return on equity, Tobin's Q, Short-term debt, Longterm debt, Growth, Size, Tangibility, Tax, Operational risk, Capital expenditure, Cash, Profitability, Liquidity, Paid dividend. They were using descriptive statistics and regression analysis. It was found that size of the firm has positively association with financial performance and growth. Further found that there is mixed outcome for firm liquidity, as well as long term and short term financial leverage.

(Chen, & Juliana 2021) in their study a sample of 136 SMEs in Brazilian context for a period of three years i.e. 2016 to 2018. The variables consider are total debt, firm age, assets tangibility, profitability, turnover growth and size. They used panel data analysis and ordinary least squares regression model to check relationship of all variables with profitability. The result shows that there is adverse association among age and profitability with debt. It was notice that there is positive association among assets tangible, growth and size with debt.

(Adepoju Adeoba Asaolu 2021) analysed the performance of two sectors for ten years with the span of 2010 to 2019. The variables consider are total assets, equity, return on assets, return on equity, leverage, firm size, assets tangibility, Non Debt tax shield, dividend growth, director's share and interest payment. Researcher used descriptive analysis, correlation matrix and panel unit test. It is notice that there is positive association and showing that these component tend to influence company show on the on the average across both areas. (Hariem & Turgut 2021) studied 102 companies for twenty four years with the span of 1993 to 2016. They had taken leverage ratio, return on assets, stock price and control as component. They were using descriptive statistics, correlation analysis and regression analysis. Point out that there is positively association among financial leverage and financial performance. It was notice that market performance and capital structure can negative influence with each other. Further notice that stock price and leverage ratio has negative impact with each other.

RESEARCH METHODOLOGY

The main objective of study is to understand the • relationship between dependent and independent variables i.e. capital structure and profitability of the telecommunication firms. For this purpose fourteen leading BSC and NSC listed firms have been selected on debt equity ratio (DER), interest coverage ratio (ICR), current ratio (CR) as independent variables and return on net worth (RONW) as dependent variable. The selected 14 firms are ATC Infrastructure Services Pvt Ltd, Bharti Airtel Ltd, Bharti Hexacom Ltd, Indus Towers Ltd, Mahanagar Telephone Nigam Ltd, Nettlinx Ltd, OnMobile Global Ltd, Quadrant Televentures Ltd, Railtel Corporation of India Ltd, Reliance Communications Ltd, Tata Communications Ltd, Tata Teleservices (Maharashtra) Ltd, Tatanet Services Ltd and Vodafone Idea Ltd. The data has been collected from CAPITALINE database. Annual report of the firms with the span of ten year viz. 2010 to 2019 and firms were analysed by using descriptive, ANOVA, coefficient and correlation.

• Hypothesis

HO: DER has positive relation with RONW

H1: DER has no positive relation with RONW

- **HO:** ICR has positive relation with RONW
- H1: ICR has no positive relation with RONW
- HO: CR has positive relation with RONW
- H1: CR has no positive relation with RONW

Analysis

- Table I presented the variables of descriptive statistics. The outcomes presented this studied will be more appropriate to the firms whose data sets resemble the descriptive method indicate in Table – I.
- 2. Table II presented that the multi co linearity between independent variables i.e. CR, ICR, DER have been considered by karl-person coefficient of correlation besides Table III consider the VIF statistic. It is accurately shows that all component of co-efficient of correlations' value has not more than +0.1 and VIF statistics not close to 10. Therefore the difficultly of multi co linearity does not occur amongst the independent component.
- 3. Table III presented the regression coefficient. It is indicating that direction, standardized Beta, significance level, values and VIF are mention in Table – III. Table – III shows that debt equity ratio, interest coverage ratio, current ratio as independent variables has association with return on net worth. The β of debt equity ratio as presented in Table –

III, stands at +0.953 viz. indicate that debt equity ratio has positive relationship with return on net worth. The value of significance level is 0.0000. it is clearly notice that the significance coefficient beta (β) is statistically very significant. Therefore null hypothesis (DER) be accepted and H1 be rejected.

- 4. Table III considered the value of interest coverage ratio i.e. 0.013 it is revel that β has positive relationship with return on net worth. The value of significance level is 0.631 it means β is statistically insignificant. Therefore null hypothesis (ICR) be accepted and H1 be rejected.
- 5. The β of current ratio as presented in Table III, stands at +0.014 viz. indicate that current ratio has positive relationship with return on net worth. The value of significance level is 0.573. It is clearly notice that the significance coefficient beta (β) is statistically not relevant. Therefore null hypothesis (CR) be accepted and H1 be rejected.

• Findings and Recommendation

1. It is find that there is significantly positive association

Table 1. Descrip	tive Statistic	2S		
Variables \rightarrow	RONW	DER	ICR	CR
Mean	17.5219	4.5226	8.7167	0.9456
Std. Deviation	93.98246	30.19685	280.49766	1.13297

Table 2. Matrix of Co-efficients of Correlations						
	CR	ICR	DER			
CR	1.000	-0.073	0.111			
ICR	-0.073	1.000	-0.491			
DER	0.111	-0.491	1.000			

	Regression Co-efficients		t	Significance Level	VIF
	Direction	Value	1		F
Constant		2.979			
DER	+	0.953	33.917	0.000	1.327
ICR	+	0.013	0.481	0.631	1.317
CR	+	0.014	0.565	0.573	1.013

among debt equity ratio and return on net worth and the significance coefficient beta (β) is statistically very important. This means companies must devote is a significant variable effect the profitability. positive relationship with return on net worth and the significance coefficient beta (β) is statistically not relevant. It recommended that firm should not allocate more important to interest coverage ratio.

Further find that interest coverage ratio has
 192

Raval & Dave

3. The current ratio has positive association with profitability and significance coefficient beta is statistically insignificant. It recommended that company do not devote is important component effect the profitability.

CONCLUSION

The research disclosed relationship between capital structure and profitability that there is positive association between debt equity ratio, Interest coverage ratio, current ratio and return on net worth. The result shows that only one variable has significantly positive relation among debt equity ratio and return on net worth and rest of two variable viz. interest coverage ratio and current ratio has insignificantly positive relation with return on net worth.

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The Association Among Working Capital Managementand Profit Ability of Telecommunication Firms

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ABSTRACT

This research study aims to examine working capital management practice carried out by Tele Communication companies listed on BSE/NSE. The study tries to undertake the data evaluation of selected variables for the tenure of ten years i.e. 2010-2019.The aim of this study is get to know association between dependent and independent component. Dependent Variable is a profit after tax to sales ratio and Independent Variables is a Sales Growth Rate, Cash, Bank & Marketable Security, Fixed Assets Turnover Ratio, and Long Term Debt Equity Ratio. Matrix of Co-efficient of Correlations, Descriptive and Regression has been used for analysis. The result shows that only two variables has moderately significant and positive relation among Cash, Bank & Marketable Security, Fixed Assets Turnover Ratio and profit after tax to sale ratio and rest of two variable viz. Sales Growth Rate and Long Term Debt Equity Ratio has insignificantly positive relation with profit after tax to sale ratio.

KEY WORDS: SALES GROWTH RATE, CASH, BANK & MARKETABLE SECURITY, REGRESSION.

INTRODUCTION

When a corporation invests in current assets, it has been think about as working capital in the custom sensibility. All industrial corporations' is effect by working capital management resolution as it has an effect on the liquidity of the company. Working capital management is preciselyimportant part for management day to day costs. Working capital management is exercise that bears current ratio. Working capital management is atool of business. Deprived of working capital management is a necessity for every prosperous occupational. Alike to long term assetresolutions there has to be a proper evaluation of the merits and demerits with respect to everyelement of current assets while taking working capital resolutions and long term investment resolution.

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The important part of variance with respect to long term resolutions and working capital results is the time line of managementpractice. Working capital conclusions in the usualsituation has an effect on the cash flows of the company for a short time i.e. maximum one year.

Literature Review: (Shikha & Srivastava 2016) in their study 179 firm a sample of 179 firms listed on S&P for the period of 13 years i.e. 2002 to 2014. They had taken gross operating profit and Tobin's Q as dependent variable and cash conversion cycle accounts receivable days, inventory days and accounts payable days as independent variable and size, sales growth, leverage, fixed financial assets, variability of net operating income and growth in GDP as control variables. Descriptive, regression, correlation analysis, panel data analysishave been used for this study. Result indicates that independent and control have significantly influence on profitability.

Dr. Benjamin Owuor Ombok, Judith Auma Omanga and (Odongo 2017) analysed four sugar companies over a period of ten years i.e. 2005 to 2014. They had taken return on assets as dependent variable and Average collection period (ACP); Inventory turnoverin days (ITO); Average payment period (APP) and Cash conversion



cycle as independent variables.Regression analysis and penal data methodology have been used in this study. It was notice that all independent componentshad a more impact on profitability.

(Johnson & Aladejebi 2020) examine30 SMEs for the period of 5 years i.e. 2014 to 2018. They had taken return on assets as dependent variable and Account Collection Period, Inventory Conversion Period, Average Payment Period, Cash Conversion Cycle, Debt Ratio, Current Ratio and Quick Ratio as independent variables. They were used descriptive statistics, correlation and regression analysis. It was notice that there is insignificant association among independent variable and profitability. Point out that there is negative relationship with Account Collection Period, Average Payment Period and profitability.

(Zbigniew Gołas 2020) examined 76 police milk industry over a time period of ten years with the span of 2008 to 2017. Researcher had taken return on assets as dependent variable and Days Sales of Inventory, Days Sales Outstanding, Days Payable Outstanding and the Cash Conversion Cycle as independent variables. Descriptive, matrix correlation and regression analysis have been used in this study.Results indicate that there is negative association among profitability and working capital cycle. (Phadindra & Maharjan (2020) examine the performance of 10 non -financial companies over a period of five years i.e. 2071-72 to 2075-76. The variable measure return on assets as dependent variable and days sales outstanding, days inventory outstanding, cash conversion cycle, current ratio as independent variable. Descriptive, correlation, regression analysis have been used in this study. It was notice that there is significantly positive relationship among current ratio and profitability. Point out that there is significantly negative association among Days' sales outstanding and financial performance of the company.

(Yash 2021) examined the dabur India ltd.company over a time period of 15 years i.e. 2005-06 to 2019-20. She considered current assets, current liability, net working capital, inventory turnover ratio, receivable turnover ratio, cash turnover ratio, working capital turnover ratio, gross working capital, total assets, working capital leverage return on net worth ratio and liquidity ratio as variable. She used ratio analysis, rank test, averages, standard deviation, co-efficient variations, and correlation coefficient. Result shows that there is negative relationship with profitability and liquidity.

RESEARCH METHODOLOGY

This study has measured only fourteen telecom companies over a time period of ten years i.e. 2009 to 2019. The evidence was acquired from Capitaline database. The aim of this study is get to know association between dependent and independent component. Dependent Variable is a profit after tax to sales ratio and Independent Variables is a Sales Growth Rate, Cash, Bank &tMarketable Security, Fixed Assets Turnover Ratio, and Long Term Debt Equity Ratio.Matrix of Co-efficients of Correlations, descriptive and regression has been used for analysis.

Objectives: The objective of this study is to know and assess the extent of impact and the relationship among dependent and independent variable of the business enterprise in the telecommunication sector.

Hypothesis

H0: SGR has positive association with PATSR.

H1: SGR has no positive association with PATSR.

H0: CB&MS has positive association with PATSR.

H1: CB&MS has positive association with PATSR.

H0: FATR has positive association with PATSR.

H1: FATR has positive association with PATSR.

H0: LTDER has positive association with PATSR.

H1: LTDER has positive association with PATSR.

Analysis And Interpretation

- 1. Table 1 indicate that the matrix of co-efficient of correlations between independent variables i.e. LTDR, SGR, CB&MS, FATR have been considered by karl-person coefficient of correlation. It is precisely displays that all component of co-efficient of correlations' value has not more than +0.1 and VIF data not close by 10. Thus the difficultly of multi co linearity does not occur between the independent component.
- 2. Table 2 obtainable the element of descriptive statistics. The outcomes presented this studied will be more suitable to the organisations whose data sets resemble the descriptive method indicate in Table 2.
- 3. Table - 3 obtain the regression coefficient. It is specifying that direction; standardized Beta, significance level, values and VIF are remark in Table – 3. Table – 3 displays that Sales Growth Rate, Cash, Bank & Marketable Security, Fixed Assets Turnover Ratio, and Long Term Debt Equity Ratio as independent variables has association with profit after tax to sales ratio. The β of debt equity ratio as presented in Table - 3, stands at +0.108 viz. indicate that Sales Growth Rate has positive relationship with profit after tax to sales ratio.The value of significance level is 0.207. It is notice that the significance coefficient beta (β) is statistically insignificance. Therefore null hypothesis (SGR) is accepted and H1 be rejected.
- 4. Table 3 measured the cost of Cash, Bank EtMarketable Security i.e. 0.114 it is revel that β has positive relationship with profit after tax to sales ratio. The value of significance level is 0.180 it means β is statistically moderately significant. Thus null hypothesis (ICR) be accepted and H1 be rejected.

5. The β of fixed assets turnover ratio as presented in Table – 3, stands at +0.139 viz. point out that fixed assets turnover ratio has positive relationship with profit after tax to sales ratio. The value of significance level is 0.106. It means that the significance coefficient beta (β) is statistically moderate. Therefore null hypothesis (CR) be accepted and H1 be rejected. viz. +0.038 it is revel that β has positive association with profit after tax to sales ratio. The value of significance level is 0.649 it means β is statistically not significant. Thus null hypothesis be accepted and alternate hypothesis be rejected.

Findings

- 1. It is find that there is insignificantly positive association among Sales Growth Rate and profit after
- 6. Table 3 considered the long term debt equity ratio

Table 1. Matrix of Co-efficients of Correlations									
	SGR	CB&MS	FATR	LTDR					
SGR	1.000	-0.023	0.177	0.018					
CB&MS	-0.023	1.000	-0.079	-0.062					
FATR	0.177	-0.079	1.000	0.026					
LTDR	0.018	-0.062	0.026	1.000					

Table 2. Descriptive Statistics									
Variables \rightarrow	PTSAR	SGR	CB&MS	FATR	LTDER				
Mean	-0.09078	10.3976	0.13627	0.5944	0.9953				
Std. Deviation	0.73826	40.5573	0.35404	0.6758	5.32254				

	Regression Co-efficien	ı ıts	t	Significance	VIF	
	Direction	Value		Level	11	
Constant		0.239				
SGR	+	0.108	1.267	0.207	1.033	
CB&MS	+	0.114	1.348	0.180	1.010	
FATR	+	0.139	1.629	0.106	1.039	
LTDER	+	0.038	0.456	0.649	1.004	
Dependent Va	ariable : PA	TSR		R ² =	0.020	
Independent V	variables:SG	R.CB&	MS FA	TR. LTDER	N = 140	

tax to sales ratio and the significance coefficient beta (β) is statistically not relevant.

- 2. Further find that Cash, Bank & Marketable Security has favourably association with profit after tax to sales ratio and significant co-efficient beta is statistically moderately significant.
- 3. The fixed assets turnover ratio has positive association with profitability and significance coefficient beta is statistically moderately significance.
- 4. It is notice that long term debt equity ratio has positive association with profit after tax to sale ratio but statistically significant co-efficient beta is not relevant.

CONCLUSION

The research disclosed relationship between Sales Growth Rate, Cash, Bank &Marketable Security, Fixed Assets Turnover Ratio, and Long Term Debt Equity Ratio and profit after tax to sale ratio that there is positive association between Sales Growth Rate, Cash, Bank &Marketable Security, Fixed Assets Turnover Ratio, and Long Term Debt Equity Ratio and profit after tax to sale ratio. The result shows that only two variables has moderately significant and positive relation among Cash, Bank &Marketable Security, Fixed Assets Turnover Ratio and profit after tax to sale ratioand rest of two variable viz. Sales Growth Rate and Long Term Debt Equity Ratio

Raval & Dave

has insignificantly positive relation with profit after tax to sale ratio.

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An Empirical Study Unfolding the Hiatus in Creating Awareness Regarding Green Products Among Retailers of Gujarat

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ABSTRACT

Retailers of any stream are holding a significant place as they are the key player of entire supply chain. A green product is a product which contains various environment friendly features in it. This study tries to explore retailers' awareness regarding same. The study is conducted among 30 retailers from different regions of Gujarat state. The sample for the study is collected by convenience random sampling with the help of a structured questionnaire. The study has tried to reveal the significance of awareness regarding green marketing practices and a green product among retailers and how this can contribute in spreading awareness further. The study explored various reasons behind unawareness and also it tries to present significant sources for spreading information. The results disclosed that only two sources of information are contributing significantly i.e. whole-seller/dealer and product label. Further they also disclosed their relationship with various features of a green product. To analyze the data frequency distribution, Weighted Average Mean and Oneway ANOVA is applied in the study. The study concluded by disclosing the importance awareness about green products and manufacturers' contribution in generating and spreading awareness among FMCG retailers as well as the entire down-stream of FMCG.

KEY WORDS: GREEN PRODUCTS, AWARENESS, RETAILERS.

INTRODUCTION

Retailers of any stream are holding a significant place as they are the key player of entire supply chain. A company's product is been mostly promoted by a retailer as they are the only stake holder that comes directly infront of consumers/customers for selling a company's product. Green marketing practices are those practices which are pursued by taking care of environment as the crucial base for performing any commercial activity right



from manufacturing till disposal of a product's packaging. A green product is a product which contains various environmental features in it. This study tries to explore retailers' awareness regarding same. The study has tried to reveal the significance of awareness regarding green marketing practices and a green product among retailers and how this can contribute in spreading awareness further.

Objectives

- 1. To examine level of awareness among FMCG retailers with regard to Green products.
- 2. To identify the reason behind lack of awareness among FMCG retailers.

Review of Literature: (Anna & Lindsey 2008) has tried to explore the trends among consumers regarding environment and retailers' perception; how efficiently



energy consumption contributes in making retail green; case studies of green market players i.e. "Wal-Mart, The Home Depot, Best Buy and Amazon.com" and tried to explore the strategies that made retail green successfully. (Anubha et al., 2013) has made an attempt to examine the level of awareness regarding green marketing among consumers and retailers. Also, study included consumer's attitude factors affecting buying behavior and certain key advices to promoters.

(Mohanraj& Rajesh (2018) has derived the prospects pertaining to future scenario of retail industry with regard to green marketing practices. The study aimed to examine the demographic profile of green retailers of Erode district and to evaluate them with regard to green marketing. (Deepalakshmi 2019) conducted a quantitative study to explore the awareness among retailers regarding green marketing and its significance on environment. This was a descriptive study conducted with the help of primary as well as secondary data. K.SathiyaPriya; ERB. (Pratiksha 2019) has explored present and future scenario of green marketing with regard to manufacturers, retailers and consumers along with upcoming various challenges and future scope of growing in green marketing.

RESEARCH METHODOLOGY

To accomplish the research objectives the study is conducted among 30 retailers from various districts of Gujarat state. The data is collected through convenience random sampling with the help of a structured questionnaire is used as an instrument for collecting the data for the study. The study is analyzed by One way ANOVA for hypothesis testing, Weighted Average Mean and Frequency Distribution for representing significant data and figures. To pursue the analysis, Cronbach's alpha is determined to check the correlation among variables and reliability of the instrument. The value of Cronbach's alpha is determined as 0.883 which is highly significant.

Hypothesis for the Study:

Ha: Various sources of information are contributing significantly in creating awareness among retailers

Ha1: Awareness is having significant relation with various sources of information

Ha2: Various sources of information are contributing significantly in creating awareness regarding various features of a green product among retailers.

Analysis and Interpretation: The study is undertaken in Gujarat among 30 FMCG retailers. The study disclosed that out of 30 retailers, only 6 retailers are aware about green products and 24 retailers are unaware which is a huge number pertaining to sample size of the study. For

increasing awareness among retailers, it is necessary to identify the significant source of information from which retailers are able to create awareness.

Researcher inquired from retailers regarding various sources which included 'News Papers, various periodicals or magazine, journals, labels on a product, e-commerce and social media portals, events such as conference or exhibitions, brochure of a respective company, respective company's website or advertisement and information generated via whole seller or a dealer'. The results disclosed that out of above all the means of generating information only two sources contributed significantly to retailers' awareness. From 6 aware retailers, majority of retailers gained knowledge about green products with the help only two sources of information i.e. 'a whole seller or dealer and from product's label'. To examine the significance of both the sources with retailers' awareness One-way ANOVA is applied. The results disclosed that both the sources of information i.e. a whole seller or dealer has significance value of 0.000 and product's label has significance value of 0.043 are having significant relation with awareness as the value is significance is below 0.05.

Therefore, alternative hypothesis is accepted;Ha1: Awareness is having significant relation with various sources of information.

To explore the contribution of each of the two sources critically, One way ANOVA is applied between all the features of a green product and both the sources of awareness. A Green Product has following features along with their relation with relevant source of awareness.

The results disclosed that the Alternate Hypothesis is accepted; Ha2: Various sources of information are contributing significantly in creating awareness regarding various features of a green product among retailers.

Hence, the main alternate hypothesis is accepted i.e. Ha: Various sources of information are contributing significantly in creating awareness among retailers.

To examine the reason behind unawareness among retailers a question pertaining with Likert Scale was asked to retailers which consists of various reasons behind unawareness. To analyze the obtained responses weighted average mean is applied and the results are disclosed as below:

Poor Understanding about green marketing practices is the main reason which gained the maximum weight among all the reasons i.e. 7.666667 but rest all the reasons are also having significant weights relevant to the highest weight. That means all the above mentioned reasons are significantly responsible behind the unawareness among retailers.

Findings and Implications of the Study: Retailers are the significant stakeholders in a supply chain. Also, retailers

are the only stakeholders that come directly in contact with the main consumers. Retailers can play a vital role in spreading awareness about green marketing practices among consumers as well as whole sellers and dealers. As retailer is the common factor between both the stake

Table 1. Features of a Green Product and their Sources of Information								
Features of a Green Product	Product's Label	Whole- Seller/ Dealer	Interpretation					
Use of renewable resources in manufacturing a product	0.479	0.000	Only Whole-Seller/Dealer Contributed Significantly					
Energy (Electricity Power) efficient manufacturing	0.479	0.000	Only Whole-Seller/Dealer Contributed Significantly					
Water efficient manufacturing practices	0.479	0.000	Only Whole-Seller/Dealer Contributed Significantly					
Less pollution from manufacturing practices (reduced CO2/GHG emissions)	0.282	0.000	Only Whole-Seller/Dealer Contributed Significantly					
Minimum waste from manufacturing process/ Efficient waste management	0.658	0.000	Only Whole-Seller/Dealer Contributed Significantly					
Products are not tested on animals (this can be known with the help of label on product)	0.785	0.000	Only Whole-Seller/Dealer Contributed Significantly					
Packaging is biodegradable/compostable (this can be known with the help of label on product)	0.001	0.000	Both the sources Contributed Significantly					
ISO Certificate for environment (e.g. ISO 14001, etc.) this can be known with the help of label on product	0.010	0.001	Both the sources Contributed Significantly					
Type of Plastic is recyclable or reusable or both or recoverable (this can be known with the help of label on product)	0.028	0.000	Both the sources Contributed Significantly					
Any other green label (e.g. Green dot) except labels mentioned above	0.000	0.001	Both the sources Contributed Significantly					
Use of renewable energy in manufacturing a product such as biomass, bio fuel, Agro waste, PNG, etc. With replacement to fossil fuel.	0.102	0.000	Only Whole-Seller/Dealer Contributed Significantly					
Eco friendly logistics	0.014	0.000	Both the sources Contributed Significantly					

holders. Therefore it is necessary to make retailers aware about green products. Here, the study disclosed that very few retailers are aware regarding green products, the reasons behind their unawareness and there are only two main sources of information contributing significantly in creating awareness among retailers.

To make maximum retailers aware it is required to utilize all the salient sources of spreading information actively by manufacturers. As a whole seller deals with multiple retailers as well as a retailer deals with multiple whole sellers, a spread of green information becomes easy if manufacturing company participates in spreading awareness among them. The down-stream supply chain of FMCG products can contribute in supply of products as well as supply of salient information about green products associated with respective company. This will result not only in increased awareness among retailers but will also help to spread awareness among entire supply chain stake holders.

Limitations and Scope of the Sudy: This study is limited in between 30 retailers within Gujarat state. To gain more precise reasons behind unawareness and to explore more sources for spreading the information, a more detailed study among a bigger sample size of retailers. Also, this can be conducted within entire down-stream to gain a meaning full and significant insight towards awareness of green products.

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Manglani & Dave

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Information Seeking Behaviour of Library Users of Mother Teresa Women's University, Kodaikanal – A Study

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ABSTRACT

The present study aims to find out the information seeking behaviour of Library users of Mother Teresa Women's University, Kodaikanal. A samples of 125 library users selected randomly were studied. Primary data were collected by using a structured interview scheduled. All the library users were asked the some questions in the same fashion and they were informed the purpose of study. Percentage analysis, Cross tabulation and Chi-square test were applied to test the hypotheses. The findings and observations are the result and outcome of the interpretations made during the study of analysis.

KEY WORDS: INFORMATION SEEKING BEHAVIOUR, USERS AND DEMOGRAPHIC VARIABLES.

INTRODUCTION

Information seeking behaviour is defined as any activity of an individual that is undertaken to identify a message that satisfies a perceived need. Information seeking begins when someone perceives that the current state of possessed knowledge is less than needed to deal with some issue problem. The process ends when that perception no longer exists. People seek information in a variety of circumstances and from a variety of sources. The developments in information storage, retrieval and derived dissemination methods affect the information scientists. The individual seeking information need not be concerned with how the information is stored but should be concerned with how much information is stored and what kind of information is stored. One will be concerned about the case and comprehensive of retrieval



mechanists, but most of all one will be affected by the delivery mechanisms.

In relation to basic human needs the new technology is likely to have some effect on the information seeking habits of those concerned for empirical knowledge and for corporate human experience and entertainment. In the short term it is not likely to have a major effect on the seeker for personal human experience or on those seeking corporate human experience. In the longer term, more information may be stored in all types of format as the community recognizes the wide range of material encompassed by corporate human experience. Then there will be a considerable change in user habits. Information seeking behaviour is an area of active interest among many librarians, information scientists, communication scientists, sociologists and psychologists. Information seeking behaviour results from the recognition of some need, perceived by the user, whom as a consequence maker depends upon formal system such as libraries; information centers, on-line services, or some other persons in order to satisfy the perceived need.

It is influenced by a number of factors such as ones education together or not he/she has been taught how to use the products and services of information units,



ones working condition and amount of time available, ones hierarchical status and professional, position, how easily one gets on with people, how much competition there is between members of a group, the attitude of each individual/group, and previous experience etc.

Review of Literature: (Bawden & Robinson 2016) conducted a study on the in formation needs and information seeking behaviour of nurses. The study mainly conducted by semi-structured interviews with them shows mid-wifery to be particularly information conscious, needing a wide variety of information and psychiatric nurses appear to be much less information conscious. (Joseph 2017) analysed the utilization of library facilities of the sree Chitra Tirumal Institute of Medical Sciences and Technology. The study deals with frequency of library visit by users, use of the library, availability of books and other resources, awareness of new materials acquired in the library, area of reading materials and adequacy of physical facilities.

(Biradar & Kumar 2018) in their study attempt to evaluate the services and facilities offered by DVS Polytechnics College Library, Shimoga. The study shows that 37.5% students and 46.8% teachers are satisfied with lending service and 48.75% students and 50% of teachers respectively have good opinion about bank facility of the college library. (Aravind & Kavitha 2020) Bibliotherapy has been widely recognized as an approach that helps librarians to betteraddress emotional, behavioral and social concerns. In the Indian context, bibliotherapy is still new, by conceptualizing ibliotherapy in a public library. The study will provide a better understanding of concepts bibliotherapy and make recommendations to the librarian by providing a description of and a rationale for the use of bibliotherapy by public libraries.139 responses received from public library readers of a chosen Central library and Selected Branch libraries in Dindigul Town.

The convenience sampling techniques were used. It is observed that more than half of the readers frequently read books like Poetry, Novels, Short stories and Motivational Books. 99 of the respondents (71.22%) feel Difficulty in choosing the right self-help book. Two-third of the respondentsstrongly agree that reading self-help books 'Enable me to change my perspective towards life as I observe life from a different angle' (69.19%), 'Inspire me to make better choices' (64.3%). Further studies may be undertaken in other environments like schools, universities, working places, etc., to get a real picture of the effect of bibliotherapy.

Objectives of the Study

- 1. to find out the document wise user preference
- 2. to analyse the level of satisfaction about the library collection.

Table 1.	Table 1. Users Preference Of Types Of Document									
S.No	Kinds of document		Ord	er of Prefere	ence		Total			
		1	2	3	4	5				
1	Books	70 (56.00)	37(29.6)	15(12.00)	3(2.40)	-	125			
2	Periodicals	30 (24.00)	60 (48.00)	29(23.20)	4(3.20)	2(1.60)	125			
3	Reference book	19 (15.20)	19 (15.20)	43(34.40)	39 (31.20)	5(4.00)	125			
4	Thesis and project works	4(3.20)	4(3.20)	29(23.20)	49 (39.20)	39 (31.20)	125			
5	Conference proceedings	2(1.60)	5(4.00)	9(7.20)	30 (24.00)	79 (63.20)	125			
	Total	155	155	155	155	155	625			
Figures in parenthesis denote percentage value										
Calculated Chi-square value = 496.1										
Degrees of freedom = 16										
Level o	of significance	=	1%							
Ho:- Students differ in their preference of type of documents.										

METHODOLOGY

The survey collected data to describe respondent's information seeking behaviour and to relate this behaviour to a number of variables. The survey form included questions about characteristic of the respondents that might influence their information seeking behaviour. A questionnaire was designed for the purpose of collecting the required data from the chosen sample user population. The questionnaire comprehensively includes broadly all the aspects regarding library, with on ultimate objective to reflect the user's opinion on the library. In this study in all 200 questionnaires were distributed among the students in the disciplines Arts and Science colleges in Nagai district. Out of 200 questionnaires distributed, 150 were-received back, making the response rate 75%. Twenty-five questionnaires were not taken into consideration for they did not include complete answers. In all 125 users of Mother Teresa Women's University, Kodaikanal were analysed for the present study. Random sampling method adopted in this present study.

ANALYSIS AND DISCUSSIONS

The analysis of the responses furnished by the respondents in respect of their preference to various kinds of information resources indicate that among the 125 respondent of the study majority of the respondent

preferred only books (56%) followed by periodicals (24%), and reference books (15.20%). Thus, it can be concluded that books and periodicals occurred the highest (I&III) – preference and the thesis, project work, conference proceedings are the lowest in the order of preference. It could be seen clearly from the above discussion most of the respondent used books for their examination purpose. This is statistically proved by the obtained chi-square test, which is significant. So the stated hypothesis is accepted.

Table 2	Table 2. Satisfied Rate And Not Satisfied Rate With The Library Collection									
S.No	Library Collection	Very Satisfied	Satisfied	Unsatisfied	Very Un satisfied	No Opinion	Total			
1	Book collection	38(30.40)	48(38.40)	18(14.40)	8 (6.40)	13 (10.40)	125			
2	Periodical	36(28.80)	49(39.20)	20(16.00)	12 (9.60)	8(6.40)	125			
3	Reference Books	37(29.60)	43(34.40)	23(18.40)	15(12.00)	7(5.60)	125			
4	Stock coverage	34(24.20)	41(32.80)	28(22.40)	18(14.40)	4(3.20)	125			
5	Bound journals	31(24.80)	38(30.40)	26(20.80)	12(9.60)	18 (14.40)	125			
6	News paper	28(22.40)	33(26.40)	29(23.20)	19(15.20)	16 (12.80)	125			
7	Stock currently	27(21.60)	34(27.20)	30(24.00)	23(18.40)	11(8.80)	125			
8	Archives and special	21(16.80)	18(14.40)	43(34.40)	15(12.00)	28 (22.40)	125			
	collection									
9	Video/tape/slides	9(7.20)	12(9.60)	39 (31.20)	24(19.20)	41 (32.80)	125			
10	Maps	10(8.00)	11(8.80)	37 (29.60)	29(23.20)	38 (30.40)	125			
	Total	271 (21.68)	327 (26.16)	293(23.44)	175 (14.00)	184 (14.72)	1250 (100.00)			
Figures in parenthesis denote percentage value										
Calculated Chi-square value = 217.8										
Degre	Degrees of freedom = 36									
Level	of significance		=	1%						
Ho:- Student differs in their level of satisfaction about the various facilities available in the library.										

It is inferred from the table that nearly 68% of the students satisfied about book collection, 85% satisfied about periodical, 80% satisfies regarding reference book, 75% satisfied about stock coverage, 69% satisfied about bound journals, 61% of them satisfied about stock currently, 39% of them satisfied about archives and special collections, 21% of them satisfied about wideo/ tape/ slides and 21% of them satisfied about maps. Therefore among the various sources, mast of them satisfied about periodical and reference books. This is also proved by the obtained Chi-square test, which is significant at 1% level. So the stated hypothesis is accepted. Therefore, students differ in their level of satisfaction about various facilities available in the library.

CONCLUSION

Library is the great source to the students and teachers to enrich their knowledge. So the University Grand Commission should sanction more funds to improve the infrastructure facilities. To increase the availability of International Journal and Foreign periodicals subscription. The library should procure new edition of

subscription. The li

current documents. Most of the students have demanded for video display on recent development. Inter library loan facilities should be improved. User suggestions enable a library to become aware of its problems and resolve these in a benefiting manner. If these suggestions are implemented, the user will have greater appreciation and respect for the role of library and its staff in supporting their academic requirements. This will ensure the full co-operation and support of the users. Who will then regard the library as their own.

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Impact of Green E-Advertisements Upon FMCG Consumers of Gujarat

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ABSTRACT

Social media marketing is a significant tool of marketing which can influence consumers efficiently. Social media is the only platform which can reach consumers at consumer's ease. It can help society to achieve sustainability development through environment. An attempt is made by this study to help marketers to contribute in achieving this sustainable goal. The study focused on how social media marketing can help in generating awareness among consumers. The study tried to provide an insight to research objectives such as the demographic profile of consumers who are most influenced by social media marketing, the impact of promoting green FMCG products through social media marketing upon awareness among consumers of Gujarat. The sample for this study is 200 FMCG consumers selected on the basis of convenience random sampling method. For analyzing the data the techniques applied are; for efficient demographic analysis frequency distribution and percentage analysis methodology was adopted, for hypotheses analysis, One-Way ANOVA, Multiple Regression were applied. The study concluded that the target market disclosed in the study can help marketers to achieve their sustainable goal. Also, marketers need to be more conscious and need to adopt ethics in influencing the consumers through various platforms of social media.

KEY WORDS: SOCIAL MEDIA, INFLUENCE CONSUMERS, FMCG.

INTRODUCTION

Green marketing practices become well renowned since 1990. Since then it made environmental gain a challenge to society. With an expeditious gain in green marketing practices, consumers are accepting their responsibility towards environment and are adopting green products voluntarily. Green marketing is not just environment friendly practice but also helps in boosting economy by generating new job opportunities. Environment conscious consumers lead economy towards sustainability by staying loyal with green companies (Heiyantuduge et al., 2015). Effective promotion is very essential for green products.



Social media marketing can play a very crucial role in marketing green FMCG products. Also, FMCG is one of the largest sectors in economy. It is necessary that this sector works actively towards green (eco-friendly) practices to heal the one of the biggest section of society. The need of the hour is to bring sustainable change. For this change, every individual is required a tranquil adoption of "Green" which will lead society to sustainability. Social media can help effectively in achieving this sustainable goal. This study tried to evaluate that how social media marketing can help in generating awareness among consumers.

Literature Review: (Duangruthai et al., 2018) studied consumer behavior for purchases which includes attributes like various brands, high risk, costly etc. The study implied EBM model to gather information, evaluate the same and attempt to conclude the research for making a purchase decision. The study disclosed that these all stages are included in making efficient purchase decision via social media. The conclusion added further stages such as purchase decision tends towards final purchase and after purchase feedback from consumers. (Ni Luh et



al., 2019) has described the marketing impact upon the products such as "Sensatia Botanical Products".

This study mainly observed the social media marketing and its impact upon green consumer behavior. All the green products marketed upon social media associated with "Sensatia Botanical" are taken as main green product for the study. The study concluded that attribute green has significant impact upon green consumers but social media was unable to influence consumers effectively. (Ramesh et al., 2019) has tried to explore the impact of attributes attached with green packaging upon consumers of online market. The attributes of green product which could influence most among online consumers were "green label, green packaging, green advertisement, price, shelf life, customisation, and green awareness." The study concluded that all the green attributes has influenced consumers except price of a green product and its advertisement.

The manufacturers need to promote green products more efficiently. (Shaina 2019) gained an insight of ecofriendly e-commerce, its influencing ecological factors, awareness among society regarding sustainability and impact of e-commerce with its wide network and connections upon sustainable India. The study disclosed that the buzz word "green" attracts consumers more when it's been attached with online shopping. The need is to educate consumers thoroughly with both the concepts of this era i.e. "e-commerce" and "green marketing". (Rebeka-Anna et al., 2020) has determined the factors which leads consumer's attitude towards purchase decision by the means of social media.

The theoretical implication disclosed by external factors which has great impact upon green consumer behavior and their purchase intentions towards green cosmetics. Study concluded that this source of marketing needs strong communication skills and strategy implementation to boost consumers' motivation towards green cosmetics. (Abdul et al., 2020) explored the online shopping context among consumers with demographics including educated and young population. The consumers were from Ghana, Africa. The study was explored with the "stimulus-organism-response (SOR) framework." The study concluded that the above defined factors were the predictors which may help any marketer in exploring consumer behavior towards new technologies.

Research Objectives:

- 1. To review the demographic background of social media users
- 2. To analyze the impact of social media marketing in creating awareness among consumers of Gujarat for green marketing practices in Indian FMCG sector.
- 3. To generate implications to make green e-advertisements more impactful upon various social media platforms.

Table 1. Frequency Distribution of Aware Consumers						
Consumers Frequency Percent Valid Percent Cumulative Percent						
Aware	94	47%	47%	47%		
Unaware	106	53%	53%	100%		
Total	200	100%	100%			

 Table 2. Demographic Profile of Consumers gaining Awareness through Social Media Platforms

Particulars	Demographics	Frequency (Out of 94 consumers)	(94 is considered as 100% Percentage with reference to aware sample)
Age	15-30	53	56.4%
Gender	Female	56	59.6%
Educational	Graduate &	33	35.1%
Qualification			
	Post-Graduate	33	35.1%
Occupation	Professionals	29	30.9%
Monthly Income	0-25,000	43	45.7%
Marital Status	Unmarried	48	51.1%

RESEARCH METHODOLOGY

To accomplish the objectives of study, a quantitative survey was conducted. Under the descriptive study design, a structured questionnaire was framed for 200 consumers of Gujarat. The sample for the study was selected on the basis of convenience sampling method. Online survey was conducted via Google doc. Due to covid-19 crisis to collect the data from FMCG consumers. Factor analysis was determined to test the reliability of questionnaire. The result of Cronbach Alpha was calculated as 0.964. Also, the Kaiser-Meyer-Olkin and Bartlett's Test of adequacy displayed the result 0.956 which is much higher than its significance level i.e. 0.6. The inspection of anti-image correlation matrix reveals that all our measures of sampling adequacy are well above acceptable level of 0.5. For efficient demographic analysis frequency distribution and percentage analysis methodology was adopted. For hypotheses analysis, ANOVA, Multiple Regression were applied.

Analysis and Interpretation: Environmental awareness among consumers is a great achievement for environmental marketers who genuinely promote green products through various mediums of advertisements. In order to know the extent of awareness among consumers frequency distribution was done and the results disclosed that from sample of 200, 94 consumers were aware regarding green marketing practices viz. 47% of total sample selected. The aware consumers are further distributed as per demographic profile. The below described is the most aware group which is sorted from the group of total aware consumers i.e. 47% to specify the target market of green FMCG products in Gujarat.

From above specified aware consumers, many consumers gathered information about green products from various social media platforms. Social media has ability of holding its customers for a significant period of time. It affects the choice preferences of many of its regular visitors. It has a significant impact upon its users. Especially, the youth who spend maximum of their time on such networking platforms. Such impact of social media can assist marketers to promote the contemporary ideas among its viewers and can also help in expanding the selling market. For crystalline field of vision among social media marketers, a demographic profile is constructed to give an insight for target market which

Table 3. Demographic Profile of Consumers gaining Awareness through Social Media Platforms					
Particulars	Demographics	Frequency (Out of 48 consumers)	Percentage (48 is considered as 100% with reference to sample gaining awareness form social media)		
Age	15-30	33	68.8%		
Gender	Female	28	58.3%		
Educational Qualification	Post-Graduate	18	37.5%		
Occupation	Students	18	37.5%		
Monthly Income	0-25,000	28	58.3%		
Marital Status	Unmarried	28	58.3%		

can get influence effectively from social media marketing and also marketers can observe the gap which is left behind. The below described is the most aware group who gathered information from various social media platforms i.e. 48 consumers, which is sorted from the group of total aware consumers i.e. 47% to specify the target market for marketers specially focusing on social media marketing of green FMCG products in Gujarat.

Hypotheses of Study:

H1a: Consumers' age group does have significant relation with generating awareness for Green FMCG Products from social media.

H1b: Consumers' gender does have significant relation with generating awareness for Green FMCG Products from social media.

H2a: Educational Qualification of consumers does play a significant role in gaining awareness from social media.

H2b: Occupation of consumers does play a significant role in gaining awareness from social media.

H3: Monthly Income of consumers doesn't have significant impact in encouraging consumers from social media for purchasing green FMCG products.

Hypotheses Testing: The descriptive data of the study was arranged in order to analyze the data. The five independent variables are Monthly Income, Occupation, Gender, Educational Qualification and Age Group. The dependent variable of the study is social media for the hypotheses testing. All five independent variables together explain 98% of the variance (R Square), which is highly significant. Only 2% of variance remains unexplained. This outcome of analysis describes the high correlation of all five independent variables among themselves. For hypotheses testing further the One-way ANOVA is applied and as the result the obtained F value is 2753.3. This result of ANOVA is significant as the computed value is much higher than the table value. For a significant result and for acceptance of alternate hypothesis, computed value should be higher than the table value. Also, the below described table disclosed the value of each independent variable with relation to dependent variable.

Manglani & Dave

Here the table disclosed that the P – value is less than 0.05 for all the independent variables. As per above interpretation, a conclusion can be drawn that Social Media does play a significant role towards Green Marketing Practices in Indian FMCG Sector. The results derived that all the alternate hypotheses of the study that are accepted with significant relationship in between all independent variables and one dependent variable.

DISCUSSION

The demographic interpretation and the discussion of analysis, successfully defined the demographic profile of consumers who are aware regarding green marketing



practices in Indian FMCG sector. Also, the study made an attempt to comprehend the target market in front of marketers especially those demographics, who are the maximum users of social media and gets green information from social media platform, are defined specifically which can help promoters to gain the attention of consumers efficiently. Also, marketers can find the consumers who are least interested in green practices. The loophole can be diminished with effective promotional activities of attribute "Green". More specific and crystalline description of green products should be provided to motivate consumers towards the benefits of using green FMCG products.

Table 4. R Square					
R	R Square	Adjusted R Square	Std. Error of the Estimate		
0.993	0.986	0.986	0.055753185		

The demographic attributes are highly correlated with each other as well as with dependent variable social media. This can help promoters to use those demographics wisely to achieve their target market. As social media is the most efficient tool for promotional activities, a sure shot can help in deriving desirable results.

Also, awareness regarding environmental activities can be spread using this mode properly. Youths are the most active participants on social media. The marketers should try to influence this them as they are enough capable of achieving anything towards which they are inclined firmly. So, marketers can perform well if they promote right information in a right way to right audience. The need of the hour is the ethical promotion of green activities and makes a sincere effort to make audience realize their responsibility towards environment and nature.

Limitation and Scope for future study: This study is limited upto the geographical boundaries of Gujarat.

Table . 4a						
	Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	
Constant	0.410	0.019		21.617	0.001	
Age Group	0.133	0.006	0.257	23.639	0.001	
Gender	0.163	0.008	0.173	19.731	0.000	
Educational Qualification	0.161	0.005	0.310	30.759	0.000	
Employment Status	0.140	0.004	0.390	39.129	0.001	
Monthly Income	0.159	0.003	0.513	47.011	0.000	

The sample size of study is 200. Almost all the people living in the society are FMCG consumers. FMCG market has advantage of not restricting its products with the geographical or income boundaries. Also, the promoting of Green Products and Green Practices needs to be more efficient and effective as this concept is still more or less ungrounded for maximum population. There should be efficient use of all the various sources of promotion like newspapers, television advertisements, advertisements through social media, websites of companies, etc. A wide study should be made upon this to fill up the loophole left out by promotional activities.

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Identification of FFI Disorder Using Dragon Fly Optimization Technique

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ABSTRACT

One of the most important signals to detect sleep disorder is Electroencephalogram (EEG). To process the study of sleep disorder, EEG database is been used which are available in Physionet databank. Among many sleep disorders fatal familial insomnia (FFI) is one of the most familiar sleep disorders in today's scenario. FFI diagnosis became a challenging task for physicians. The standard database is obtained from PhysioBank (www. physionet .com /EEG/sleep disorder data). From the databank total of 635 patient's data is considered for processing the proposed work. The features from the signals are extracted and then reduced using reduction techniques like PCA, ICA and LDA. Dragon fly Optimization (DFO) technique is applied and classified using support vector machine. The proposed Dragon fly Optimization technique that is performed to optimise the features is compared with other existing optimization techniques like GA and IWO. The metrics are evaluated. The rate of accuracy is obtained having high efficiency compared to existing methods. The proposed method have achieved high rate of accuracy in detecting the sleep disorder. Experimental results show that the algorithm can effectively detect normal and abnormal quality of sleep. The disorder is identified and the remedy is provided. GUI is created to show a computerized system.

KEY WORDS: FATAL FAMILIAL INSOMNIA DISORDER, EEG SIGNALS, PCA, LDA, DRAGON FLY ALGORITHM, SUPPORT VECTOR MACHINE.

INTRODUCTION

In the current scenario, human beings depends lot on the technology which is upgrading day-by-day. The use of technology in medical diagnosis helps in achieving good results for identification of diseases in earlier stages. Sleep disorder is one form of disease that many of the people are suffering from. Inorder to identify the sleep disorder, brain waves play an important role. The signals obtained from brain helps in diagnosing the patients.The



EEG signals that are generated brain are been recorded, these brain waves have different patterns that helps to classify the sleep disorders. The functioning of brain and time to time change positions of signals in brain region are determined using EEG signals. Understanding of EEG data is a difficult task (John, 2020).

The EEG signal amplitude varies continuously based on the external environment and the mental ability of the person. Both internal and external factors affect the amplitude of brain signal. Typical amplitudes in EEG waveforms are of the order of 50–200 μ V (Srinivasan N, 2017).Basically, the brain waves are categorised using the frequency bands, among all bands five are considered as important i.e.: delta (δ), theta (θ),alpha (α), beta (β) and gamma (γ).



Figure 1: EEG waveform	s at different stages
Waking	instrument of the start of the start of the second start of the se
NREM sleep stage N2	ANN An Mar Mar And
NREM sleep stage N3 (slow wave sleep)	And hand bud W
REM sleep	Officto 4-711=1

The psychological symptoms of disorder person have multiple impacts on his life. These symptoms will make human brain mentally imbalance. Sleep disorders are closely related to psychological disorders. These kinds of disorders create distress in the human beings. They are different types of sleep disorders. Type of disorder along with the symptoms is shown in table 1. In the year 1818, Johann Heinroth first identified the psychosomatic disorder, Insomnia is a disorder which effects the quality of sleep or percentage of sleep (Mellinger et al., 1985) Insomnia disorder has a symptoms of falling asleep for long time on bed, repetitive wakeup over the nights, time for going back to sleep when disturbed, walking up early in the morning etc. (Saddicha 2010).

Table 1. Sleep disorder and Symptoms				
Sleep Disorder	Symptoms			
Rapid Eye Movement	Kick, punch, hit, grab, leap out of bed while sleeping			
Periodic Limb Movement disorder	Repetitive cramping, Jerking of legs during sleep			
Obstructive sleep apnea	Stop breathing during sleep, snoring loudly			
Nocturnal frontal lobe epilepsy	Inability to concentrate, Involuntary movement, Tongue biting			
Narcolepsy	Sudden loss of muscle tone, Hallucinations			
Fatal Familial Insomnia	High blood pressure, rapid heart rate,weight			
	loss, trouble in controlling body temperature			

Table 2. Insomnia Disorder classification among the population				
Age Group	Effected Percentage			
Adult Population	33-50% (Ancoli-Israel S et al., 1999)			
General Population	10-15% (Roth T et al.,2001)			
Divorced, separated or widowed people	Higher rates (Dollander M et al., 2002)			
Older age and female population	Moderate rate (Hohagen F et al.,1993]			
White population	Moderate rate(Riedel BW et al.,2004)			
co-morbid medical or psychiatric illness	40% (Buscemi N et al., 2005)			

Table 3. Categories of Insomnia			
Type of Insomnia Percentage			
Occasional Insomnia	30%		
Chronic Insomnia	10%		
Fatal Familial Insomnia	25%		

Majority of population facing insomnia sleep disorder are adult's i.e. up to 33-50% (Ancoli et al., 1999). The data obtained from various sources are shown in table2. According to various studies insomnia is categorised and shown in table 3 From the observation of previous study on sleep disorders, insomnia is very low recognized, low treated and also level of diagnosis is low, 50-80% of individual with insomnia disorder have very low follow-up i.e. once a year (Frazen et al.,2008). Fatal Familial Insomnia mostly occurs inpatients over the age of 40 years with insidious and progressiveinsomnia accompanied by vivid dreams initially, and then syndromescaused by dysfunction of autonomic nervous system emerged, such as hyperhidrosis, palpitation, sexual impotence, and constipation. Various optimization techniques like Genetic Algorithm (Sudha et al., IJITEE, 2020) and Invasive weed Optimization (Sudha et al., IJAST, 2020) techniques are implemented. In this paper a dragon fly optimization algorithm is considered for obtaining accurate features in detecting the sleep disorder. The proposed method is done by processing of signal, detecting the sleep order and remedy is been presented. The graphical user interface module is created. The main objective of this paper is to identify and diagnose the sleep disorder using EEG signals.

MATERIAL AND METHODS

Dragon Fly Optimization: The algorithm initiates the swarming behaviours of the dragonfly. Two types of

moving patterns are involved during the process of hunting one is static and other is dynamic. Static type is considered while moving in small areas to hunt insects. The hunt process in static includes unexpected movements and local movements. Dynamic type is considered for long search, in this bunch of dragonflies forms a group and travel in single direction for longer interval (Mirjalili 2015). The static and dynamic swarming is shown in figure2. In this process of swarming two phases are involve i.e exploration phase and exploitation phase.

The performance of dragon-files algorithm depends on various parameters like separation (s), alignment (a), cohesion(c), food and enemy vectors (f,e) and inertia weight (w). These parameters helps dragonflies move to different paths. Two phases' exploration and exploitation depend on alignment and cohesion. High level alignment and low level cohesion parameters are used for exploration of the search space vice versa i.e low level alignment and high level cohesion parameters are used for exploitation of search space. The parameters need to be tuned during the process of optimization to maintain equality between the two phases. The transfer of phases i.e form one phase to other depends on number of iterations. The parameters are designed mathematically and are shown in below equations from eq 1 to eq 5. The separation can be calculated as mentioned by(Reynolds CW, 1987).



$$SP_i = -\sum_{j=1}^N P - P_j \tag{1}$$

In equation (1), The position of current dragonfly is given as P, Position of jth neighbour dragron fly is given as P_j , Number of dragronflies in the search space is given asN, and SP is the separation motion . For calculating of alignment parameter the below equation 2 is used:

$$AP_{i} = \frac{\sum_{j=1}^{N}}{2}$$

Where, the alignment motion of i^{th} individual is given by AP_i and the velocity is represented by Ve.

The mathematical expression for calculating Cohesion function is given as,

$$CP_i = \frac{\sum_{j=1}^N P_j}{N} - P \tag{3}$$

Where, cohesion of ith individual is CP_i, size of neighbour is termed as N, Position of jth fly is P_j, current position of fly is indicated by P.Search of food and the attraction for food is calculated using equation 4 below:

$$Fd_i = P^+ - P \tag{4}$$

Where, food attraction is Fd_i for ith dragonfly, food source is position P⁺, current position of fly is P. In this algorithm the best objective function is the food.Distraction outwards predators are calculated as follows:

$$En_i = P^- + P \tag{5}$$

Where, Distraction of enemy is given as En_i for the ith individual, current position of enemy is termed as P⁻, and current position of fly individual is P.To update the positions in the search space two vectors are used one is step vector and other is position vector and denoted using Δ P and P. The step vector used over here is similar to the vector in PSO (Zhang et al., 2015). The updating of position is similar to PSO algorithm. The step vector is defined in (Mirjalili S 2015) as follows:

$$\Delta P_{t+1} = (sSP_i + aAP_i + cCP_i + fFd_i + eEn_i) + w\Delta P_t$$
(6)

wis the inertia weight; and t indicates the iterationcounter. After the evaluation of step vector, position vectors are evaluated using equation 7.

$$P_{t+1} = P_t + \Delta P_{t+1} \tag{7}$$

Where, current process of iteration is termed ast.



Karri et al.,

To raise the likelihood of investigating the entire choice space by an improvement calculation, an arbitrary move should be added to the looking through method. At the point when no neighbouring arrangements are there, to build irregularity, stochastic conduct, and investigation of fake dragonfly people, dragonflies are needed to utilize an arbitrary walk (L'evy flight) to fly all through the inquiry space. In dragonfly algorithm, a set of solutions are created randomly in the starting of optimization process. Boundaries are created and the values for step and position vectors are given initially between the lower and upper boundaries. The updating of position and step vectors of each dragonfly is done at every stage of iteration using equation 6 and 7. The Euclidean distance is calculated to choose the neighbours. The position will be updated until the global best solution is obtained.



Detection and Remedy Process: In this process they are different stages entitled for detection of sleep disorder and for providing the remedy. The remedy is provided based on the output disorder obtained for the given input signal. The stages are (a) Input signal and Pre-Processing (b) Feature Extraction (c) Features reduction and Optimization (d) SVM classifier. In final stage the classifier is which determines the rate of accuracy in finding out the disorder. The process flow of work is shown in Fig 3. A GUI is created for all the things to get performed. The signal is uploaded from the dataset, processed internally by using the techniques that are

used and displays the types of sleep disorder along with its remedy.

Input Signal: In this stage the EEG signal database is considered. The database consists of different EEG signal out of which some of the signals are of normal patients, some are brux disorder patients and some are FFI disorder patients. These signals are considered as input for process our experimentation. The standard database is obtained from PhysioBank(www.physionet .com/EEG/sleep disorder data). From the databank total of 635 patient's data is considered. These EEG signals are pre-processed for obtaining the features from the signals. In the pre-processing step, the EEG signals were filtered between 0.5-40Hz using a low pass filter to remove noise. They were then normalized and any epochs containing amplitude levels above the 250 µV were removed. After pre-processing, feature extraction is performed.

Parameters		GA- SVM(Sudharamya et al.,2020)	IWO- SVM(Sudharamya et al.,2020)	Proposed DFA- SVM
N/B	Α	89.1	91.8	93.5
	Se	73.8	76.3	79.2
	Sp	88.9	91.1	93.8
	Pr	86.2	92.4	95.4
	F1	0.89	0.912	0.94

Table 4. Metric evaluation for two combinations i.e. normal and Brux

Table 5. Metric evaluation for two combinations i.e normal
and FFI

Parameters		GA- SVM(Sudha RK et al.,2020)	IWO- SVM(Sudha RK et al.,2020)	Proposed DFA-SVM
N/FFI	A	90.8	92.5	94.3
	Se	82.0	84.3	87.8
	Sp	89.2	91.8	94.2
	Pr	86.4	92.3	96.1
	F1	0.90	0.92	0.952

Table 6. Metric evaluation for two combinations i.e. FFI and Brux

Parameters		GA- SVM(Sudha RK et al.,2020)	IWO- SVM(Sudha RK et al.,2020)	Proposed DFA-SVM
	Α	88.6	92.1	93.8
FFI/B	Se	70.4	75.2	78.6
	Sp	89.6	91.8	94.1
	Pr	85.6	92.3	95.5
	F1	0.88	0.917	0.938

Feature Extraction: One of the main step for detecting the disorder to extract the desired features from the EEG signals. From one channel of EEG data 28 number of features are extracted. For every 30s of the input data

features are extracted which are related to sleep stages. The extracted features are listed as mean, standard deviation, kurtosis, skewness, max, min, different ratios of alpha, theta and delta. The signal amplitude levels determine the time domain features and also describes statistics with higher order. In frequency domain, welch's method is used on the entire length of signal. Based on the ranges of these features as shown in (Sudha et al. IJITEE, 2020) the type of disorder can be derived. To find accurate results feature reduction process is performed and is optimized to improve the rate of accuracy.

Table 7. Metric evaluation for two combinations i.e. Normal.

Parame	ters	GA- SVM(Sudha RK et al.,2020)	IWO- SVM(Sudha RK et al.,2020)	Proposed DFA-SVM
	A	86.2	89.6	93.2
	Se	72.6	74.8	77.8
N/FFI	Sp	87.6	90.1	93.8
/B	Pr	83.5	91.1	94.4
	F1	0.86	0.894	0.936



Feature Reduction and Optimization: The extracted features will be reduced using reduction techniques likePrincipal Component Analysis (PCA), Independent Component Analysis (ICA) and Linear Discriminant Analysis (LDA). The LDA models the difference between the classes of the data while PCA does not work to find any such difference in classes. In PCA, the factor analysis builds the feature combinations based on differences rather than similarities in LDA. ICA separation of mixed signals gives very good results is based on two assumptions and three effects of mixing source signals. Two assumptions are, the source signals are independent of each other and secondly the values in each source signal have non-Gaussian distributions. The results show that LDA has better performance in reducing of features. These features obtained using LDA is given to

Optimization Technique to obtain the optimal and global best features. The dragon fly optimization is considered and the optimal features are obtained by the process discussed in section 2. These optimized features are been provide to classifier. In fig4, the results obtained using dragon fly optimization for the signals is shown. These are the best features to identify or detect the type of sleep disorder and to provide remedy. By using these optimized features the rate of accuracy can be increased.

Classification: Classifier is used to separate the features and find the rate of accuracy. Here Support vector machine (SVM) classification method is used. It is a method based on theory of statistical learning. The inputs given to this classifier are considered as vectors and are linearly separated to find the best results. SVM brings a concept of hyper plane by which the separation process takes place with maximum margin. The data which is given as input will be trained and tested. The 70% of data is used for training and 30% is considered for testing. After completing the training and testing of all signals are performed and the rate of accuracy is achieved.

RESULTS AND DISCUSSION

The experimental data used in this study comes from theNormal sleep and sleep disorder database, which is part of the Physionetdatabase. The proposed algorithm is verified on the dataset that is used. K-fold cross verification is implemented in which training and testing is performed. For training k-1 folds are used and for purpose of testing kth fold are used. Every fold will be used for testing by the time it reaches stop criteria. We extractaccuracy, precision and recall values for each class, as defined below:

$$Accuracy = \frac{Trp + Trn}{Tp + Tn + Fp + Fn}$$
$$Recall = \frac{Tp}{Tp + Tn}$$
$$Precision = \frac{Tp}{Tp + Fp}$$

The results obtained using proposed Dragon fly optimization based SVM is shown in below tables. Various combinations of detections are considered and parametric values are obtained.

From the above tables 4,5,6,7 it is shown that proposed method have good rate of accuracy compared to existing methods. The graphical user interface of showing the remedy for the detected disorder is shown in below figures. The proposed method is compared with existing techniques.

Case1: For the given Input signal the results obtained states that the disorder is Bruxism. From fig5, it is shown that sleep disorder is bruxism and the remedy is Muscle Relaxants & Botox Injections. This GUI gives better output progress and better understanding of outputs.

Case2: For the given input signal the result obtained states that the disorder is FFI. By clicking browse file we provide the input signal from the database. The status will be in progress until the above process which is discussed

Karri et al.,

in section 3 completed. After processing is done, the status shown is process completed. After completing the process, the important features are displayed. Based on the displayed features the disease is identified and displayed. From fig6, it is shown that sleep disorder is FFI and the remedy is zolpidem(Ambien),eszopiclone (Lunesta),zaleplon (Sonata), doxepin (Silenor). Cognitive behavioural therapy (CBT).Relaxation techniques.Avoid caffeine, alcohol and smoking.Do regular exercise.



Case3: For the given input the output is normal.From fig7, the result is normal and no kind of sleep disorder. The overall accuracy of the disorder detection is also shown in the GUI.

CONCLUSION

The EEG signals play an important role for identifying the sleep disorder in humans. The sleep disorder like bruxism and fatal familial insomnia are identified and the remedy have been displayed. The entire process is done using Matlab GUI tool. The graphical user interface helps to obtain results for every signal which is been processed and listed. The outputs shown gives an immense impression on how the detection of sleep disorder and remedy displayed with proper rate of accuracy using Dragon Fly optimization techniques. This technique helps in obtaining the best features for identifying the disorder. The accuracy and other parametric results obtained using proposed methodology is compared with exiting techniques. The proposed method shows promising results in all aspects with an accuracy of 93.8%.

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Predictive Diagnosis of Breast Cancer Using Deep Neural Network

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ABSTRACT

The ultimate aim of the study was to predict the overall survival rate for women affected by breast cancer by developing and validating a prognostic model. In this study mammography image were collector and the health records for at least 1 year before mammography. The algorithm was trained on mammogram and health records of women to make two breast cancer predictions: (i)to predict biopsy malignancy and (ii)to differentiate normal from abnormal examination. In this model, ANN's were used to complete the task. This model was developed using a large proportion of concealed layers for thedatageneralization. Alarge proportion close to a 1000 mammography records and results were used in the model to differentiate between benign and malignant tumors. Before being inputted, all the data was inspected by radiologists. The accuracy of the model was determined to be an AUC of 0.96 and was a huge success(area or curve used to determine the success of model). This model is highly consistent, effective and less prone to error when compared to diagnosis performed by pathologists. The study obtained very high accuracy of predictions such as 93% and 95%. This facilitates early and accurate diagnosis of breast cancer for patients and early diagnosis is integral in cancer diagnosis. This also contributes as a useful tool for new selective drugs for these tumors to be treated. In Today World, Technology has facilitated great improvements in various important aspects of the world such as healthcare, agriculture, business etc. Despite this tremendous growth and improvement various diseases are still on the rise world wide. Among these Cancer stands as one of the major causes of death and accounts for about 9.6million deaths world wide. Cancer has various forms. Among which Breast Cancer is one of the most dangerous and common reproductive cancers that mostly affects women. According to the World Health Organization, Breast cancer affects about 2.1 million women every year. In order to improve Breast cancer outcome and survival, Early detection is critical. Hence, the goal of our project is to use Machine learning techniques and deep learning to increase the proportion of breast cancers identified at an early stage, allowing for more effective treatment to be used and reduce the mortality rate. Since early detection of can ceriskey to effective treatment of breast cancer, we use various machine learning and deep learning techniques to predict if a tumour is benign or malignant, based on the features provided by the data in a more accurate, consistent and less prone toerror.

KEY WORDS: BREAST CANCER, WORLD HEALTH ORGANIZATION, 2.1 MILLION WOMEN EVERY YEAR.



INTRODUCTION

The occurrence of mutations which are changes in genes regulating the growth of cell causes the deadly disease Cancer. This causes the multiplication and division of cells in an uncontrollable fashion. The cancer developed in the breast region is defined as breast cancer. The formation of cancer takes place in the duct or lobules of breast.



The milk-producing glands are termed as lobules and the milk transportation pathways to the nipple from the glands are known as ducts. Occurrence of cancer can be extended to the connective fibrous and fatty tissue of the breast. The affected cancer tissue has the dangerous ability to affect other healthy tissues and also spready or travel to the lymph nodes in the arm. The movement of the cancer cells to the rest of the body parts is facilitated by the lymph nodes (Singh & Gupta 2015).

Machine learning (ML) and its techniques have recently provided great results in the healthcare field. Although Machine learning models are not new and have been increasingly used analyse data in health care, A machine learning can be used to diagnose breast cancer at a level equal to pathologists and Hence acceptable in clinical practice as a very useful tool. The purpose of our study is to use Machine learning and deep learning for early breast cancer prognosis and assess its stage and survival rate of the patient. Analyse data in health care, A machine learning can be used to diagnose breast cancer at a level equal to pathologists and Hence acceptable in clinical practice as a very useful tool. The purpose of our study is to use Machine learning (Geras et al., 2017).

Breast Cancer: The cancer occurred and developed in the region of the Breast is termed as breast cancer. Typically, Breast cancer occurs in women and also in men in rare scenarios. It is one of the most prevalent and deadly diseases around the world. It is said to commonly occur in women between the age group 40-55 years old. Breast cancer is said to initiate with cells in the best growing in an uncontrollable manner. Early diagnosis and treatment is key in breast cancer (Blockeel & Struyf 2001).

Symptoms: One of the dangerous attributes of breast cancer is that close to no symptoms are visible during its early stages. There are many scenarios in which the tumor being very small can be neglected, However the abnormality can be identified on a scan or mammogram. When the tumor is first felt it mostly mean sit's anewone formed in the breast which was initially absent. But, all tumors in the breast are not a tumor caused by cancer. A variety of symptoms are caused due to each kind of breast cancer. Most of these symptoms are similar in character, but there are few symptoms which are distinct. The common symptoms of breast cancers include:

- A lump in the breast developed recently and may or may not cause pain.
- Pain in breast region
- Skin turning red in the breast
- swelling in breast region
- discharge from nipple except breast milk
- discharge containing blood from nipple
- Skin flaking or peeling nipple or breast region.
- Change in size or shape of breast which takes place suddenly.
- Nipple inversion
- Appearance changes on breast region
- Under arms welling

Types of Breast Cancer: The common types of breast cancer are as follows:

In situ Cancers: This type of cancer does not spread to other regions and stays in the region of initial development.

Ductal carcinoma in situ (DCIS): The carcinoma at the very initial stage.(stage0).The cancer hasn't spread and in its initial region of development. However, if untreated this may become dangerous. This stage of cancer is easily curable. Lobular carcinoma in situ (LCIS). This carcinoma originates exclusively in lobules producing milk. It isn't termed cancer but has the ability to develop into breast cancer in the future. Regular medical check-ups are mandatory (Zhang 2017).

Invasive Cancers: These are dangerous and have the ability to grow and spread across the body.

Invasive or infiltrating ductal carcinoma (IDC): This originates in the ducts producing milk and grow and damage the surround cells and tissues in the breast region by breaking the walls. It is highly prevalent and accounts for a greater margin of deadly cases.

Invasive lobular carcinoma (ILC): This originates in the lobules and spreads to the other parts It accounts for about lesser margin of deadly breast cancers.

Breast Cancer Risk Factors: The reason and cause of breast cancer is yet to be identified. But, The probability of occurrence can be determined by some factors such as age, genetic factors, personal health history, and food habits contribute to them. The factors of risk are classified as controllable and Uncontrollable risk factors.

Breast Cancer Uncontrollable Risks factors:

- Age: Women below the age are less likely to be in risk and womenaboveage50areproneto the disease.
- Dense breasts: Presence of more connective tissue than fatty tissue can reduce the visibility of tumors in the breast in scans.
- Personal history of cancer: This plays a major role as previous breast cancer patients are more prone to recurrence of the disease.
- Family history: If a close blood relative had breast cancer, you're more prone to the disease.
- Genes: Mutations or change in genes may cause this disease. Especially genes such as, BRCA1 andBRCA2.
- Menstrual history: A patient is more prone to breast can cerif:
- 1. Early periods initiation before the age of 12.
- 2. Periods don't stop until age55.

Breast Cancer Stages

- Early stage (stage 0) or non-invasive breast cancer. The presence of the disease is completely limited to its place of origin and cause no symptoms.
- Stage I breast cancer. The tumor or cancer is very

small in size and doesn't spread but stay in its original position.

- Stage IIA breast cancer. The tumor is:
- less than 2cm with development in underarm.
- Bigger than 2cm and smaller than 5cm with no development any where else.
- Stage IIB breast cancer. A tumor that's:
- A big tumor of 5cm in size without any development in any other region.
- A big tumor in size with development in the other regions across breast.
- Stage IIIA breast cancer or locally

advanced breast cancer:

- A large tumor in size and spread across the region of breast such as lymph nodes under the arm.
- A cancerous tumor that spreads to surrounding tissues.
- Stage IIIB breast cancer. A tumor which spreads across the chest.
- Stage IIIC breast cancer. A tumor which has rapidly spread and includes development in lymph nodes
- Stage IV (metastatic) breast cancer. A tumor which rapidly spreads from its place of origin to other parts of the body and is very dangerous.

MATERIAL AND METHODS

Dataset: The dataset consists of 292,624 mammography examinations screened digitally from close to 2 lakh patients. The examination distinctly includes minimum 4 images which were a part of the mammography screening. The four images are as follows: L-CC (left craniocaudal), R-CC (right craniocaudal), L-MLO (left mediolateral oblique) and R-MLO (right mediolateral oblique). The reports obtained from the pathology department were used in the process of determining the labels which designate whether the tumor in the breast denotes malignant tumor or benign tumor.

In a period of 140 days of mammogram screening close to 5000 examinations accompanied by a minimum of one biopsy was performed. It was found that 980 (8.2%) were found to be malignant cancers and close to 5000(47%) were determined to have benign cancer and the remaining 200(20%) were determined to have both benign and malignant cancer. The proportion remaining that failed to match with the results of the biopsy, were labeled as malignant and benign tumours absent in both breasts. The examinations which were found to be matching with the results of biopsies, were provided to pathologists and radiologists to determine at pixellevel placement or place of origin of the biopsied lesions. It was then determined by the specialists that about 32% of the examinations were concealed and failed to be visible or found on mammography and could be determined of their presence using other imaging techniques such as: MRIor Ultrasound (Oquab 2014).

METHODOLOGY

Adaptive mean filter has been used to remove noise from

image. Since it is better among all the spatial filters and distinguish fine details from noise. The Adaptive Median Filter is used to determine the noise impulse affected pixels in an image by spatial processing. The pixels are classified by adaptive mean filters as noise by comparing each pixel in the image to its surrounding neighbor pixels. The size of the neighborhood is adjustable, as well as the threshold for the comparison. A structurally disjoined pixel to its similar pixels and greatly varying from a maximum of the pixels surround it is designated as impulse noise (Huang 2017).

The median pixel value is then exchanged by the noise pixels in the surroundings where pixels have already passed the noise labelling test. Initial conversion of the image into grayscale image using rgb2gray () function which is followed by the application of adaptive mean filtering to the resulting image and then finally converting the image into unsigned integer 8 using uint8() function. In this manner the image is preprocessed and followed by performing GMM segmentation (Gaussian Mixture Model)onthepreprocessedimagewith2regionsand2 components GMM components 2 and maximum number iterations 10. we performed k-means segmentation.

with k=2. then we Implemented HMRF-EM (Hidden Markov Random Field Model) and its Expectation-Maximization Algorithm (Dheeba & Singh 2014).

Block Diagram



Figure 2.A: Diagrammatic representation of breast cancer examination classification as a learning task.



Deep CNNs for cancer classification: Two primary binary labels were designated for every breast under examination: malignant tumor present/absent in the breast region, and the benign tumor presence/absence

in the breast region.Taking into account both the sides of the breast,left and right every examination consists of four labels. Our ultimate goal is to construct four distinct predictions which are attributed to the four distinct labels corresponding to every examination. The four High resolution images are in agreement with the views of the four mammography screening are taken as the input. Every image is cropped to a fixed size of 2767 \times 1924 pixels for CC views and 2947 \times 1784 pixels for MLO views.

Model Architecture: We trained a deep multi-viewCNN of architecture. There are 2 core modules in the overall network:

- 1. Four columns four view-specific, each based onthe ResNet architecture that outputs a fixeddimension hidden representation for each mammographyview,
- Mapping of the calculated concealed representations 2 to the final predictions using two completed and connected layers. The calculation of 256-dimension concealed representation vector of every view was performed using Resnet-22. The weights were shared by columns applied to L-CC/R- CC.Thisw asalsofollowedandweightsweresharedby columns applied to L-MLO/R-MLO. This step is followed by the concatenation process of L-CC and R- CC representation into a 512 dimensional vector, and the generation of predictions of the four outputs are achieved by application of two completely connected layers. This process is repeated for the successive L- MLO and R-MLO views. The final output and predictions are deduced by using the average probability of CC and MLO branches of the model.

Figure 3: Architecture of our model. Four Res Net-22 columns take the four views as input left breast left breast right breast right breast malignant / mnin / malignant/ alig not malignant d berlign ot m average average average average softmax softmax softmax softmax softmax io/tmix softmax fully connected layer fully connected layer concatenation concatenation average average average average pooling pooling pooling pooling ResNet-22 ResNet-22 ResNet-22 ResNet-22 R-CC L-MIO R-MID

Fig.3. Architecture of our model. Four Res Net-22 columns take the four views as input. The architecture is classified into two branches called CC and MLO. In each branch, the corresponding right and left representations from the ResNets are individually average- pooled spatially and concatenated, and two fully connected layers areapplied to compute the predictions for the four outputs. The predictions are averaged between the CC (craniocaudal) and MLO (mediolateral oblique) branches. Weights are shared between L- CC/RCC columns and L-MLO/R-MLO columns. The first layer of the columns are modified in accordance to inputs as additional channels are added to theheatmaps.

Experiments: For each and every experiment, the training set is used for optimization of parameters of our model and the validation set and thetraining procedure. Unless in any other cases specified, the results are computed throughout the screening population. To acquire, test sample prediction for each sample we applied random transformationsforinput10times, applied the model to 10 of the samples each separately and then average the 10 predictions (in SI details). To improve our results further, we used the technique of model ensemble [19], wherein the predictions of various different models are averaged to produce overall prediction of the ensemble. In our case, we trained 5 copies of every model with different random initializations of the weights within the fully connected layers. The pre-trained model's weights are used to initialize the remaining on BIRADS classification, it gives our model a significant boost in performance. For each model, we report the results from a single network and from anensemble.

Test Populations

In the experiments, to test the various hypothesis we evaluate our model on several populations:

- 1. screening population, it includes all exams from the test set without sub sampling;
- 2. biopsied subpopulation, which is subset of the screening population, and includes the exams from the screening population containing breasts which underwent abiopsy;
- 3. reader study subpopulation, consists of the subpopulation of the biopsied report and randomly sampled subset exams from the screening population without any findings.

Evaluation Metrics: The models were initially evaluate in terms of AUC (area under the ROC curve) for malignant or not malignant and benign or not benign classification tasks on the breast level. The model and readers' responses on the subset for reader study are evaluated in terms of AUC and precision-recall AUC (PRAUC), which are the regularly used evaluation metrics of the performance of the radiologists.

The different as pect of predictive model performance is captured by ROC and PRAUC. The RO Ccurve summarizes the trade-off between the true positive and false positive rate for a model using probability thresholds. The true positive rate and positive predictive value is summarized by the precision recall curve for a model using different probability thresholds.



Results across ages and breast densities: We split the test data by patient age, breast density and evaluate the model for each and every subpopulation (Fig 4). The performance of the image-only and image- and heat maps model varies based on age. We also find that both models perform worse on dense breasts ie..in "het erogeneouslydense" and "extremely dense" thanon fattier ones which are almost entirely fatty, which is consistent with the decreased sensitivity of radiologists for patients with dense breasts. Differences between the model's performance whether its benign/notbenign classification is larger than in malignant/not malignant classification. We conclude that this is due to age and the level of noise is influenced by the breast density in benign/not benign labels, associated with radiologists confidence in their diagnoses.

Literature Survey

S.N 0	NAME OF THE PAPER	AUTHOR	DATE OF ISSUE	INFERENCE
1.	Curvature-based Selection of Feature by applying in Classification of Electronic Health Records	Zheming, Jie Li, NouraMoubayed.	10 January 2021	Curvature-based Feature Selection method - lack of expert knowledge of clinical science, visualisation the results of feature ranking of the proposed CFS to support better explainability.
2.	Deep Neural Networks Performance in Screening of Breast Cancer.	Nan Wub, Jason Phangb, Jungkyu Parkb	20 March 2019	Deep convolutional neural network; AUC of 0.895; high accuracy-two-stage training procedure, which allows them to use a very high-capacity patch-level network to learn from pixel- level labels alongside a network learning from macroscopic breast-level labels.
		Habib Dhahri	3November 2019	Geneticprogramming technique for feature selection and selection of parameter
	Machine Learning based Automated Breast Cancer Diagnosis algorithm			values of classifiers of machine learning. The Performance was based on sensitivity, specificity,precision, accuracy.
4.	Prediction and detection of breast cancer using machine	Anoy Chowdhury	19 June 2020	breast cancer tumour predictor on the Wisconsin dataset and created graphs and results for the sam.e Selection of appropriate algorithms with good home dataset will lead to the development of prediction systems. Proper diagnosis of patients suffering from breast cancer can been sured using the sesystems.
5.	Applications of Machine Learning in Cancer	Joseph A, David S.	2006	From this paper it is concluded that machine learning methods

6.	Prediction and Prognosis Machine learning methods for Breast cancer diagnostics	Shahnorbanun, Ashwaq Qasem.	29January 2018	can be used to substantially (15-25%) improve he accuracy of Predicting cancer susceptibility, recurrence and mortality. This paper deals with two most popular techniques that use machine learning (CADe & CADx).False positive rate is reduced significantly using this method and rapidly improves the prediction performance of breast cancer.
7	Using Machine Learning Algorithms for Breast Cancer Risk Prediction and Diagnosis.	HibaAsria	2016	In this paper, they have employed four main algorithms: SVM, NB, k-NN and C4.5 on the Wiscons in Breast Cancer (original) datasets; Compared efficiency and effectiveness of those algorithms in terms of accuracy, precision, sensitivity and specificity to find the best classification accuracy; SVM reaches accuracy of 97.13% and out performother algorithms.
8.	Early Detection of Breast Cancer Using Machine Learning Techniques.	Bashari Rad	September 2018	Breast cancer AndML;introduced in-depth literature review on ExistingML methods;Suggest that SVM- most popular method used for cancer detection applications.

DISCUSSION AND CONCLUSION

A large number of training sets based on breast level and pixel level labels are added to build a neural network for breast cancer classification on screening exams. The significant success is due to the amount of computation encapsulated in this model, that had been densely applied to the input images as an additional input channel to breast level model. The training to the model would be impossible with the current available hardware. Even Though our results are promising, we suggest he test set used are relatively small and are advised to require further clinical validations. We also acknowledge that our performance is much stronger than that of the specific task performed by radiologist.

Screening mammography is just the beginning step in the pipeline of diagnosis, further requiring the radiologist's final decision for another process and decision to biopsy after considering the mammography images and possible ultrasound. In our study, the hybrid model out performed both the neural network and expert radiologist suggestion, suggesting that the use of model like this could improve radiologist sensitivity for breast cancer classification and detection. Contrastingly, our model design is relatively simple. and with our model it is possible to develop more sophisticated and accurate models. Moreover, the prediction based on whether the patient had any visible cancer at mammography exam is the most simplest possible way of prediction among other. In addition to testing the model in real-time analyzing of screening mammograms, a transparent next step would be predicting the development of breast cancer in the future–at the earliest before it is even visible to a naked human eye and symptoms are well shown.

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Utilization of ICT by the Users of Arts and Science Colleges in Thiruvarur District – A Study

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ABSTRACT

This is the age of information dominated by the Digital Technology. The Digital Technology has influenced all aspects of human life. Education is not an exception. Now the technology is in the process of change from Digital to Photon. Shortly Photonic Technology will be available for the use of the society. On the present majority of devices are based on Digital Technology. One such device is the Computer. The Computer is an electronic device that has the capacity to store, retrieve & process both qualitative & quantitative information fast and accurately. The computers were never developed for improving quality of the teaching – learning process. But researchers started using Computers for teaching purpose. It gave birth to Computer Assisted Instruction (CAI), Computer Managed Instruction (CMI), Computer Based Instruction (CBI), etc. People started developing CAI for teaching different subjects at the school as well as Higher Education level. The present study aims to find out the utilization of ICT by the users of arts and science colleges in Thiruvarur District. A samples of 116 library users selected randomly were studied. Primary data were collected by using a structured interview scheduled. Percentage analysis and Chi-square test were applied. The findings and observations are the result and outcome of the interpretations made during the study of analysis.

KEY WORDS: INFORMATION COMMUNICATION TECHNOLOGY, COMPUTER ASSISTED INSTRUCTION, COMPUTER MANAGED INSTRUCTION AND COMPUTER BASED INSTRUCTION

INTRODUCTION

Networking of computers gave birth to Information Technology (IT). UNESCO considered Information Technology as "Scientific, technological and engineering disciplines and management techniques used in information handling and processing, their application, computers and their interaction with men and machines, and associated social, economical and cultural matters". According to (Smith & Campbell 1982), a mosaic of



technologies, products and techniques have combined to provide new electronic dimensions to information management. This mosaic is known by the name of Information Technology. OECD (1987) treated Information Technology as "a term used to cover technologies used in the collection, processing and transmission of information. It includes micro-electronics and info-electronic based technologies incorporated in many products and production processes and increasingly affecting the service sector. It covers inter alias computers, electronic office equipment, telecommunication, industrial robot and computer controlled machine, electronic components and software products."

IT was limited only to the textual mode of transmission of information with ease and fast. But the information not only in textual form but in audio, video or any other media is also to be transmitted to the users. Thus, the ICT = IT + Other media. It has opened new avenues,



like, Online learning, e-learning, Virtual University, e-coaching, e-education, e-journal, etc. Third Generation Mobiles are also part of ICT. Mobile is being used in imparting information fast and cost effective. It provides e-mail facility also. One can access it anywhere. It will be cost effective. The ICT brings more rich material in the classrooms and libraries for the teachers and students. It has provided opportunity for the learner to use maximum senses to get the information. It has broken the monotony and provided variety in the teaching – learning situation.

The students understand better, if they do some practices related to the concept. It makes learning easy and interesting. Laboratory helps in developing a scientific temper. But the fact is that practical are not done by each student in each school. There are many schools which do not have a laboratory. Sometime if the laboratory is available, the instrument is not available. The students are not given freedom to do experiments on their own. Some good schools have laboratories all classes right from class I to XII. They allow students to play with the material available in the laboratory under the supervision of a teacher. The teachers also make use of laboratories during their teaching. At a higher level, the schools are asked not have practical where in animals are used. Animals based practices are done in Biology. In short, there are many restrictions under which the students have to work in the laboratory. Now it is possible to have Virtual laboratory. Once the Virtual Laboratory is developed, it can provide lots of freedom to students. The students can manipulate any attribute or variable related to the experiment and can see how it affects the outcome. Suppose a student wants to study the factors that can affect the focal length of a mirror.

At present in the real laboratory, the student cannot manipulate many variables that he thinks might be related. But Virtual laboratory can provide lots of freedom to the student. That is, student can take different types and shapes of objects, change the distance between the mirror and object to any extent, change the thickness of the mirror, etc. and can see how such attributes affect the focal length of the mirror. The Virtual Laboratory can be developed using ICT. It may be made available at the doorstep of each and every student by uploading it on the Website. Further, each country can think of the developing science website which should give access to Virtual Laboratory and it must be free of cost. Such a Web site will not only help Indian students, but can go a long way in helping students of Underdeveloped and developing countries.

The digital technology has broken the foundries between countries. Human beings do not feel any type of restriction in communicating with people all over the globe. The access has become easier. It is a well-known fact that all students do not understand all subjects to the same extent. Some students find subjects, like, Mathematics, Physics, English, Chemistry, Accountancy, etc. difficult. All educational institutions do have well equipped laboratories and qualified & competent Faculty. Consequently, students do feel the need of academic support out of the school. Therefore, students go for tuition. These days' students from USA & other countries are enrolled in private tuition classes in India.

That is they are being taught Online. This has become possible only due to ICT. In Online tutoring the student stays at his home. He logs into his tutor through the use of the Internet and software. He can see the teacher who is in India and the teacher can see the student who is in the USA. The student asks the question and teacher replies it by writing on soft board or using power point presentation. This interaction is normally one to one. It has made the academic life of many students easy. This is how the manpower available in India can be made use of other countries. Not only Online Tutoring but some of the students do outsource their assignments. These assignments are completed by the teachers of other countries. Of course, academically it is not correct because the purpose of giving assignment is not achieved. The student does not develop academically and he may become weak in the subject. All this is happening just because of ICT.

Review of Literature: Islam (2017) stated that the application of web-based information retrieval trends of researchers is ever increasing and the electronic material will eventually replace the traditional library and users need not go there to find and collect information they need. (Gulbahar, & Guven 2018). Turkey has been undertaking many projects to integrate Information and Communication Technology (ICT) sources into practice in the teaching-learning process in educational institutions.

This research study sheds light on the use of ICT tools in primary schools in the social studies subject area, by considering various variables which affect the success of the implementation of the use of these tools. A survey was completed by 326 teachers who teach fourth and fifth grade at primary level. The results showed that although teachers are willing to use ICT resources and are aware of the existing potential, they are facing problems in relation to accessibility to ICT resources and lack of inservice training opportunities. (Aravind & Vinod 2019) conducted a survey ICT has grown up as the most popular and effective information tools of present age. In this study, the usage of ICT by the students of MS Ramaiah Institute of Technology, Bangalore is conceded. A total number of 207 respondents were selected and their response was obtained with the help of questionnaires. Most of the students use the ICT for education purposes and for checking E-mails. Slow access speed and over lode information produced by the internet are the two problems faced by the users. (Archibong, et al., 2019) conducted a survey which explored ICT usage and challenges among academic staff.

Thus, the main purpose of this study was to determine the areas of ICT usage among academic staff; identify the obstacles to their ICT usage and identify their areas of training need in ICT usage. Five research questions were posed to guide this study and a questionnaire was designed to collect data from a sample size of 80 academic staff. From the results, academic staff indicated that ICT is of much help to them in the areas of upgrading of knowledge, research and publication. Weak infrastructure, financial constraints and lack of access to ICT facilities were identified as the major obstacles to ICT usage among academic staff. Furthermore, designing of new learning activities, electronic presentation of materials and making use of the internet were identified as their areas of train need in ICT usage. Recommendation made include providing compulsory free, adequate training opportunity for academic staff by the university management.

Objectives of the Study

- 1. To study the personal profile of the respondents.
- 2. To Study the awareness of ICT based resources among the respondents.
- 3. To find the adequacy of accessing ICT based resources.
- 4. To study the purpose and usefulness of accessing ICT based resources among the respondents.
- 5. To identify the method of acquiring IT Skills by the respondents.
- 6. To identify the problem faced by the respondents.
- 7. To determine the level of satisfaction among the respondents

METHODOLOGY

The survey method is adopted the present study. The primary data for research has been collected from the respondents through a well-structured questionnaire based on the objectives of the present study. Data collection the questionnaire was distributed to faculty members of arts and science colleges, Thiruvarur District. Totally 123 questionnaires was distributed and received only from 116 respondents. The simple percentage and chi-square test are used for further analysis.

Table 1. Use of ICT based Resources and Services					
S.NO	Types of E- Resources	No of respondents	0/0		
1	CD-ROM	51	19.24		
2	Internet	80	30.18		
3	OPAC	14	5.28		
4	Online database	30	11.32		
5	E-Journals	45	16.98		
6	E-book	29	10.94		
7	Audio Cassettes	12	4.53		
8	Video	4	1.51		
Total	265	100			

Note: Because of multiple choice options the percentage is proceed with more than 100%

Limitations of the Study

- Only students and faculties of Arts and Science colleges, Thiruvarur District were included in the study, hence the findings cannot generalize to other population.
- Since the Sample is not large enough, the findings of the study cannot be generalized to all students and faculties of Arts and Science colleges, Thiruvarur District.
- In this study only few personal variables have been related to ICT usage of the respondents.

ANALYSIS AND DISCUSSIONS

Table shows the use of ICT based resources and services. The maximum number of 80 (30.18%) of respondents are using the internet, followed by 51 (19.24%) of respondents use E-journals, 45 (16.98%) of respondents use CD-ROM, 30 (11.32%) of respondents use E-books, 14 (5.28%) of respondents use the OPAC, 12 (4.53%) of respondents audio cassettes and 4 (1.51%) respondents use Video. It could be seen clearly from the above discussion that a maximum number of 80 (30.18%) of respondents use inter.

Table 2. Purpose for using ICT based resources and Services					
S.NO	Electronic Resources	No of respondents	%		
1	For research / study	85	35.71		
2	For communication	39	16.38		
3	Finding relevant information 43 18.06				
4	For career development 46 19.33				
5	5 Other activities 25 10.51				
Total 238 100					
Note: Because of multiple choice options the percentage is					

Note: Because of multiple choice options the percentage is exceeded by more than 100%

From the table, it is clear that 85 (35.71%) of respondents are using ICT based resources and services for the purpose of their research/ study while 46 (19.33%) of respondents using for career development, 43 (18.06%) of respondents are using electronic resources for finding relevant information, 39 (16.38%) of respondents are using for communication purpose and 25 (10.51%) of respondents are using electronic resources for other activities. It could be seen clearly from the above discussion that, a maximum number of 85 respondents are using electronic resources for research/ study (Gulbahar 2018).

Table shows the most popular method of acquiring the necessary skill to use ICT based resources and Services ,80(30.88%) of respondents are learned through self-thought, while 63(24.32%) of respondents are learned through trial and error,42(16.22%) of respondents each acquired skill from external course,31(11.96%)of

Aravind S & Kavitha R

respondents are learned from computer, staff,22(8.49%) of respondents and learned guidance from others ,12(4.63%) of respondents are learned from library staff and 9(03.48%) of respondents are learned from course offered by in situation. Table indicates that preference of using search engines, It could be noted that 72 (27.16%) of Respondents are using yahoo, followed by 60 (22.64%) of respondents use Google, 30 (11.32%) of respondents use info seek, 29 (10.94%) of respondents use Alta vista, 26 (9.81%) of respondents use Lycos (stick), 06 (2.26%) of respondents use Ask.com, and 05 (1.88%) of respondents use excite to access the information in the internet's. It is seen from the above discussion that, the majority of the respondents use yahoo to access the information in the internet (Islam (2017).

Table 3. Learned to ICT based Resources and Services				
S.NO	Learned to E-Resources	No of respondents	0/0	
1	Trail an Error	63	24.32	
2	Guidance from Others	22	8.49	
3	Self-Taught	80	30.88	
4	Guidance from Library Staff	12	4.63	
5	Course Offered by Institution	09	3.47	
6	External Course	42	16.22	
7	Guidance from (Computer)	31	11.96	
	Staff			
Total 259 100				

Note: Because of multiple choice options the percentage is exceeded by more than 100%

Table 4. Freierence of using search engines				
S.NO	Search engines	No of respondents	0/0	
1	Google	60	22.64	
2	Yahoo	72	27.16	
3	Info seek	30	11.32	
4	Lycos	26	9.81	
5	Alta vista	29	10.94	
6	MSN	32	12.07	
7	Ask.Com	06	2.26	
8	Excite	05	1.88	
9	ERNET	05	1.88	
	Total	265	100	
Note: Because of multiple choice options the percentage				
is exceeded to more than 100%				

Table shows the 96 (28.83%) of respondents stated that access to up to date information as a benefit of using ICT based resources and Services, followed by 90 (27.03%) and 87 (26.13%) of respondents stated that

ICT based Resources and Services helps faster access to information and easier access to information respectively and 60 (18.02%) of respondents found that access to a wider range of information an advantage of using ICT based Resources and Services. It could be seen clearly from the above discussion that, a maximum number of respondents that stated that access to up to date information as a benefit of using ICT based Resources and Services.

academic development S.NO Impact of E No of 0⁄0 Resources respondents 1 Access to Current up to date information 96 28.83 2 Easier access to information 87 26.13 Faster access to information 3 90 27.03 4 Access to wider range 18.02 60 Total 333 100

Table 5. Impact of ICT based Resources and Services on

Note: Because of multiple choice options the percentage is exceeded to more than 100%

Table 6. Hindrance of access ICT based Resources and Services.

S. NO	Hindrance	No of Respondent	0/0
1	Too Much Information Retrieved	95	26.02
2	Time Consuming	69	18.90
3	Limited Access to a	70	19.17
	Computer Terminal		
4	Lack of IT Knowledge to	71	19.45
	Effectively Utilize the Service		
5	Using Electronic Resource	60	16.44
	often Detracts from		
	Doing work		
	Total	365	100

Note: Because of multiple choice options the percentage is exceeded to more than 100%

It is noted that in the table, that 95 (26.02%) of respondents stated that too much of information retrieved is the main barrier to access electronic resources, 71(19.45%) of respondents stated that lack of IT knowledge and electronic resources, 70(19.17%) of respondents opinion that limited access to a computer terminal hindered to access electronic resources 69 (18.90%) of respondents stated that is time consuming and 60 (16.44%) of respondents stated that the electronic resources detracts from their work respectively. It is seen from the above

discussion that, a maximum number of respondents stated that too much of information retrieved is the main barrier to access electronic resource (Okello-Obura 2018).

Table 7. Chi square test for College of the respondent and
frequency of library visit

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.166ª	2	.339
Likelihood Ratio	2.105	2	.349
Linear-by-Linear	1.093	1	.296
Association			
N of Valid Cases	116		

Table 8. College wise distribution of respondents andQuantum of time spent in the Library.

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.817	2	.213
Likelihood Ratio	5.596	2	.231
Linear-by-Linear	1.040	1	.308
Association	11.5		
N of Valid Cases	116		

Table 9. College wise distribution of respondents andpreference of library materials.

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.917 ^a	2	.922
Likelihood Ratio	.909	2	.923
Linear-by-Linear	.304	1	.582
Association N of Valid Cases	116		

Table 10. College wise distribution of respondent's opinionabout ICT Based Resources and Services

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.593ª	2	.101
Likelihood Ratio	4.894	2	.087
Linear-by-Linear	1.290	1	.256
Association			
N of Valid Cases	300		

There is no statistically significant relationship found between the college of the faculty belongs and frequency of library visits (X2=2.166 df=2 p=0.339). So, irrespective of the college, the visiting to the library is the same among the faculty members. There is no significant relationship found between the college of the faculty belongs and the quantum of time spent in the library (X2=5. 817 df=2 p=0.213).So, irrespective of the college, the time spent in the library is the same among the faculty members. There is no significant relationship found between the selected college faculty and their preference levels in accessing the library materials in the respective colleges (X2=14. 19 df=2 p=0. 922). Hence, it is shown that there is no variation in the preferred levels of library materials among the selected college faculties. There is no statistically significant relationship found between the college of the faculty belongs and the opinion about the available materials in the library $(X_2=4.593 df=2 p=0.101)$. So, irrespective of the college, the visiting to the library is the same among the faculty members (Watson 2001).

CONCLUSION

On the basis of the findings of the study undertaken, the following suggestions are listed for the surveyed libraries. User friendliness should be the top most consideration in the library management. Library staff should periodically undergo for training courses on the use library software fro the better service. It is also suggested that more number of OPAC terminals are needed within the campus. Although the cataloguing system of the select libraries is comparatively encouraging, however, further improvements are required. New recruitments should be done keeping in view the proficiency in handling the automation project.

Technology has had and will perhaps continue to have a dramatic impact on library operations and services. It is the main force for changing the core work culture of library situation. The trends in technology will certainly find their way into large academic library set up. Because, the libraries must satisfy the expectations of their end users to sustain their goal, objective and existence in present techno-oriented world. The first effort for computerization of library work started in the early 1970sin India. However, it has been seen that Indian academic libraries gained significant momentum during the last decade in automating their functions and services. Presently, the large libraries of Indian University colleges are automating their entire library systems operations and services. But, the library staff and user community, particularly in academic universities still limited knowledge in this regard.

Therefore, improving he service quality of the library profession and creating sufficient awareness and interest in adopting the ICT tools among the faculty members are the high priority agenda in higher education. Enhancing the end user experience in the library will bring lots of new innovations in the research and higher learning.

Aravind S & Kavitha R

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Achievement of Quality Education of Primary School Students: A Micro Level Study At Kalyani Community Block in West Bengal

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ABSTRACT

Education is indispensable in order to elevate the standard of life. Education makes an individual a better person, because it broadens one's exposure to the world or teaches one to distinguish between right and wrong. Primary school is the first step in a child's education. Hence, it is often called 'basic education'. For once the quality of primary education is adequate; students may have better education in higher levels. So it may also be called an 'entrance to higher education'. The quality of education at primary level in West Bengal is far from satisfactory. In government schools of West Bengal students are provided Mid-day Meal for much required nutrition along with education. They are also provided with books, exercise books, school dresses, school bags, scholarships and other basic amenities. The present study attempts to find out why the quality of students in government schools still lower than that of the private schools.

KEY WORDS: QUALITY EDUCATION, STUDENTS, TEACHERS, PARENTS, MID-DAY MEAL, GOVERNMENT SCHOOL AND PRIVATE SCHOOL.

INTRODUCTION

Fredrick Douglass said "It is easier to build stronger children than to repair broken men". Education is the first step in the edifice of character building and it also includes development of social, cognitive, cultural, emotional and physical skills. During a survey, some researchers asked a lady – why she considers it necessary for her daughter to attend school. The lady simply answered "just to live a safe life – we are farmers, and there are bottles of pesticides in our house, if she can read, she will never mistake it to be anything else". The so called uneducated mother may not have any idea what she was saying, but it clearly shows how intensely she wanted her daughter to attend school and get education. There is a saying in rural West Bengal which goes something like 'wealth can



be divided but not education'. Primary school is the first step in a child's education. Hence, primary education is often called 'basic education'. For once the quality of primary education is adequate; students may have better education in higher levels. So it may also be called an 'entrance to higher education'. The quality of education at primary level in West Bengal is far from satisfactory.

Although a report of Annual State Education Report (ASER) for 2015-16 shows little progress but that does not keep up much hope. It is only because in some schools some teachers have been trying at their own level best to make their students learned. They do not merely see themselves as teachers but as researchers, trying to find out novel ways to teach their students effectively rather than sticking to traditional methods. It is found that where there is a communication gap between parents and teachers the quality of education is relatively lower vis-à-vis where there is a contact among parents and teachers on a regular basis. In order to bring about a comprehensive development, there is a requisite of routine communication among parents and teachers on the one hand and a systematic upgradation of the present education system on the other. The school can



also influence the parents' involvement by notifying the parents of their child's progress. It is clear that the more the school notifies the parents about the meetings and activities that need to be attended by parents at school, the higher is the parental involvement, seen in discussing their child's activities in school, helping their child with school homework and guiding their child in their preparation for school examinations.

Broadly two types of schools are prevalent there in West Bengal viz. government schools and private schools. The government schools are under the School Education Department and Panchayat and Rural Development Department (Shishu Shiksha Kendra). Private schools are either affiliated to West Bengal Board of Primary Education or central education boards. In government schools of West Bengal students are provided Mid-day Meal for required nutrition alongwith education. They are also provided with books, exercise books, school dresses, school bags, scholarships and other basic amenities. Due to lack of knowledge, adequate time and poverty, the guardians of government school children remain busy gaining livelihood. Therefore they are unable to assist their children in enhancing quality education. The parents of the private school goers are relatively much more educated and financially stable, so they are able to help their children with money and knowledge. Children's education is of utmost priority to these parents. In private schools the Pupil to Teachers Ratio is also adequate. (Ahmad Susanto2019) shows that there was a significant effect of parental guidance and emotional intelligence together on students' learning achievement in social science.

Parental guidance and emotional intelligence contributed 64.2% to the students' learning achievement in social science and as a result, there was a significant effect of parental guidance on students' learning achievement in social sciences. This is evidenced by the acquisition of sig= 0.037<0.05 and t count =2.114; 3) There is a significant effect of emotional intelligence on learning achievement in social sciences. This is revealed by the p<0.05 and t-count of 6.336.

According to Lamar University online document (2019), it was found that firstly, less than 60 percent of students in no-degree families completed their degree, compared with 70 percent of students in one- and two-degree families. The study found 86 percent of children with parents who have less than a high school degree live in low-income families, compared with 67 percent of children with parents who have a high school degree (but no college education) and 31 percent of children with at least one parent who has some college education. The study found low socioeconomic status, in turn, can affect family interactions and lead to behavioural problems that can impact children's academic and intellectual development. In addition, parents who put great effort financially tends to have children who are more cynical about their education and job prospects.

The study of (Abie Ntekane 2018) found that the

participation of family in learning helps to improve students' performance, reduce non-attendance and restore parents' self-assurance in their children's education. Learners with parents or caregivers, who are involved in learners' education, earn higher grades and test scores, had improved social skills and show improved behaviour. The paper also offered a perception that something that overall community and the world at large are in need of, as it would highly contribute in reducing crime and poverty. Ideally it would help to have a greater percentage of parental involvement in their children's education. Parental involvement is associated with a wide range of positive child outcomes in primary and high schools, such as good academic skills, positive attitudes and social competence. Parental involvement in learning acts as a gel that helps to make learning for children pleasant and encourages them to work even more as they seek to make those closest to them proud.

The study of (Tyler Bailey 2017) shows that the four areas of speculation were recognized in the research including – responsibility, driving force, communication, and students' relationship with teachers and parents. These identified areas formed a well-rounded point of view on student success and how parents played a role in that achievement. Ultimately, the personal accounts imparted by the students, teachers, and prospectus coach provided valuable perspectives into their educational experiences and viewpoints and formed relevant insights to be reviewed by teachers, parents, and school community.The study of (Asadul Islam 2017), shows that the full effect of such programs takes some time to be visible and to become a significant factor.

In the short term, better performing students (those with baseline test scores in the top third) benefitted more from the program; but over time, as the meetings progressed, gradually the low-performing students too began to benefit. There were also positive pills over effects in the treatment of schools among students in classes that were not in the part of the intervention. The effect of the treatment is stable and robust, and observed regardless of education level and experience of the teachers, or the socioeconomic backgrounds of the students. We observed some parents needed a nudge to motivate them to meet with teachers. We found parents and other household members spending more time at home helping children to do home work or study. The intervention led to significant improvement in the attitudes, behavior, and confidence of children.

Thus our findings extend the existing literature and confirm that the positive effect of parents' involvement on students' learning observed in developed countries can also hold true in low-income countries. Educational outcomes of children in developing countries such as Bangladesh can be significantly improved through programs that stimulate greater parent-teacher interaction and encourage parents to be more involved in their children's studies. Such programs have immense potential for scaling up because they are low-cost and easy to implement, even in disadvantaged communities where parents have low levels of literacy. The result of the study of (Yuddin Passiri 2017) reveals that there was a positive and significant influence of parental education level on the learning accomplishment shown by the partial fortitude test obtained by the input value of 7.5%. The data also showed a positive influence and significant level of income on learning attainment which is shown by partial determination test obtained by input value of 17.9%. Further the testing result also revealed a positive and considerable influence of education level and income level on learning accomplishment which is indicated by simultaneous determination test obtained by contribution value of 3.47% and the rest 96.53% influenced by other factors not included in research variable.

The study of (Mishra 2016) found that these mothers were regularly involved in ongoing learning activities at school and at home. Their involvement is grounded on regular observation rather than ambitious long term planning. They were aware of child's school life and provided necessary support and sought help, if needed. The overall resultant of the study of (Paula et al., 2016) indicates that the parents can influence positive student attitudes the most. The most interesting is that even when parents were not directly involved in the learning process for their child, they can still have an encouraging impact by discussing the significance of math learning. According to the study when parents stressed the importance of learning math to their children, it would positively impact the student's future achievement in math. When students really believed that exercising math will directly benefit them in their real lives, they will have better attitudes toward learning. Their selfefficacy would improve when they kept trying, and then math achievement will improve because they were more confident in themselves.

The study of (Jai & Sushma 2016) shows that, there is a significant relationship between academic achievements of students and parental involvement of Private and Government School students. Lack of parental involvement in Government Schools is the reason that the academic achievement level of students is also low. There is significant difference in the academic achievements of students of Private and Government Schools. It may happen that students of private schools develop in a better way because they have better facilities to achieve higher standards. Also, there is significant difference in parental involvement of Private and Government School students. Parents belonging to Government Schools' communities have less parental involvement in comparison to parents who are in Private areas. The study of Camelia Voicu, Alina Anghel, Maria Savu-Cristescu (2015) has revealed that not only socioeconomic factors are important in conditioning parents' attitudes and behaviors towards children's rights, but also parents' awareness and understanding of these rights. Consequently, parental education programs will focus on increasing the understanding and awareness of children's rights, promotion of pro-democratic cultural patterns and learning new ways to manage the problems of intra-familial relationships.

The results of the study Charo Reparaz, Maria Angeles Sotes-Elizalde (2015) show the great efforts made in the schools to involve parents, according to the principals interviewed. The parents have a more moderate evaluation in this respect. Regarding performance in science, it is found in Spain and in Germany that not all factors related to parental participation favor a higher achievement.

The study of (Ginaet al., 2013) shows parental involvement at home and in school are meaningfully different in constructing the population of Ghanaian youth and their parents and parental involvement predicts academic performance. Results suggest that parental involvement is a biodimensional construct consisting of home and school involvement. The effect of parental involvement on youth's academic performance appears to be a function of the type of involvement. Home based parental involvement is associated positively with academic performance, while school-based parental involvement has a negative association. Parents can model positive attitudes and behaviour toward school and convey the importance of school. According to a study of Drèze and Kingdon, 2001, enrolment increases when the benefits of attending school outweigh the costs. Sending a child to school involves direct costs (such as uniform, text books, tuition fee etc.) and opportunity costs (such as child's forgone earnings and parents' time and effort required to drop and pick up their child from school).

Statement of the Problems: The main issue of the present study is to find out why the quality of education of government school students is lower vis-à-vis private school students. The quality of Mid-day Meal provided is not good because government allotment for it is a meager Rs. 4.48 per student. To improve the quality of food it is essential on part of the government to sufficiently increase the allotment. It has been found out that wherever the quality of education is superior it is because of the involvement of the parents along with teachers. But most parents of government school students are either illiterate or even if literate then of inadequate nature and hence they are unable to assist their children in their study. Should the government take adequate steps in order to resolve this problem? or, can this problem be left as it presently is?

Significance of the study: The present study will enable us to understand the role of parents as well as private tutors for the quality education of their children at primary level. Teachers will have clearer perceptions about their students.

Objectives

- To study the achievement of quality education of primary school students.
- To study the role of teachers in enhancing quality education of primary school students.
- To study the role of parents in enhancing quality education of primary school students.
- To study the relationship between parents and teachers for enhancing quality education of primary

Rahaman Gain et al.,

school students.

• To study the quality of Mid-day Meal in primary

schools of Kalyani Community Development Block of West Bengal.

Table 1. Mean and standard deviation between dependent variables (Y) and26 casual variables		
Variable	Mean	Std Dev
Type of School (X ₁)	1.32	0.58
Religion (X ₂)	1.20	0.45
Social Identity (X ₃)	2.06	1.00
Lesser Financial Stability (X_4)	3.76	1.74
Gender(X ₅)	1.50	0.50
Class(X ₆)	1.50	0.50
Who accompanies you to school? (X_7)	3.87	1.35
Who accompanies you while returning-		
from school? (X ₈)	3.95	1.32
Solo(Alone)(X ₉)	75.90	62.88
Under Someone (X ₁₀)	18.90	42.99
At school(X ₁₁)	217.80	73.19
Most preferred cause(s) in school(X ₁₂)	2.26	0.79
Can you read? (X ₁₃)	2.42	0.74
Can you write? (X ₁₄)	2.46	0.70
Problem in understanding text in		
school (X ₁₅)	2.45	0.54
Why do you face problem in under-		
standing text in school? (X_{16})	54.07	47.96
Do you refer to your teacher if you-		
face problem? (X ₁₇)	1.33	0.80
Do the teachers teach carefully-		
(affectionately)? (X ₁₇)	1.79	0.41
Do the teachers Punish? (X ₁₉)	3.54	0.99
How much do you spend on-		
your tuition? (X ₂₀)	303.64	214.09
Do you receive Mid-day Meal? (X ₂₁)	1.71	0.46
Do you receive sufficient Meal-		
(Mid-day Meal)? (X ₂₂)	30.07	44.28
How is the quality of the Meal-		
(Mid-day Meal)? (X ₂₃)	28.13	43.32
Do you wash your hands before-		
eating? (X ₂₄)	30.81	43.80
Does your school have toilet? (X_{25})	2.69	0.54
Does anybody recite you stories? (X_{26})	1.48	0.50
The perception level of students on-		
quality education at primary level (Y)	20.23	3.01

Scope of the Study: The scope of the present study is to measure the role of parents as well as teachers in their children's education at primary level at Kalyani of Nadia district.

METHODS

Survey-based descriptive research method is followed.

Study area: The present study has been conducted in the primary schools of Kalyani Community Development

Block in Nadia District of West Bengal.

Sources of Data: The primary data was mainly collected from the target primary school students of different Government and Private Schools at Kalyani Community Development block of Nadia District of West Bengal.

Population: All the primary students of seven Gram Panchayats of Kalyani Community Development block in Nadia District of West Bengal constitute the population.

Sample: A random sample of 100 primary school students

was identified from Seven Gram Panchayates of Kalyani Community Development Block in Nadia District of West Bengal.

Tool: A scheduled questionnaire was prepared to study the achievement level of primary school students and another one to study the perceptional view from the target primary school students. The survey was conducted during December, 2020 to Jan, 2021. Statistical methods as SPSS 2.0 version to explore the target with the help of correlation, regression, step-down regression, Multiple Regression Analysis and Chi-Square test have been used.

Table 2. Chi square test between dependent variables (Y) and 26 casual variables		
Variables	Chi-Square	Significance
Type of School (X ₁)	77.3600	0.0000
Religion (X ₂)	109.5200	0.0000
Social Identity (X ₃)	51.7600	0.0000
Lesser Financial Stability (X_4)	83.3600	0.0000
Gender(X ₅)	0.0000	1.0000
Class(X ₆)	0000	1.0000
Who accompanies you to school? (X_{γ})	77.4800	0.0000
Who accompanies you while returning-		
from school? (X ₈)	84.9200	0.0000
Solo(Alone) (X ₉)	96.9600	0.0000
Under Someone (X ₁₀)	291.2000	0.0000
At school(X ₁₁)	230.2600	0.0000
Most preferred cause(s) in school(X ₁₂)	65.2000	0.0000
Can you read? (X ₁₃)	27.7400	0.0000
Can you write? (X ₁₄)	32.2400	0.0000
Problem in understanding text in- school (X_{15})	44.4200	0.0000
Why do you face problem in under-		
standing text in school? (X_{16})	95.8000	0.0000
Do you refer to your teacher if you face-		
problem? (X ₁₇)	121.3400	0.0000
Do the teachers teach carefully-		
(affectionately)? (X ₁₈)	33.6400	0.0000
Do the teachers Punish? (X ₁₉)	35.0400	0.0000
How much do you spend on your-		
tuition? (X ₂₀)	60.4200	0.0000
Do you receive Mid-day Meal? (X ₂₁)	17.6400	0.0000
Do you receive sufficient Meal-		
(Mid-day Meal)? (X ₂₂)	53.0600	0.0000
How is the quality of the Meal-		
Mid-day Meal)? (X ₂₃)	27.2000	0.0000
Do you wash your hands before-		
eating? (X ₂₄)	108.5600	0.0000
Does your school have toilet? (X_{25})	113.5200	0.0000
Does anybody recite you stories? (X_{26})	0.1600	0.6892

Rahaman Gain et al.,

Variable: The following variables are used in this study:

Dependent Variable: The perception level of students on quality education at primary level (Y)

Independent Variable: Type of School (X₁), Religion (X₂), Social Identity (X₃), Lesser Financial Stability (X₄), Gende $r(X_5)$, Class(X₆), Who accompanies you to school? (X7), Who accompanies you while returning from school? (X₈), Solo (Alone) (X₉), Under Someone (X₁₀), At school (X₁₁), Most preferred cause(s) in school (X₁₂), Can you read? (X₁₃), Can you write? (X₁₄), Problem in understanding text in school (X₁₅), Why do you face problem in understanding text in school? (X₁₆), Do you refer to your teacher if you face problem? (X₁₇), Do the teachers teach carefully (affectionately)? (X₁₈), Do the teachers Punish? (X₁₉), How much do you spend on your tuition? (X20), Do you receive Mid-day Meal? (X₂₁), Do you receive sufficient Meal (Mid-day Meal)? (X₂₂), How is the quality of the Meal (Mid-day Meal)? (X₂₃), Do you wash your hands before eating? (X₂₄), Does your school have toilet? (X₂₅), Does anybody recite you stories? (X₂₆).

students on quality education at primary level (Y) and 26 casual variables.		
Variables	r' Values	
Type of School (X ₁)	- 0.4726**	
Religion (X ₂)	0.2415*	
Social Identity (X ₃)	0.1590	
Lesser Financial Stability (X ₄)	- 0.2519*	
Gender(X ₅)	0.0633	
Class(X ₆)	0.0967	
Who accompanies you to school? (X_7)	0.1906	
Who accompanies you while returning from school? (X_8)	0.1323	
Solo (Alone) (X ₉)	-0.1570	
Under Someone (X ₁₀)	-0.1181	
At school (X ₁₁)	0.1209	
Most preferred cause(s) in school (X ₁₁)	0.1492	
Can you read? (X ₁₃)	-0.1025	
Can you write? (X ₁₄)	-0.1268	
Problem in understanding text in School (X ₁₅)	0.3709**	
Why do you face problem in		
understanding text in school? (X ₁₆)	- 0.3818**	
Do you refer to your teacher if you face problem? (X_{12})	0.1391	
Teachers' performance (X ₁₈)	- 0.2388*	
Do the teachers Punish? (X ₁₉)	0.1476	
How much do you spend on your tuition? (X ₂₀)	-0.1221	
Do you receive Mid-day Meal? (X ₂₁),	0.4898**	
Food sufficiency (X ₂₂)	- 0.4901**	
Quality of the Mid-day Meal (X ₂₃)	- 0.5139**	
Washing hands (X ₂₄)	- 0.4897**	
Does your school have toilet? (X ₂₅)	-0.1406	
Does anybody recite you stories? (X_{26})	0.1799	
Critical value (2-Tail, 0.05) = +or- 0.197 *Si	gnificant at 5% level	
Critical value (2-Tail, 0.01) = +or- 0.256 ** S	ignificant at 1% level	

RESULT AND DISCUSSION

Table I indicates that the results as above give the mean score and standard deviation score. According to the mean score and standard deviation, the medium high is in between 1.20 to 303.64. Data also showed that the mean score of item (How much do you spend on your tuition?) X_{20} , 303.64 is the highest and standard deviation, 214.09. The lowest is item (Religion) X_2 , mean score 1.20 and standard deviation is 0.45. Table II depicts that since P value is less than 0.01, the null hypothesis is rejected at 1 percent level of significance. Hence it is

concluded that there is significant relationship between dependent variable, the perception level of students on quality education at primary level (Y) and 26 casual variables.

Table III depicts the correlation analysis between dependent variable that is, the perception level of students on quality education at primary level (Y) and 26 casual variables. After doing the analysis it is found that only ten (10) casual variables have shown their level of significance towards addressing the perception level of students on quality education at primary level. It is found that Type of School (X₁) has a negative impact. Parents preferred private school to government school (Those under School Education Department and those under Panchayate and Rural Development i.e. Shishu Siksha Kendra) because in their perception the former is more capable of disseminating quality education. Due to their financial instability they are compelled to send their child to government schools. Parents perceive private schools with higher esteem because of the glaring difference in the number of teachers in both these types of schools. Religion (X₂) has shown positive results. It is noticed that the quality of education among Hindus is relatively better. Lesser Financial Stability (X₄) among the Muslims is the reason attributed to it and for that they tend to devote more time in generating income than in caring their child.

Problem in understanding text in school (X_{15}) is found to be positive. Students find it difficult to make out what they are taught in school. The reasons behind the problem in understanding text in school (X_{16}) are many such as most of the students are not familiar with Bengali letters; difficulty in understanding the English language as it is a foreign language and they are much scared of it; teachers are found to be more interested in teaching better students: so for not-so-better students it creates an invisible distance between them and their teachers and whenever the same teachers punish them this distance furthers. Consequently, these students are more reluctant to get their doubts cleared if any; this torn student-teacher relationship harms students in learning Mathematics. Sabuj Roy studies in class IV at Iswaripur Primary School in Kalyani Block. He is not so studious. He has been provided private tuition from his family. As his tutor Amar Sarkar is ill himself, he cannot teach him well. Even school is not a better place for him to study. He is not familiar with English letter and even most of the Bengali letters.

He is not even able to pronounce a word. He cannot write Bengali text. In mathematics he cannot solve basic level addition, subtraction, multiplication and division. There is a madam at school who teaches him well. Sabuj alleged that none of the male teachers teaches well. He and his friends receive corporal punishment. They are also asked to do some works of their teachers such as purchasing vegetables for Mid-day Meal, bringing Xerox copies of school documents, bringing tea and biscuits for teachers. Teachers' Performance (X_{18}) has a negative impact. Apparently, in students' view even if most of the teachers differentiate between them based on their performance, it is found that inadequate number of teachers in most of the schools is more prominent reason behind this. As the Pupil to Teachers Ratio (PTR) is less than required, teachers are not able to handle disturbing students and likely to lose their temper. In most of the schools there is no class-wise teacher which is another constraint for teachers in imparting quality education.

Out of 100 students 81 go to government school where they are provided Mid-day Meal (MDM) and 19 go to private school where they are not provided Mid-day Meal (MDM). The proportion of students having Mid-day Meal (X_{21}) is positive at almost 90%. Food sufficiency (X_{22}) is found to be negative. Students complain that they are not provided sufficient food and the cook carries home some portion of the meal allotted to them. Students from the most humble background often hesitate to ask for more food even if they are still hungry. Quality of the Mid-day Meal (X₂₂) provided is not of good quality, so the result is negative. The reason for it is inadequate funding for Mid-day Meal which is Rs. 4.48 per head with 100 gram rice. The finding of washing hands (X_{24}) before eating Mid-Day Meal is negative. Washing hands with soap is not frequent. Students are observed to have washed hands with clean water in most cases and with detergent in some instances. It is due to lack of awareness and government allocation for the same. If teachers are to allocate this they are to do this from the allocation for Mid-day Meal which is meagre at Rs.4.48 per head. In some instances teachers are found to have done it out of their own expenses and sometimes with the help of willing guardians but that cannot be a model to be imitated. Can this problem be left as it is or will the government take proper initiative in order to mend it?

Table IV shows the Multiple Regression Weight, "β" value and at the level at which "t" value is significant. The table shows the relationship between relative contributions of 26 casual variables. 26 casual variables were significant at 0.05 levels significant at 5% and 0.01 levels significant at 1% and the table also shows relationship of 26 casual variables toward the perception level of students on quality education at primary level (Y). From the values of the Beta (" β ") value and "t" value for each variable, it is apparent that types of school and does any body recite you stories have the highest contribution. From above, the contribution of all the variables (26 casual variables) have a multiple correlation (R) of 0.72351 and an adjusted R square (R²) of 0.37097. The combination of these variables explained standard error 2.4 per cent of the variance in the perception level of students on quality education at primary level as revealed by the coefficient determinant R2 (0.52347). From above shows the ANOVA of the effect of all the variables (26 casual variables) to predict in the perception level of students on quality education at primary level yielded a coefficient of multiple regression (R²) of 52.35 per cent and adjusted R square (R^{2}) of 0.37097. The result indicate that analysis of variance of the multiple regression showed a significant F-ratio [F (24, 75) = 3.43276].

Table 4. Multiple Regression Analysis		
Variable	"β" value	"t" value
Type of School (X ₁)	-0.241164	-2.376*
Religion (X ₂)	0.168810	1.663
Social Identity (X ₃)	0.129153	1.234
Lesser Financial Stability (X_4)	-0.107290	-1.163
Gender (X ₅)	0.054506	0.601
Class (X ₆)	0.024278	0.280
Who accompanies you to school? (X_7)	-0.129429	-1.079
Who accompanies you while returning		
from school? (X ₈)	-0.024335	-0.226
Solo (Alone) (X ₉)	-0.062273	-0.584
Under Someone (X ₁₀)	-0.097919	-0.967
At school (X ₁₁)	0.083486	0.787
Most preferred cause (s) in school (X ₁₂)	-0.092821	-0.974
Can you read? (X ₁₃)	-0.001467	-0.009
Can you write? (X ₁₄)	0.110436	0.608
Problem in understanding text		
in school (X ₁₅)	0.689145	1.896
Why do you face problem in under		
standing text in school? (X ₁₆)	0.430436	1.147
Do you refer to your teacher if you		
face problem? (X ₁₇)	-0.059345	-0.608
Do the teachers teach		
carefully (affectionately)? (X18)	-0.094300	-0.809
Do the teachers Punish? (X ₁₉)	0.146229	1.520
How much do you spend on your		
tuition? (X ₂₀)	0.037560	0.376
Do you receive Mid-day Meal? (X ₂₁)	0.0	0.0
Do you receive sufficient Meal		
(Mid-day Meal)? (X ₂₂)	0.025312	0.079
How is the quality of the Meal		
(Mid-day Meal)? (X ₂₃)	-0.380269	-1.192
Do you wash your hands before eating?(X ₂₄)	0.0	0.0
Does your school have toilet? (X ₂₅)	0.002746	0.028
Does any body recite you stories? (X_{26})	0.191060	2.130*
Critical value (2-Tail, 0.05) = +or- 1.989 Critical value (2-Tail, 0.01) = +or- 2.636	*Significant at 5% lev * Significant at 1% lev	el vel

From the variables in table V to the regression model of regression analysis, it is found that after step 5, five variables are - Quality of MDM (X_{23}), Type of School based on school management (X1), Problem in understanding text in school (X_{15}), Religion (X_2), Does anybody recite you stories? (X_{26}) had explained 43.53 per cent of the total effect. Therefore, the remaining 21 variables explain only about 8.80 per cent of the total effect. Quality of the Mid-day Meal (X_{23}) provided, is not good. The reason for it is inadequate funding for Mid-day Meal which is

Rs. 4.48 per head with 100 gram rice. In the variable Type of School based on school management (X_1), the state of the performance of students studying under the school education department is found to be relatively lower than that of their private school counterparts. Most of the students in government schools face problem in understanding their lessons(X_{15}). Regarding Religion (X_2), it is observed that the performance of the Hindu students is better when compared to the Muslim students. Among the Hindu students the 'Upper' caste students

are far better and the Scheduled Caste students are still lagging behind. Within the Scheduled Caste students, children from the *Namoshudra* sub community have been performing well.

Table 5. Step-down Regression Model		
Step I = X23		
Multiple R	=0.51392	
R Square	=0.26411	
Adjusted R Square	=0.25660	
Standard Error	=2.59923	
Step II = X1		
Multiple R	= 0.58214	
R Square	= 0.33889	
Adjusted R Square	= 0.32526	
Standard Error	= 2.47629	
Step III = X15		
Multiple R	= 0.61878	
R Square	= 0.38289	
Adjusted R Square	=0.36361	
Standard Error	= 2.40490	
Step IV= X2		
Multiple R	=0.61878	
R Square	=0.40789	
Adjusted R Square	=0.38296	
Standard Error	=2.36805	
Step V= X26		
Multiple R	=0.65975	
R Square	=0.43527	
Adjusted R Square	=0.40523	
Standard Error	=2.32492	

It is owing to their being disciple of Sri Guruchand Thakur and Sri Harichand Thakur who gave education the most priority, used to appoint disciples based on their education culture who were required to have minimum materials for learning such as books, pen, paper etc. It is not that all the Muslim students are lagging behind, the better off among them have had their chances of getting quality education at various stages of time as the operation of Al-Ameen Mission is largely enclosed within the well offs presently. Although, the kind of community intervention mentioned above could bring substantial amount of development, the state intervention in this field is a must in order to bring about comprehensive development. Very few children are found to have been listening stories(X_{ze}).

Findings

1. The quality of education, it is found is not, good enough. A guardian, Rupa Hazra of Kalyani Block has said, "Our children cannot be left uneducated

only because we are illiterate". When she was asked why the quality of her children was not good, she replied, "How will our children get more education when we ourselves are uneducated?" "Teachers should not be blamed for this", she added.

- 2. Scheduled Tribes such as the Santhals and Scheduled caste such as the bind community who speak Bhojpuri face their biggest hurdle in alien language being used as the medium of instruction in school. Children come to make out Bengali almost after four years of schooling. By then, they are promoted to class three. But the Bhojpuri speakers cannot speak in Bengali even then. That is why they cannot interact with teachers and cannot get their doubts cleared. As they are basically poor in background they have to work many odd jobs to support their family. For instance, Laxmi Mahato, a class four student of Charjajira Primary school, Kanchrapara Gram Panchayate, Kalyani, carries stubble on her head along with her mother. Antara Biswas is also a class four student. She studies at Ishwaripur Kalitala Sishu Siksha Kendra. Along with studying she has to cook for her family and make blouse to support her family.
- 3. MDM has attracted a portion of students largely from among the poor. But it is allegedly complained by students and parents that they had been turned down when asked for adequate meal. The students further complained that the cook brought home much of their allocated food even if they were partly hungry. A reason attributed to this may be that the cook are often from 'higher castes' (Mahishya) and the mentioned students are from Scheduled Castes (Bauri).
- 4. Scholarships create eagerness among learners to perform better. However, not all the students get scholarships. In West Bengal only the students from minority communities are entitled to receive scholarships. This is a State provided discrimination.
- 5. The followings are some of the findings regarding educational status of students at primary level in Kalyani block:
- A. While only 42.50% students in government schools can read Bengali, in private schools almost every student (above 90%) can read Bengali.
- B. 75% students in private schools can read as well as understand Bengali texts, while only 15% of their counter parts in government schools can do the above.
- C. There are 15% such students in government schools as are able to only read English texts. The percentage is 35 in private schools.
- D. In government schools, only 6.25% students can read and make out English texts compared to 25% of their peers in private schools.
- E. Regarding mathematics, private school students are more advanced with 80% of them being able to do basic addition and subtraction than the

Rahaman Gain et al.,

government school students with only 44.25% students, solving basic addition and subtraction.



CONCLUSION

Nadia district of West Bengal has achieved the target of universalization of primary education. Now it is time to seek quality in education. According to most teachers it is necessary to have at least one teacher each class. Samagra Siksha Mission (SSM) District Information System for Education (DISE, 2018) data of Nadia district shows that Pupil Teacher Ratio is good at 1:22. But an inequality in distribution of teachers has been found to still prevail. In most schools the number of teachers stands at three, while in some schools, mostly in suburbs, the number of teachers is eight. On their part, the teachers complained of less salary. If their salary was increased, they could concentrate more on teaching rather than familial maters.

But this allegation of theirs is only partly true. Because the high school teachers receive a sizable pay packet but the quality of education among their learners remains inadequate. If truth be told, what lacks is genuine intention to teach students on part of the teachers. Additionally, it must be ensured that the students regularly attend school, MDM should be cooked well, communication among teachers and parents should take place on regular intervals so that the progress of the students can be discussed. Students can be drawn in by offering scholarships to all, not only minorities, like school dresses are offered.

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Abundance of Hetrocystous Blue Green Algae of Rice Field of Mangaldoi Sub Division, Darrang District Assam

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ABSTRACT

An Experiment were conducted from Feb 2017 to Jan. 2019 in *Mangaldoi* sub division, Darrang District Assam for taxonomical study of blue green algae In these studies total 67 numbers of heterocystous blue green algal species were identified belonged to the genus. *Richelia, Cylindrospermum, Anabaena, Nostoc, Aulosira, Camptylonemopsis Scytonema, Tolypothrix, Microchaete, Fortiea, Calothrix, Dichothrix, Rivularia, Gloeotrichia, Stigonema. Fischerella, Westiellops, Hapalosiphon.* Out of which the Genus Nostoc having highest number of species, and Order Nostocales consists 91.04% of species

KEY WORDS: ABUNDANCE, BLUE GREEN ALGAE, HETEROCYSTOUS, RICE FIELD, GENUS NOSTOC.

INTRODUCTION

Blue green algae, constitute a fascinating group of prokaryotic photosynthetic organisms, some of them fix atmospheric nitrogen ,mostly heterocystous types by which they can increase fertility in the tropical rice field. Many workers have studied the cyanobacterial flora of rice fields of our country. (Rai & Bergman, 2002) (Jaiswal et al.,2008) (Karthikeyan et al.,2009) Anamika Singh, Hema Joshi 2018,) cyanobacteria have enormous potential in serving humanity in many ways as bio-fertilizer, protein source, food and fodder etc. It maintain ecological balence and conservation of soil also. Their diazotrophic nature, wide distribution pattern and capability to enter into N2 -fixing symbiosis make them attractive research interest. Cyanobacteria have a long history of usage in agriculture as biofertilizer (Whitton, 2000). They improve the texture of soil and increase the biochemical quality of the soil which forms a rapidly multiplying over of microscopic plants. They have highly colonization with almost all types of soils. (Bold and Wanne, 1978) These strains are having special concern in microbiology as

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they are widely used as biofertilizer. Keeping in view in a study were conducted to find out the heterocystous types of blue green algae with special interest.

MATERIAL AND METHODS

Water samples were collected from seven different sites of Mangaldoi sub-division of Darrang District, Assam. To perform the proposed taxonomical study in a precise manner, the Mangaldoi Sub-division is specified into seven selected sites for the present study. During the field survey, specimens are being collected in wide mounted bottles, test tubes, polythene bags, plankton net, scalpel, blade, forceps are being used to collect blue green algae from running water. Sampling bottle is filled up with specimen along with water collected from the area to its one third capacities, the remaining parts is for aeration. Species of different levels of water is being collected by using pipes & tubes. Samples will be collected from the same area in each case. The methods and techniques are used on the basis of "Standard Operating Procedures for the Collection and Analysis of Aquatic Algae"June 2016 (Version2.0) Published by North Carolina department of Environmental Quality. 2016.

RESULTS AND DISCUSSION

Identification of collected species was carried out by consulting keys given by, Fritch (1935) Smith (1950),



Desikachary, (1959) Randhawa, (1959), and some published literature, monographs of algal taxonomy also

studied. However Desikachary's (1959) classification is followed in arranging the genera and species.

	Order N	ostocales		
Family	Genus	Species		
	1.Richelia	1. Richelia intracellularis		
	2. Cylinarospermum	3 A sphaerica		
		4. A. spiroides		
		5. A. oryzae		
		0. A. fertilissima 7. A. khamaa		
		8. A. anomala		
		9. A. ambigua		
		10. A. vaginicola		
		12. A. aphanizomenoides		
	3.Anabaena	13. A. orientalis		
		14. A. iyengarii		
		15. A. ballygangili 16. A. naviculoides		
		17. A. doliolum		
		18. A. variabilis		
		19. A. variabilis var. kashiensis		
		21. A. circinalis		
Nostocaceae		22. A. utermohli		
		23. A. oscillarioides		
		24. N. punctiforme 25. N. linckia		
		26. N. piscinale		
		27. N. spongiaeforme		
	4.Nostoc	28.N. ellipsosporum 29 N. calcicola		
		30.N. commune		
		31.N. paremlioides		
		32. N. verrucosum		
		34. A. genigmatica		
	5.Aulosira	35. A. pseudoramosa		
	6. Commit lan annais	36. A. fritschii		
	0. Campiyionemopsis	38. S. chiastum		
		39. S. multiramosum		
c	7.Scvtonema	40. S. burmanicum		
Scytonemataceae	-	41.5. scrimiani 42. S. ocellatum		
		43.S. guyanense		
	8. Tolypothrix	44. Tolypothrix bouteillei		
		45.1. byssoidea 46 M uberrima		
Management	9. Microchaete	47. M. elongate		
Microchaetaceae	10 Fortieg	48.F. incerta		
		49. F. bossei		
		51.C. clavatoides		
Rivulariaceae		52.C. scytonemicola		
	11.Calothrix	53.C. wembaerensis		
		55.C. dolichomeres		
		56.C. membranacea		
		57. C. marchica		
	12.Dichothrix	58. Dichothrix baueriana		
	13.Rivularia	59. Rivularia hansgirgi		
	14.Gloeotrichia	60. G. pilgeri 61. G. longicanda		
Order Stigonemat	ales	01. 0. Iongraadd		
		62. S. hormoides		
	15.Stigonema	63. S. panniforme		
Stigonometerer	16 Eirobavalle	04. S. dendroldeum		
Sugonemataceae	10.F ischereila	05. Fischereila ambigua		
	17. wesitenops	67. Hanalosink		
	18. Hapalosiphonis	sr. mapatosipr		

The identified Heterocystous blue green algae are structurally different in shape, size and structure. The identified blue green algal species of rice field are 67 in numbers withen 18 genus of two orders as Nostocales and *Stigonematales*. Order Nostocales consists 91.04% of species and Order Stigonematales consists 8.95% of species. Genus *Anabaena* having 31.34% including 21 number of species, followed by genus Nostoc having 14.92% including 10 number of species. Other genus Calothrix11.94%, Scytonema 8.95% *Aulosira* and *Stigonema* 4.47%, *Tolypothrix, Microchaete, Fortiea, Gloeotrichia* having 2.98%, *Richelia, Cylindrospermu m,Camptylonemopsis*1.49% among the (heterocystous) species found.

Algal species add readily available nutrition to crop plants in agricultural lands and ensure better crop nutrient management. They improve the texture of soil and increase the biochemical quality of the soil which forms a rapidly multiplying cover of microscopic plants. They have highly colonization with almost all types of soils. (Bold & Wanne, 1978). The study shown that heterocystous Genus Anabaena having 31.34% including 21 number of species in rice field of Mangaldai sub division. In another study "Taxonomic Enumeration of blue green algae of tea garden area of Mangaldoi sub division Darrang District Assam". Shown that the genus Anabaena (of heterocystous type) was the most dominant species throughout the study period. Blue green algae are sensitive to environmental change and mutrient fluctuation has been suggested by (Frempong 1981); (Tilman et al. 1982); (Sudhkar et al. (1991). Herbicides have two fold effects on cropping they reduce the fertilizer need of crop which is the most efficient method for weed control, but such chemicals cause damage to the cyanobacterial photosynthesis either as photosynthetic indicator or as photosynthetic energy deviators (Dodge, 1975); (Kapoor & Sarma, 1980); (Kapoor et al., 1996a) (Kapoor & Arora, 1996, 1998, 2000a, 2000b). According to Chopra (1971) 45.80% pesticidal compounds disappear from the soil within a year.

CONCLUSION

Among the heterocystous blue green algae genus Anabaena was the most dominant species throughout the study period. Blue green algae.

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Implementing a Non-Invasive Brain Temperature Monitoring System with Two-Type RF Switches Antenna

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ABSTRACT

The research offers an extensive cavity-based antenna for the active monitoring via sensations microwave radiometry of brain temperature. The antenna will be 20 mm in diameter and will measure 4.56 mm in height from 2.723 to 5.032 GHz. The layout of the antenna is a three-slotted, hexagonal patch similar to the picture of the human head. The analyses of the Specific Absorption Rate (SAR) show that the antenna can access the deep brain's microwaving energy that is suitable for the brain temperature monitoring technique as assistance. The antenna is then attached to a two-type switch system for strong ESD (Electromechanical and Solid-State RF Switches) immunity and high replacement capacity.

KEY WORDS: MICROWAVE RADIOMETRY-BRAIN TEMPERATURE-SPECIFIC ABSORPTION RATE (SAR) – RF SWITCHES.

INTRODUCTION

The constant monitoring of the deep brain temperature is one of the most important diagnostic markers for mental health. The brain relief in preterm infants, hyperthermia analyses and hypothermic problems during operations, cancer cure thermotherapy and newborn treatment are among the situations needed for such analyses. Effective brain temperature monitoring is impeded by problems associated with deep brain access. Because of its overcontact character, replacement microwave radiometry (MWR) techniques can also be deployed. The MRI and MRS methods have been two comparable approaches, but their wider use was prevented due of their excessive cost and limits of intuitive measures. In hospitals, they have been widely used. MRI and MRS were both comparable techniques. This pertains also to positron emission tomography (PET) and infrared functional spectroscopy (FNIR). It is thus greatly praised that the brain temperature is inexpensive and convenient for use at the treatment



facility, including passive and noninvasive microwave radiometric monitoring (Dittmar & Maruyma 2006).

Deep measurement of the brain temperature presents several problems owing to extraordinarily low microwave energy radiation between 10-14 W/MHz at 37°C. This energy is equivalent to -80 dB m at a bandwidth of 1GHz, which requires narrow band head antennas to assemble the maximum of power. In addition, fragile and heavy-gain RF amplifiers have been needed to achieve appropriate attenuation. Set up around the head, as indicated in Figure 1, assorted head-matched antennas with a greater hyperactivity of flexible, dielectric surface, as shown in Fig. 1(a). The range may also be radially moved over the head to various points for any sub-set of head measurement (Dario 2014).

Figure 1(b) provides a block layout of a proposed instance for measuring brain temperature. The system consists of two RF-type (Electromechanical and Solid State) switches intended for single or multiple antennas to be connected to the RF-front. The outcome will be the ideal solution in two phases by connecting two-type switches. The received RF signals are transcribed and delivered to a digital signal processor which modifies the temperature measuring panel qualitatively and geographically. This article depicts a wideband antenna with a matching head with a compact design and a unique loop design.





Table 1. Parametric Result for RF Switches					
Parameters Electromechanical Solid State					
Frequency range	from [DC]	from kHz			
Repeatability	Good	Excellent			
Isolation Excellent Good					
ESD immunity High Low					

II. Overview of RF Switches: An RF switch is a tool for setting higher frequency signals using propagation paths. RF switches are often utilized to route signals between instruments and Device under test (DUT) under this automation system. By incorporating a switch to a switch module system you may transmit signals from different devices to single or many DUTs. It allows tests using the same framework and reduces the requirement for frequent contact and disruptions of service. This might simplify the huge screening procedure and increase network performance in cases of heavy output.

The two main RF switch types provide expertise:

(i) Electromechanical RF Switch: The simple electromagnetic induction principle underpins electromechanical switches. The operation of switching is mechanical. Electromechanical switches blend physically moving interaction measurements with a circuit shutdown switch to re-assign messages from one part to the next. These switches are always constructed using wavelength interconnections to incorporate more power. Not every electromechanical switch is equal. It makes sense. They cannot even be designed to accommodate heavy-power hot-switching transmissions. An electric electromechanical switch, for example, spins an electrical connection between numerous switch sites.

(ii) Solid State RF Switch: The solid-state relay and the SSR do not have mechanical parts but rather incorporate the electric and optic properties of solidstate semiconductors to process its access to detached performances or toggle features in electromechanical relays (EMRs), using loops, magnetic fields, springs and mechanical interactions to activate and toggle an outcome. SSR includes total isolation surrounding their input and output interactions as a traditional electromechanical relay, as it perform with a very high near-finitely rough friction (open) but extremely low friction while conducting (closed).

III. Proposed System: The antenna was placed under the fantasy of the human head in an extended posture. The fantasy includes skin, bone, brain, muscle and countless more biological cells provided by CST Microwave Studio. The default result deviation reveals the antenna has 2.723-5.032 GHz capacity range (2,309 GHz). This largescale reaction fulfils the body's implementation criteria. Their specific rate of absorption (SAR) in their operation range has been evaluated at two frequencies in order to determine the dependability of the antenna for deep brain temperature test. The suggested specific absorption rate (SAR) is the verifying energy collection of the deep brain antenna for 3.5 and 4.5 GHz. This may be deduced that the skull (bone) has negligible failure and the bulk of energy disappears into the brain. This is the influence on a balanced model of brain fantasy. The parameters are reasonably optimal with its positioning system by introducing a two-type switching mechanism into the suggested antenna. The multi-type switching system is shown as a feature table. The above figure shows that when the two switches are applied in the non-invasive antenna, the results of the parameters are excellent.

CONCLUSION

A broad band head matched antenna for deep brain temperature control is identified in this document. A large transmission range of 2.723 – 5.032 GHz appears to be on this idea antenna. The examination of the Specific Absorption Rate (SAR) demonstrates that deep brain energy may be gathered and then utilized as an average brain temperature. This antenna is suitable for brain temperature monitoring systems thanks to its small size and outstanding human head fitting.

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A New-Fangled and Alternative Synthesis of Anticoagulant Drug Substance, Apixaban

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ABSTRACT

A cost effective and technically viable process was for apixaban(anticoagulant drug) developed by using commercially available chlorinating agent sulfurylchloride in the place of phosphorus pentachloride not as everyone using and introduced a new amidation process for ester simply by treating with sodamide and sodium methoxide in methylene dichloride to land up with cost effective and simple process.

KEY WORDS: COMMERCIALLY VIABLE PROCESS, APIXABAN, DI-CHLORINATION, SULFURYL CHLORIDE. AMIDATION, SODAMIDE.

INTRODUCTION

Apixaban (Apixaban. Monograph for Professionals.2019; Raghavan, et al., 2009) is an oral anticoagulant used to lower the risk of stroke caused by a blood clot in people with a heart rhythm disorder called atrial fibrillation .It is also used after hip or knee replacement surgery to prevent a type of blood clot called deep vein thrombosis (DVT), which can lead to blood clots in the lungs. There are several routes were available in the literature (Zhou et al., 2003) (Yafei et al., 2012) (Ji, et al., 2012) (Huo et al., 2014) (Guo, 2014) (Dwivedi et al., 2014) (Shekar, et al., 2014) for its synthesis, but few of were cost effective methods. After a through reveals of the literature of apixaban, the author developed a cost effective and scalable process.

Experimental

MATERIAL AND METHODS

All the raw materials used for the selected route of synthesis are procured from Aldrich and the reagent grade



materials were purchased from Merck synthesis. All the solvents used for its entire apixaban process development were purchased from Merck inc.

RESULTS AND DISCUSSION

Most of the literatures reported for chlorination of 1-(4-iodophenyl) piperidin-2-one is in phosphorous pentachloride (PCl5) only, but the author in this research invented a new and cheap reagent sulfuryl chloride (S02Cl2) in the place of PCl5. Which given fruitful results same like regular di-halogenation. In the selected route of synthesis of apixaban was involved a new sequence is that amidation followed by N-alkylation with piperdin-2-one whereas in regular synthesis it is in reverse mode and it has more advantages is that it can be eliminated or minimized the formation of pipridin-2-one ring opening impurity and as well as apixaban acid impurity (Figure 1).

Step-1: Synthesis of 3, 3-Dichloro-1-(4-lodophenyl) Piperidin-2-one: In a 500mL round bottom flask 200 mL of sulfuryl chloride was taken at room temperature and cooled the reaction mass temperature to 0-5oC. Added 50gm of 1-(4-iodophenyl) piperidin-2-one portion wise (5 lots) under gentle stirring which lead to the formation of gel type reaction mass and is maintained for 3-4 hours at 0-5 oC. After completion of the TLC (1:9, Ethyl acetate and Hexane) reaction mass was quenched in ice cooled water (300 mL) and the resulting solution was pH adjusted to 7.5-8.0 with sodium carbonate and extracted with



Suresh & Rambabu

Ethyl acetate (3 x100 mL), the combined organics were washed with brine solution and dried over anhydrous sodium sulfate. The organic layer further distilled off under reduced pressure and obtained solid was filtered with hexanes slurry to get 3, 3-dichloro-1-(4-iodophenyl) piperidin-2-one as white colored solid material 60 gm. 1H NMR (CDCl3, ppm): δ 2.07-2.13 (m, 2H), δ 2.90-2.93 (m, 2H); 3.72 (t, 2H); δ 7.13 (d, 2H); δ 7.77 (d, 2H); Mass: 370.7 (M+H), 372(M+2); FT-IR (Cm-1): 3087.93, 2967.07, 2945.89, 1681.72, 1485.27, 1474.87, 685.62, 792.46.







Step-2: Synthesis of 1-(4-lodophenyl)-3-Morpholino-5, 6-Dihydropyridine-2(1h)-One(a): In a dry 250mL round

bottom flask 25gm of 3, 3-dichloro-1-(4-iodophenyl) piperidin-2-one was taken in 100mL of Ethyl acetate and added 10gm of Tri-ethyl amine followed by addition of 15 gm morpholin in 25 mL of Ethyl acetate at room temperature and maintain for another 2 hours. After completion of the reaction mass quenched with Water and separated the organic layer, washed with brine solution and dried over sodium sulfate. The organic layer was distilled under reduced pressure and obtained 1-(4-iodophenyl)-3-morpholino-5, 6-dihydropyridine-2(1H)-one is dried and packed 30gm.



Step-3: Synthesis of Ethyl-6-(4-lodophenyl)-1-(4-Methoxyphenyl)-7-Oxo-4,5,6,7-Tetrahydro-1h-Pyrazolo[3,4c]Pyridine-3-Carboxylate(b): In a dry 500 mL round bottom flask 50gm of 1-(4-iodophenyl)-3morpholino-5, 6-dihydropyridine-2(1H)-one and 100mL of methylene dichloride was taken at 0-50 C and added 48 gm of (Z)-Ethyl-2-chloro-2-(2-(4-methoxyphenyl)

hydrazono)acetate dissolved in 50mL of methylene dichloride drop wise and maintain it for 3-4 hours at 0-5oC and then raise the temperature to room temperature, maintain at for another 3 hours. After completion of the reaction 100 mL of water added and separated the organic layer and removed the solvent under reduced pressure. The resulting crude material was taken in 200mL 4N hydrochloride solution and maintained it for 6 hours at room temperature and after completion of TLC; added additional 200 mL water and stirred for 30minutes at 0-5o C, filtered the resulting precipitated solid, filtered bed was washed with 35 mL water and dried to afford 42 gm of Ethyl-6-(4-iodophenyl)-1-(4-methoxyphenyl)-7-oxo-4, 5, 6, 7-tetrahydro-1H-pyrazolo[3,4c]pyridine-3-carboxylate as off-white solid.



Step-4: Ethyl-1-(4-Methoxyphenyl)-7-Oxo-6-(4-(2-Oxopiperidin-1yl)Phenyl)-4, 5, 6, 7-Tetrahydro-1h-Pyrazolo[3,4c]Pyridine-3-Carboxylate(c): 20gm of Ethyl-6-(4-iodo-phenyl)-1-(4-methoxyphenyl)-7oxo-4, 5, 6, 7-tetrahydro-1H-pyrazolo[3,4c]pyridine-3-carboxylate, 25gm of piperidin-2-one and 5gm of copper(I)iodide taken in a mixture solution of 40gm of anhydrous potassium carbonate and 5.0mL of triethylamine in 200mL of Toluene. The reaction mixture heated for reflux and collected water by maintaining the reaction mixture for 8-9 hours. Once reaction completed over TLC, then filter the reaction mass through celite bed and the resulting filtrate mother liquor was concentrated under reduced pressure to get crude Ethyl-1-(4-methoxyphenyl)-7-oxo-6-(4-(2-oxopiperidin-1yl) phenyl)-4, 5, 6, 7-tetrahydro-1H-pyrazolo[3,4c]pyridine3-carboxylate and which was isolated in ethyl acetate and hexane (1:1 ratio) to yield pure compound 15gm with purity \leq 99%.



Suresh & Rambabu









Step-5: Ethyl-1-(4-Methoxyphenyl)-7-Oxo-6-(4-(2-Oxopiperidin-1yl) Phenyl)-4, 5, 6, 7-Tetrahydro-1h-Pyrazolo[3,4c]Pyridine-3-Carboxamide(d): In a 250 mL round bottom flask taken 12 gm of Sodamide and

Methylene dichloride (MDC)(250 mL) and then added 30 gm Ethyl-1-(4-methoxyphenyl)-7-oxo-6-(4-(2oxopiperidin-1yl)phenyl)-4, 5, 6, 7-tetrahydro-1Hpyrazolo[3,4c]pyridine-3-carboxylate. The above reaction mass was cooled to -50C, added 12.1 gm of sodium methoxide powder lot wise in 45 minutes duration. After addition was completed reaction temperature rose to room temperature and maintains for 1-2 hours. After completion of the reaction, the reaction mass was filtered, the filtered cake was washed with MDC (125mL) and the filtrate MLs was washed with Water, the organic layer was concentrated and the resulting solid material was isolated in water by filtration. The crude apixaban (23 gm) was purified in methanol to afford 18gm of pure apixaban with purity of \leq 99.5% with single maximum impurity $\leq 0.1\%$.

1HNMR (CDCl3, ppm): δ 1.83 (t, 4H); δ 2.38 (t, 2H); δ 3.20 (t, 2H); δ 3.58 (t, 2H); δ 3.79 (s, 3H); δ 4.04(t, 2H); δ 7.00 (d, 2H); δ 7.28(d, 2H); δ 7.33(d, 2H); δ 7.44 (s, 1H); δ 7.49 (d, 2H); δ 7.71 (s, 1H); 13C NMR(ppm): 21.00, 22.97, 32.56, 50.79, 55.44, 113.35, 125.18, 125.96, 126.79, 132.53, 132.94, 139.77,141.44, 156.60, 159.09, 163.14, 168.80; Mass: 460.20 (M+H); FT-IR(Cm-1): 3311, 3484, 3017, 3071, 2930, 2977, 1595, 1630, 1683, 1144, 1256, 1296.

CONCLUSION

In conclusion, the present paper summarizes the improved synthetic approach utilized for the synthesis of the anticoagulant drug apixaban. The synthetic approach of apixaban was made by using commercially available chlorinating agent sulfurylchloride that a new amidation process for ester simply by treating with sodamide and sodium methoxide in methylene dichloride. The developed process could be used for the industrial production of apixaban in high yield and enantio purity.

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Innovative Practices in Preventive Health Care Services in Covid–19 and Disease Management

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ABSTRACT

The Indian healthcare industry is transforming. It is the time to adopt for new models and approaches. The study aims to understand the preventive care practices in disease management and; to develop a framework with innovative preventive centric solutions. Preventive health is the area of focus. Before Pandemic, Non-Communicable diseases as cardiovascular, diabetes, cancer are the diseases responsible for mortality and morbidity in the country. A theoretical methodology is adopted to engage individual in preventive healthcare practices for their disease management during the pandemic. A model was developed to understand the importance of health literacy in prevention of disease. The paper explores innovative practices like patient centric solutions and product based health care services in preventive healthcare management. Also, the paper suggests the strategies for the government in preventive care also provides the low-cost approaches for effective preventive management.

KEY WORDS: COVID-19, NON-COMMUNICABLE DISEASES, BUSINESS MODEL INNOVATIONS, PREVENTIVE HEALTH CARE, PATIENT-CENTRIC SOLUTIONS, INDIA.

INTRODUCTION

According to a WHO report, 3.19 million deaths were recorded in the world; on a 7 day average 11,990 deaths were recorded as of 2nd May 2021 due to the global pandemic covid-19. Before Covi-19, 71% of the overall deaths recorded are due to non-communicable diseases like cardiovascular diseases, cancer, chronic respiratory, and diabetes. Preventive health care management in the long term will provide better outcomes to the patients. Preventive health care focuses on prevention by screenings, counseling, and maintenance of future illness. For a healthy life to lead preventive healthcare measures are a must. It is important to slow down the progression of illness by understanding preventive healthcare solutions.



For prevention to happen it is vital to have information on a daily basis, which can help the population to follow all the precautionary measures to stay fit and healthy. Medical practitioners, hospitals, and clinics play a vital role in the detection of ailment which done early can save huge money to the patient (Chadha et al., 2008).

Wellness Management and Preventive health

A state of a healthy balance of the mind and body that results in overall well being

-NABH

The concept of preventive care is multi-dimensional with emotional, physical, mental, intellectual, social, physical, occupational, and environmental dimensions. Each dimension is vital in increasing the quality of life. Optimum wellness is achieved by understanding every dimension of wellness (Alotaibi et al., 2020).

Emotional wellness is all about one able to cope up with life challenges. Emotional wellness services available are counseling sessions, anger management, stress



management services, personal development services, and healing services. Physical Wellness is all about being proactive and preventive. Physical wellness is bought by diets, fitness centers, health checkups, vaccinations, diagnostics, alternative therapies, wearable technologies, beauty care, pharmacies, and disease management. Spiritual Wellness is a broader concept of values and beliefs and its existence in the system as a whole. Spiritual wellness services are meditation, yoga, and life coaching services (Kanagala et al., 2008).

Intellectual Wellness is all about openness in learning new concepts and methods. The services include critical 1thinking, education and skill development, simulation exercises, and time management. Social Wellness is the ability to connect with people. Social wellness begins with empathy and active listening. Family relationships, self-discipline, group discussions, joining clubs will increase your self-esteem. Occupational wellness is all about balancing work. Occupational wellness explores career options, choice of a career, and balance of work-life. Realistic goals are to be set and practice open communication and involve in proper conflict management. Environmental Wellness is the responsibility for clean air and water. Environment wellness begins with understanding our surroundings, getting outdoors, volunteering for organizations in conservation of energy and recycling. Financial Wellness is achieved by managing wealth. Financial wellness is bought by having control over day-to-day finances, preparing for the unexpected, and freedom in making choices (Bhowmik et al., 2013.

Patient-Centric Solutions: The government of India needs to initiate, run integrated programs for chronic diseases to increase the consultation in bringing quality of life by avoiding costly treatments, early diagnosis, and remote care for chronically ill patients.

Health initiatives include technologies like data governance, blockchain technology, initiate a high degree of transparency in interpreting data that is secure across the network, and acts as an input in better preventive care management. eHealth products have a huge opportunity for business start-ups in products and services, in categories as infrastructure in data analytics, devices that accelerate self-care. Mhealth is all about the delivery of healthcare services via mobiles and make the patient aware of the growth in technology. The government of India is taking up projects of initiating immunization, maternal care, diagnostic, treatment support through apps (Ganapathy et al., 2021).

India's telemedicine market has witnessed significant growth in recent times, largely because of its potential to provide world-class clinical and medical services to distant and rural locations across the country. The healthcare disparity is mainly due to a shortage of trained health care professionals and a lack of necessary infrastructure in remote areas of the country. Telemedicine is a tool for health care delivery, particularly in curative Et preventive healthcare. Telemedicine as a method of healthcare delivery has been successfully tested all over the country, and the results have been very promising.

Tele-health in real-time uses remote sensors, channels of communications, and data-processing technologies that enable interactions between the individual and health care providers. The technologies of telehealth facilitate access to health care professionals, reach patients across distances by getting meaningful data.

Healthcare Information Systems: (HIS) is about managing and transmission health-related information to individuals and organizations. HIS Involves functions like data generation, compilation, analysis, communication, and use. Data from various levels, at the Individual level, the population as a whole, health facility is generated and summarized to enable that decision at all levels. The HIS incorporated hospitals are into best practices and are eager to build business enterprises strategically focusing on innovations. The product incorporated in the organization analyses the process at 360 degrees level and brings improvement in the practices by managing a high level of patient volumes through optimal utilization of resources (Fleisch et al., 2021).

Electronic health records are digital versions available at health care centers. These records facilitate information sharing among the health providers, diagnostic assistance, assistance who is involved in the process of care. The complete healthcare information can be accessed by a practitioner in a secure and timely manner. The electronic health record includes all the information about the patient's health family medical history disease diagnosis, medications used, allergies if any, and lab and test results. With the help of e-health records the practitioner accurate and complete information about the patient's health in ensuring the best possible care.

The function of EHR includes communication disease surveillance, electronic billing and insurance, lab orders, and patient demographics- education. The other important reasons include less paperwork, reduction of medical errors. Evolve up in linking patients, practitioners, diagnostic centers; pharmacies are connected over the internet in a standardized format. The company offers an EMR module to record and retrieve the information of the patient. They do provide a central repository in an organized and structured manner. So those, the health care providers can easily access the data. ICT is used in practice management laboratory tests, prescriptions, documentation, and decision support. Precision Medicine is a model of medicine tailor-made to a particular patient. In India, precision medicine is evolving and emerging and is currently involved in the treatment of oncology, cardiology, and psychiatric. Precision medicine is slowly getting adopted by Indian clinics. A rise in income in the country is accepting the concept of genetic testing, early diagnosis, treatment, and prevention.

Population Health Managementacross the population brings clinical, financial, and operational data through business intelligence tools. The value-based care starts for patient compliance and satisfaction which requires streamlining interoperability to identify opportunities that further leverage best practices through data transparency for better patient care. The PHM tracks health using IT, managers scare and helps in identifying the gap between the precision and organizations in allowing access data in real-time. Finally, leveraging data analytics improves health outcomes and brings our cost-effectiveness (James 2016).

Product-Related Solutions: Interoperability is an exchange of information within and across boundaries. In healthcare, the service allows for the exchange of information through the flow of data. Data shouldn't be piled up have to flow from point to point and if data missed can lead to a loss in prevention as well as for the organization financially. Once the data is available the data should be flexible in facilitation that it can eliminate the gaps and finally the data should be fleasible so that the data can be captured on a real-time basis.

Lean Start-Up Solutions: It is a risk to launch a startup. In the Indian atmosphere where startup failure is more common, the lean startup concept allowed the startups in healthcare to move forward with less risk. The healthcare industry is gaining ground focusing on innovation and intensively needs to focus on driving down risk. Preventive health care startups are supposed to drive down costs and foster innovation in the healthcare industry through lean startups (Wu et al., 2021).

Continuous Improvement in preventive health care services is an ongoing process that can be incremental or breakthrough innovation. Preventive healthcare services need to Plan health and assess health, do educate the patient on health, Act with considerable support programs, reward the promoters of health and Check for the improvement with the data available and continue the process with feedback at every step to be innovative. Wearable Medical Devices are electronic devices attached to the human body in understanding the health of an individual. The devices do possess various functions like tracking, monitoring, disease management, and rehabilitation. Growing elderly population and illness, the rise of incomes are making the patient enable them to have these wearable devices

Preventive Healthcare Practices –Organizational Level:

The organizations get involved to be focused on business model innovations. The business should create value, share information, and engage in providing personalized care, networking, and cost-effectiveness. A Business especially the pharma and medical equipment companies have to work on war footing towards the fight against and Covid-19 and for the future of the organization The following can thrive the companies:

- Ine following can thrive the companies:
- 1. Crisis Management Team: to be deployed to set up business continuity plans, trigger action, and define communication between employees, customers, vendors, and the management.
- 2. Research & Development: Clinical trials, investigate alternatives, impact racking, and strong

communication platform with the patients and the operations.

- 3. People Management: strict protocols, periodic health checkups, and daily monitoring across all locations
- 4. Plant and Operations Management: Prepare for a production plan to cater to the needs of the domestic market. Simplify the operational work charts and electronic payments and explore new avenues to serve better as a telehealth
- 5. Supply Chain Management: Review the demand, improvement in supplies, search for alternative suppliers and increase in warehouse capacity
- 6. Financial Management: Manage Payables, Inventory, cash-to-cash conversion cycle, variable costs, and audits.[15]

6. Preventive Healthcare Practices –Individual Level

Individuals Prevention towards Covid-19

- 1. Know how the Virus Spreads
- Maintaining the Physical Distance of Approximately
 6 Feet
- 3. Restrict Yourself from Social Gatherings
- 4. Double Masking
- 5. Practicing personal hygiene: often involve sanitizing
- 6. Good Food and Supplements
- 7. Watch the symptoms

It is very clear that wellness programs promote healthy behaviors like

- Being active for at least 30 minutes per day can reduce the risk of chronic disease
- Periodically getting diagnosed with chronic illness.
- Including a well-balanced diet including fresh fruits and vegetables
- Manage stress with Work-life balance
- Smoke and alcohol-free life is the most crucial step to good health

Well-structured programs promote behavioral changes that can play a crucial role in decreasing chronic health care cost burden and also help people to lead a successful healthy life.



Preventive Healthcare Practices –Government Level: Surveillance Strategies: The goal in front of all the countries is to slow down the transmission of Covid-19. Here are the surveillance strategies that can help various countries to prevent and manage the pandemic.

Table 2. Immunization by 1 st May 2021 in select countries					
Name of the Country	Covid-19 vaccine provider	Total population Immunized by May 1 st , 2021			
U.S	Pfizer, Moderna, J&J	40% Population received a single dose			
U.K	Pfizer & BioNtech, AstraZeneca	65% of the adult population received a single dose			
Russia	Sputnik V	8.5% received at least one dose			
India	AstraZeneca, Bharath Biotech	1.9% fully vaccinated			
Israel	Pfizer, Moderna	56.3 % Fully Vaccinated			



Surveillance is considered important in prevention the above figure takes density of population and health infrastructure as two parameters in deciding the strategy for the countries around the world that can help in prevention. Immunization the best preventive option the world population has for Covid-19. The government has a pivotal role in providing the infrastructure and logistic support to the population to combat the Covid-19. The countries are working on improving their production capacities to meet the need existing in the market towards Covid-19 management. The table below provides the information of few countries and their progress of immunization.

Health Literacy is an action to improve the living conditions during pandemic. Access to health information can achieve a level of management to improve personal and community health. The developing countries to progress in pandemic management must raise the health literacy among their population for long-term benefit.

DISCUSSION

Preventive behavior and Covid-19 awareness is associated with health literacy. Strategic intervention in view of Covid-19 management can yield to the benefit of prevention. Immunization, Surveillance and Preventive measures at Individual level are the options in front of the countries. The dissemination of information in Research and Development, Quality, Production, Lean Tools and Techniques, Logistics and Supply Chain are important in disease prevention.

CONCLUSION

Preventive programs to be offered by Health companies and governments can help the population stay fit. A structured research in dissemination and transfer of the knowledge with adoption of technology enabled centric solutions in health care can primarily address the prevention. The countries through their health assessment, health education, and support services can prevent the spread of the virus and diseases further.

Limitations and Future Scope of the Study: The Paper is a review paper further an analytical paper can support the results discussed. Covid-19 a problem prevailing had a scope further to know how government and individual have to participate actively in its prevention.

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Modification of the Projection from Anterior-Posterior to Posterior-Anterior for Abdominal Radiographic Examinations

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ABSTRACT

The technological development improvement in healthcare, specifically in medical imaging, resulted in an increase in the number of examinations performed in diagnostic medical imaging. These examinations involve the use of ionizing radiation in both adult and pediatric patients. The aim of the study is to provide the foundation for the modification of the current practice of using Anterior-posterior (AP) projection in favor of Posterior-Anterior (PA) projection. The modification will facilitate adherence to the "as low as reasonably achievable" (ALARA) principle. This study was conducted at the Main X-ray of the Radiology Department, Ministry of National Guard-Health Affairs (MNGHA), King Abdulaziz Medical City (KAMC), Riyadh, Saudi Arabia. A cross-sectional study, with an experimental research study, were performed and measured in different phases. We included 110 patients (57 males, and 53 females) who required an abdominal radiographic examination. The majority (63) were exposed to the AP and 47 to the PA orientation. A nonparametric Mann Whitney U test was used to analyze the data. A total of 110 patients participated in this study. Statistical significance (P <0.001) was observed in the overweight Body mass index (BMI) category, with a mean Dose area product (DAP) of 11.8 dGycm² and 6.8 dGycm² for the AP and PA projections. In the overweight BMI category, the Entrance Skin Dose (ESD) was 1.51 mGy and 0.83 mGy for the AP and PA projections, respectively, with a statistically significant 58.11% difference (P<0.001). Similarly, in the obese BMI category, the ESD was 2.35 mGy and 1.6 mGy for the AP and PA projections, indicating a statistically significant 37.97% difference (P<0.046). The study provided evidence that the PA projection is an easily implementable method to reduce the dose, with no loss of diagnosis for the patient and no additional cost to the department.

KEY WORDS: RADIOGRAPHIC EXAMINATION, ANTERIOR-POSTERIOR, POSTERIOR-ANTERIOR, ENTRANCE SKIN DOSE, DOSE AREA PRODUCT, BODY MASS INDEX.

INTRODUCTION

The continuous advancement in technology has impacted



the science field specifically the medical field; thereby, improving the delivery of healthcare. Radiology is a branch of medicine where technology has revolutionized and transformed patient care delivery. Many diseases are frequently first detected through diagnostic medical imaging. However, the technological advancement witnessed in medical imaging has led to an increased number of examinations that involve the use of ionizing radiation in both adult and pediatric patients (Furlow 2011). Radiography constitutes the highest number of examinations performed for patients of all



age groups, when compared to other imaging modalities (Don et al., 2013).

According to Furlow (2011), "the frequency of diagnostic radiologic examination for patients of all ages in the United States has increased by 10-fold since 1950" (p. 421). Strict adherence to one of the main principles of radiation protection policies, "as low as reasonably achievable" (ALARA) and protecting a vulnerable group of patients appropriately from unnecessary radiation exposure should be paramount while delivering excellent patient care services with diagnostic ionizing radiation (Brennan & Madigan, 2000; Don, 2011; Furlow, 2011). The Ministry of National Guard-Health Affairs' Administrative Policy and Procedures (APP 1430-43), stated that "As Low as Reasonably Achievable (ALARA) refers to a radiation safety principle for minimizing radiation doses by employing all reasonable methods. ALARA is not only a sound safety principle but is a regulatory requirement for all radiation safety programs" (4.1).

Due to the undesirable effects, which unnecessary radiation exposure from diagnostic ionizing radiation procedures could cause, it is important to explore all available avenues and strategies to reduce the patient radiation dose? One important strategy to reduce and prevent an excessive radiation dose a patient is exposed to, is the modification of patient's position from the anterior posterior (AP) to a posterior anterior (PA) projection (Brennan & Madigan, 2000).

Radiographs of the lower and upper extremities, abdomen, and chest are a component of plain film imaging, which are categorized under projection radiography. These radiographs constitute the majority of the imaging examinations performed in the diagnostic imaging department, of most hospitals for both adult and pediatric patients (Don, 2011; Moore, 2015). The sensitivity of the human organs and tissues varies, as some are more sensitive to radiation than others (Furlow, 2011; Moore 2015). The majority of the sensitive tissues and organs, such as the colon, breasts, liver, intestines, and stomach, are located in the anterior portion of the body (Furlow, 2011; Moore 2015). As stated by Moore (2011), when projection radiography examinations of the chest, pelvis, abdomen, and spine are performed in the AP projection, patients are exposed to a high "surface dose" of ionizing radiation. Radiation exposure to organs and tissues located anteriorly would be significantly reduced by changing the patient orientation from AP to PA by the performing technologist (Furlow, 2011; Moore 2015).

In an abdominal examination, "AP projections give rise to higher effective doses than do PA projection because the majority of the irradiated radiosensitive organs in the abdomen, such as the stomach, the colon and the liver, lie closer to the entrance surface for AP views compared with PA views" (Marshall et al. 1994, p. 482). Performing an abdominal x-ray examination in the PA position, as a radiation dose reduction strategy, has been supported in literature highlighting that significant dose reductions can be achieved with a projection modification from AP to PA (Marshall et al. 1994). In the study carried out by Ghearr and Brennan (1998), they discovered that an effective dose and the entrance surface dose to the patient was reduced when the PA projection of the abdomen was used, with no changes noted in the overall image quality in the two methods. Changing the patient's position from a supine AP projection to a prone PA projection would play a significant role in reducing the patient's radiation exposure because the abdominal "soft" tissues are compressed in the prone position, and lower exposure factors will be required to obtain the image (Moore 2015).

The aim of the study was to provide empirical evidence that will help to create awareness among decision makers, stakeholders, and change the policy and procedures, primarily in the MNGHA-KAMC, and generally in Saudi Arabia to accommodate the new protocol by utilizing the benefits of using a PA projection as compared to an AP projection when conducting a abdominal radiographic examination. This will provide the foundation to support the modification of the current practice of using an AP-projection in favor of a PA-projection, keeping in line with the adherence to the "as low as reasonably achievable" (ALARA) principle. The goal of reducing and avoiding unnecessary ionizing radiation dose to patients should be highly prioritized in diagnostic medical imaging. Except in some condition of the patients that requires performing AP projections such as: 1- Critical post procedure patients. 2- Intubated on suction patients. 3- Portable case or bedside abdominal exams. 4- Pregnant patient, which consider as a limitations for the current study, modification of the projection from AP to PA for abdominal radiographic examinations will be a step in the right direction.

Research Question: The research question sought to determine if there are any differences in the ESD and DAP values recorded during an abdomen radiography exam under the AP-positioning or the PA-positioning.

MATERIAL AND METHODS

This study was conducted at the Main X-ray of the Radiology Department, Ministry of National Guard Health Affairs (MNGHA), King Abdul-Aziz Medical City (KAMC), Riyadh, Saudi Arabia. A cross-sectional study, with an experimental study, were performed and measured in different phases. We included 110 patients who required an abdominal radiographic examination, and the majority (63) were exposed to the AP orientation and 47 patients were exposed to the PA orientation. In terms of gender, there were 57 males and 53 females. A comparison of the AP and PA abdominal x-ray procedures were done. For this purpose, one digital radiography unit in the Medical Imaging Department was chosen as the setting. During the initial investigation, a test was performed on an anthropomorphic phantom, as shown in the Image 1 (RS-111T, manufactured by Radiology support Devices INC, RDS). It is a rugged sectional representation of an average male, 175 cm tall, weighing 74 kg, which provides a comprehensive platform for the evaluation of imaging systems and imaging techniques in realistic conditions.



Table 1. Basic Exposure Characteristics of PhantomStudy

kVp	100
SID	100
Grid	100cm focused grid
Collimation	33cm x 26cm

Image 2: Raysafe X2 Dosimeter set



The phantom was scanned under both the AP and PA projections. In the next step, in a duration of 6 months, from May 2019 to October 2019, patients requiring an abdominal x-rays were examined into an AP and PA projections depending on patient condition. A GE Revolution XR-D digital radiography machine, with a digital detector was used to scan both groups with the automatic exposure control (AEC) system turned on. Basic exposure characteristics for the phantom measurement are shown in Table 1. All the abdominal examinations were performed at a nominal tube voltage of 80 kVp. The grid used in the study had a 12:1 grid ratio with 78 lines/cm and a focusing distance of 100 cm. Before conducting the study, a qualified medical physicist performed a complete quality control test of the machine using a calibrated Raysafe X2 dosimeter (Image 2). It is used for radiography and fluoroscopy measurements with or without a phantom between the sensor and the X-ray source. The baseline values for the entrance skin dose were measured using a 20 cm thick ACR Radio/Fluoro

patient phantom with 80 kVp exposures at different ranges of mAs and source to phantom distances. The dose area product (DAP) measurements were taken from the built-in DAP meter in the tube housing.

Table 2. Scoring system for Image quality			
Score	Description		
Inadequate	The anatomical feature is not visualized or is detectable but the details are not fully reproduced		
Adequate	The details of anatomical features are visible but not necessarily clearly defined		
Perfect	The anatomical details are clearly defined		

Table 3. Image Quality assessment criteria			
	Criteria		
1	Complete Visualization of the		
	anatomy on the image (kidney outline,		
	liver, spine pelvic bones and liver		
2	Sharpness of the image		
3	Visualization of important area and organ		
4	Detection of opacified calcification		
5	No blurring and good visualization of		
	bowel gases and air fluid levels		

Table 4. Exposure and output in AP projection of thePhantom measurement

Exposure	mAs	Dose mGy	DAP dGycm ²
1	4.71	4.66	18.27
2	4.68	4.63	18.15
3	4.72	4.67	18.31
Mean	4.70	4.65	18.24

Table 5. Exposure and output in PA projection of thePhantom measurement

Exposure	mAs	Dose mGy	DAP dGycm ²
1	4.34	4.30	16.84
2	4.35	4.31	16.88
3	4.34	4.29	16.82
Mean	4.34	4.30	16.85

Phantom Measurements: In the first phase of the study, we used chest phantom due to unavailability of Abdomen phantom at NGHA. The Phantom used in the project composed of chest and upper abdomen, and our main area of interest is being covered on this

Almaziad et al.,

phantom. Measurements were carried out on a human body phantom for abdominal procedure. For all the exposures performed, parameters such as kVp, SID, grid type and collimation were kept constant while changing the orientation of the phantom from AP to PA. Automatic exposure control (AEC) was used with central chamber turned on, the phantom was imaged 4 times in each orientation. Dose area product (DAP) values were recorded for each exposure along with entrance phantom dose measured by an external calibrated dosimeter placed on top of the phantom. The exposure mode was taken on Automatic Exposure Control AEC, so the exposure parameter mAs was set up automatically by the machine itself with respect to orientation of phantom whether AP or PA projection. In fact, due to the difference of structures in the anterior and posterior surface in composition, density and attenuation, different readings among AP and PA projections were recorded, although compressibility of phantom abdomen was not achievable.







Patient Measurements: The second phase of the study comprised of the dose measurement with patients requiring an abdominal radiography examination. The patients were examined with an AP or PA orientation depending on patient condition over 6 months. Prior to their examination, the patient's height and weight were recorded and the BMI calculated. The source to skin distance (SSD) from the center of the field was measured and recorded. After the exposure, the mAs used by the system and the displayed dose area product values were also noted. The values of SSD and mAs were later used to calculate the entrance skin dose for each patient individually.



Table 6. Demographic characteristics (n=110)				
Variable	Number & percentage			
Gender				
Male	57 (51.8%)			
Female	53 (48.2%)			
Age, mean ± SD	58.74 ± 18.93			
Body mass Index kg/m2				
Healthy	26 (23.6%)			
Overweight	38 (34.5%)			
Obese	46 (41.8%)			

The approval of Institutional Research Board of King Abdullah International Medical Research Center (KAIMRC) was obtained prior to conducting the study. All the patients included in this study were informed about the purpose of this experiment and written consent was obtained before the examination.

Image Quality Assessment: Three experienced consultant radiologists working at King Abdul-Aziz Medical City, Riyadh, Saudi Arabia evaluated the radiographic images obtained in both AP and PA orientations. The radiologists reviewed and assessed the abdominal images of 80 patients, which were displayed in a randomized manner, with them not knowing the patient orientation through examination. During the image assessment, the radiologists were not allowed to do any image adjustments or magnification which could indicate an AP or PA projection of the image. They used a 3-point scale, according to the specific criteria for an abdominal projection, as issued in the European Guidelines on Quality Criteria for Diagnostic Radiographic Images (Doktor, Klaus et al). The ratings of the 3-point scale was: score 1 - inadequate, 2 - adequate and 3 - perfect (Table 2). Subsequently, five different standards were used to rate the quality of the images, based on complete visualization of the anatomy, image sharpness, important organs/area clearly visible and detection of opacified calcifications (Table 3). The criteria for the assessment was modified and adapted according to the protocol of KAMC, Riyadh, Saudi Arabia.

Anterior views as per BMI category							
BMI	Sample Size	Patient Dose	Projection	Mean	P-value		
Healthy	Total = 26 $AP = 13$	ESD (mGy)	AP	0.81	0.045		
	PA = 13		PA	0.53			
		DAP (dGy.cm2)	AP	7.00	0.0403		
			PA	4.70			
Overweight	Total = 38 AP = 23						
	PA = 15	ESD (mGy)	AP	1.51	0.001		
			PA	0.83			
		DAP (dGy.cm2)	AP	11.80	0.001		
			PA	6.80			
Obese	Total = 46 AP = 27						
	PA = 19	ESD (mGy)	AP	2.35	0.046		
			PA	1.60			
		DAP (dGy.cm ²)	AP	16.60	0.088		
			PA	12.40			

Table 7. Comparison of ESD and DAP for the Anterior Posterior and Posterior



Figure 6: An AP projection of abdomen



Data Management and Statistical Analysis: The data analysis was performed primarily by a medical physicist. The data was collected from May 2019 to October 2019 for 6 months period, entered in Microsoft Excel, and





transferred to SPSS version 23 for statistical analysis. A nonparametric Mann Whitney U test was used. The results were based on the ESD in relation to the DAP of the abdominal x-ray examination for both the AP and

262

PA positions. The significance cut-off point of P<0.05 was used for the study. Finally, the findings are presented with relative difference and standard mean error and illustrated in graphs (Figures 1-3 and Tables 4-7).

RESULTS

The Phantom Study: Prior to the study, the measurements of an anthropomorphic phantom (RS-111T, manufactured by Radiology support Devices INC, RDS) were obtained. It is a rugged sectional representation of an average male, 175 cm tall, weighing 74 kg. For all the measurements, parameters such as the kVp, SID, grid type and collimation were kept constant. Based on the results, we concluded that by changing the orientation from AP to PA, we can decrease the patient dose, although it was not highly significant. This is mainly due to the nature of the phantom where abdominal compression, when oriented in the prone setup, cannot be achieved. The calibration of the machine, such as the built-in DAP was tested prior to study. The phantom was imaged 6 times, three times in the AP and then three times in the PA projection with AEC active in both projections (Tables 4 and 5). A mean ESD of 4.65 mGy and 4.30 mGy was measured for the AP and PA projections, and the mean DAP was 18.24 dGycm2 and 16.85 dGycm2 for AP and PA projection respectively. The organ dose, which will be much lower in the prone setup than the supine orientation, must be taken into consideration.

Patient Study: In the second phase of the study, we included 110 patients who had an abdominal radiographic examination, of which 63 were positioned in the AP and 47 in the PA orientation, and 57 were male with 53 females. The data was categorized into three groups based on the body mass index (BMI) as healthy, overweight, and obese. The choice of AP or PA depended on the condition of the patient. A GE machine with an X-ray beam energy of 80 KVP and 100 SID was used throughout the study. The demographic information is displayed in Table 6. All the data related to DAP, ESD and the patient's abdominal diameters are summarized in Table 7.

The DAP for the AP and PA projections of all the BMI categories are summarized in Figure 1 and Table 7. For the overweight BMI category, the mean DAP of 11.8 dGycm2 and 6.8 dGycm2 were recorded for the AP and PA projections respectively; hence, statistically significant (P<0.001), representing a difference of 53.76%. Comparing the ESD for the AP and PA projections (Figure 2, and Table 7), the mean ESD was 813.7 µGy and 531.7 µGy for the AP and PA projections in the healthy BMI category, and statistically significant (P<0.045), though a 41.9% difference was recorded. However, in the overweight BMI category, an ESD of 1518.2 µGy and 833.1 µGy for the AP and PA projections, was statistically significant (P<0.001) with a difference of 58.27%. For the obese BMI category, an ESD of 2350.2 µGy and 1607 µGy for the AP and PA projection was recorded, indicating a statistically significant difference of 37.56% (P<0.046). For comparison analysis of the abdominal diameter for the AP and PA projection is illustrated in below Figure 3

whereby maximum value came from the obese category followed by overweight and healthy weight category.

Demographic Characteristics: From Table 7, 51.8% were male and 48.2% female. The majority (63) were done with the AP projection, and 47 were performed in the PA projection. The mean age was 58.74 years. Based on the BMI kg/m2, the patients were categorized into three groups; healthy, overweight and obese.

Image quality: In the current study, the overall score of the evaluation of the three radiologists of the image criteria for the AP and PA projections, were slightly higher with the PA abdominal projection. Examining the criteria, the sharpness and the visual detection of opacified calcification was better in the PA position. From Figure 5, the visualization of areas such as the spine, bowel and abdominal organs, was clearer compared with the anatomical structures, important for the initial patient assessment. It was concluded that fat lines, abnormal air fluid levels, and obstructed area were more visible in the PA than the AP projection. It should be noted that in some patients, the superimposition of the sacral bones over the pelvic structures, was the only criterion visualized better in the AP projection. To conclude the assessment of the image criteria, all three radiologists agreed that it was better using a PA projection for an abdominal examination, as this would not result in the loss of diagnostic information in the resultant image. All the images received a combined score of the criteria from a minimum point scale of 5 to a maximum of 15 points. The average score of all the AP and PA images of all the radiologists were calculated (Figure 4 & 5) and was 88% and 92% for the AP and PA projections respectively. An example of each radiographic projection is shown in Figures 6 and 7.

DISCUSSION

The main aim of the study was to compare the AP and PA projections of abdominal x-ray among 110 patients, both males and females, different sizes and different clinical conditions. The comparison was based on the measurement of different parameters when changing the technique from supine to prone position. Anatomy of internal abdominal organs (Soft tissue, bones, gas, fat lines and opacifications), patient radiation dose and image quality were measured in the current study. All patients were positioned for AP and PA in the same protocol followed in the department. We found that performing abdomen PA projection leads to overall reduction of DAP and effective dose significantly. Apparently, this significant dose reduction in the PA projection noticed more in patients with an obese and overweight BMI.

There was a significant difference in the soft tissue parameter, in the comparison between AP and PA projections, showed that PA was better. This was because abdominal thickness was compressed in prone position, which allows for more enhancement, decrease in scatter radiation and production of better quality. While AP projection is slightly better in pelvic bone anatomy due to two reasons: -

a- In PA position, the pelvic bones are away from detector no more in contact, which cause magnification and lead to slight image quality loss.

b- In addition, the prone position will cause in some patients overlapping of pelvic bones with intra pelvic structures obscuring some anatomy and decreasing image quality.

For all other parameters; the sharpness and visibility of lung bases, spine and calcifications and bowel, there is not much of a difference between AP and PA projections supporting the fact that all image quality is better in PA than AP according to three radiologists. The average percentage of effective skin dose along with different BMI categories was from 30 to 45. In healthy patients, the average skin dose reduced around 32, while in overweight and obese patients it was 45 and 35 respectively.

In healthy BMI patients who already have small abdominal diameter thickness, there is no large area to be compressed in prone position which will result in no change or decrease in the effective skin dose. Similar results of dose reduction in patient entrance surface was observed in the research conducted by P.C. Brennan and E. Madigan (Brennan & Madigan, 2000), where an average of 38.6 % reduction in lumbar spine imaging was reported when the patient was moved from AP to PA position for lumbar spine projection. Similar results in DAP and effective dose reduction by 27% and 53% respectively were found in the research conducted by Erna Alukic et al (Alukic et al., 2018), PA projection was used instead of AP projection in lumbar spine radiography (Frank et al., 1983). Another research called dose reduction in Lumbar spine radiography conducted by Heriard JB et al, mentioned that PA lumbar projection produced the benefit of reduced dose (200+ %) to the eyes, ovaries, uterus and testis (Jb et al., 1993).

CONCLUSION

The practical implication of this technique does not require additional equipment and has no extra cost. In changing the technique from AP to PA, the patient lies on his/her abdomen and achieved easily without affecting the time of the exam or disturbing the patient comfort. The results of our study, in line with previous studies, confirm that patient diameter strongly affects patient dosage. Finally, although AP abdomen is more preferable than PA among all radiology departments across the globe due to AP position is more comfortable for patients in all condition and sizes. Moreover, it is more comfortable for the technologist to face patient and look to his face expressions for better communication and assessment, PA projection justified to be simple method pertinent to dose reduction without any loss of diagnosis and image quality for the patient and no additional cost for the department. Its supporting and achieving strict adherence to one of the main principles of radiation protection policies, "as low as reasonably achievable" (ALARA).

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Partnerships and Extension: Evidence from India

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ABSTRACT

Partnerships between the government, private players, and farmers are essential for agri-business in agricultural nations such as India. However, the farming community lacks awareness of and interest in entrepreneurship or partnerships. This study evaluates various approaches to promote farmer participation in agri-PPPs (public-private partnerships). A multistage and purposive sampling technique was employed. Nine agricultural produce marketing committee (APMC) markets in Karnataka, India, were randomly chosen to understand the PPP model's functioning in operating and maintaining cleaning and grading facilities. Of the total 180 respondents, 20 of each APMC were officials, traders, and farmers. Analysis of variance (ANOVA) and Duncan's method were applied to test each party's interest in PPPs. The fixed revenue-sharing model is the most suitable as the government bears the capital costs, while the private partner oversees operations. The proportionate revenue-sharing model is ideal for the private sector, which undertakes design, development, and operations, with limited government intervention. The ANOVA test indicated a significant difference in awareness and interest among farmers, traders, and officers. Further, a post hoc analysis with the Duncan method showed that the farmers having low awareness of and interest in PPPs.

KEY WORDS: PARTICIPATION; PUBLIC-PRIVATE PARTNERSHIP; ENTREPRENEURSHIP APPROACH; EXTENSION; REVENUE SHARING.

INTRODUCTION

Rural progress in developing countries such as India hinges on the growth of agribusinesses. Both institutions and governments consider community entrepreneurship as a strategic growth channel to accelerate the development process. Farmers see such entrepreneurship as an opportunity to earn improved profits, while women view it as an opportunity to apply their time and skills to attend to family responsibilities; finally, such entrepreneurship also widens the scope for youth to gain employment and earn a livelihood. Community entrepreneurship aims to advance the agricultural profession by improving product quality, the livelihood of farming households, and consumers' well-being, as well as sustaining a clean economy and green environment (Alfen et al., 2009)

Conventionally, India's extension strategy has primarily focused on transferring information or ensuring the



diffusion of innovation, to help people develop. Extension approaches focus more on indirect mechanisms such as acquiring new knowledge and developing new skills, rather than on bringing about a direct change. However, extension professionals must play a facilitator's role and guide people to make changes in their families, businesses, farms, or communities. Extension outcomes need to be real, enabling meaningful changes in people's livelihoods, and not just focus on knowledge acquisition (Cui et al., 2018).

The term 'entrepreneurship approach 'refers to helping farmers and their communities by providing sustainable livelihood and income through rural business creation. This approach promotes business based on local resources, marketing needs, or the product's value chain. Entrepreneurs must focus on the value chain of different commodities, including the supply of inputs, production, processing, value addition, cold chain, distribution, and improved market access. Primary processing creates entrepreneurial opportunities with an aim to satisfy consumer preferences, as well as ensure food safety, traceability, and quality. Accordingly, it is important to have infrastructure at various levels of the agricultural value chain to promote entrepreneurship in rural areas.

Participation In Partnership (P-I-P): Ensuring a high level of involvement is critical. Traditionally, various



participation channels have been employed to ensure people's involvement-either active or passive in development processes. The participation ladder describes how people can steadily change from being passive spectators (beneficiaries) to key actors (agents of self-development). This involves a transition from 'Participation' to 'Partnership'. Public-private partnerships (PPPs) may be suitable tools for developing and managing agricultural infrastructure, as they encompass a wide range of possible associations between the public and private sectors for rural development and livelihoods. Entrepreneurs, non-governmental organisations, and farmer organisations such as farmer producer organisations (FPOs), could be considered at par with private players in this context. (FAO 2016) defined an agri-PPP as a 'formalised partnership between public institutions and private partners designed to address sustainable agricultural development, where the public and private players share the benefit and the risk'. (Cui et al., 2018) observed that the PPP approach was originally adopted to enhance (Dhameja 2017).

According to (Hurk 2018), the PPP model for infrastructure can benefit both the private and public sectors. FAO (2016) found value-chain PPPs at the meso and micro levels worldwide. In meso-level agri-PPPs, the public sector plays a prominent role in facilitating, coordinating, and supporting small farmers. The private partner controls all business activities, with limited interference from the public partners. Either a partner or a third party may offer extension service such as skill development and training. Shukla, Sharma, and (Thumar 2016) suggested that establishing agricultural infrastructure at different agricultural chain levels is key to vibrant and competitive agriculture. PPPs could be a useful tool to accelerate development in various areas of agribusiness and infrastructure. The WEF and (McKinsey 2013) observed that agri-PPPs could modernise the agriculture sector and deliver multiple benefits that can contribute to the pursuit of sustainable agricultural development, including among smallholding farmers. (Ponnusamy 2013) indicated that PPPs are among the best proven strategies for achieving specific goals within a time frame, particularly for modernising public services, developing agricultural infrastructure, and offering extension services (IFAD. 2013).

Reasons for the evolution of PPPs in various fields include the lack of facilities, human resources, and time. The different forms of PPP–such as service contracts, management contracts, leases, concessions–and their differentiation based on ownership, operations, maintenance, capital investment, commercial riskbearing, and contract duration, are listed in Table 1. Appropriate models may be selected based on the business plan, period, and type of service provided to the farming community. Under field conditions, agri-PPPs may follow either contractual or collaborative measures, and lean towards primary, limited contract modalities such as memoranda of understanding, compared to traditional PPPs for infrastructure (Shukla 2016).

Table 1. General matrix of PPP models								
Option	Asset Ownership	0 & M	Capital Investment	Demand Risk	Duration (Years)			
Service Contracts	Government	Government and private	Government	Government	1-2			
Management Contracts	Government	Private	Government	Government	3-5			
Lease	Government	Private	Government	Shared	8-15			
Concessions	Government	Private	Private	Private	20-30			
BOOT/BOO	Private and							
	Government	Private	Private	Private	20-30			
(Source: FA0, 2016)								



MATERIAL AND METHODS

India is geographically divided into the southern, northern, eastern, and western regions. Multistage



and purposive sampling techniques were used in this study. The southern state of Karnataka was chosen as the research setting, owing to its success in implementing PPPs for agricultural infrastructure. The state has approximately 150 district agricultural produce marketing committee (APMC) markets. The state marketing department selected 50 APMCs based on the feasibility of establishing cleaning and grading units in these APMCs. Finally, nine APMCs were randomly chosen to understand the functioning of the PPP model. Of the total 180 respondents, 20 were randomly selected from

officials (4), traders (8), and farmers (8) in each APMC. A three-point scale response -'strongly agree', 'agree', and 'disagree' was used to capture the responses. Analysis of variance (ANOVA) and Duncan's method were applied to statistically compare the interest of officials (public), traders and entrepreneurs (private), and farmers (people) in the partnerships (Syngenta 2014).

Table 2. ANOVA The relationship between PPP and farmers, traders, and officers								
Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower	Upper		
					Bound	Bound		
Farmers	72	1.58	.190	.085	1.35	1.82	1	2
Traders	72	2.47	.156	.070	2.27	2.66	2	3
Officers	36	2.02	.968	.433	.82	3.22	1	3
Total	180	2.02	.651	.168	1.66	2.38	1	3

Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.945	2	.972	2.926	.092
Within Groups	3.989	12	.332		
Total	5.934	14			

Table 3. Duncan test for inter-group difference						
Groups	N	df	Subset for alpha = 0.05			
			1	2		
Farmers	72	2	1.58			
Traders	72	12		2.02		
Officers	36	14		2.47		
Significance				.245		

Means for groups in homogeneous subsets are displayed.

RESULTS AND DISCUSSION

The partnership process must be broad and results oriented. The new system of governance and policy in India expects more accountability and transparency, even in the public sector. To ensure a strong return on the government's resource investment as well as efficiency in the private sector, it is essential to establish a strong partnership that would reduce unnecessary expenditure and facilitate delivery in the public sector. These PPP models follow a win–win strategy to share risks and returns equally. The public sector must be ready to reduce its complete ownership of projects and share the expected revenue with the private partner. The private partner, on its part, should actively contribute to better delivery and results (Van den Hurk 2018).

A PPP involves sharing capital, working capital, revenue,



risk, responsibility, assets, and authority. The marketing department considers the PPP's principles and after a detailed deliberation, identifies a fixed revenue-sharing (FRS) model. As shown in Figure 1, this model is based on

Marouani et al.,

infrastructure development through capital investment by the public sector and the business function of the private partner. The FRS model suits public players when the government lacks human resources or expertise, or when the project involves social responsibility. The marketing department conclude that to provide the best possible service to the farming community, the government should provide financing, while the private sector manages the business competently.

Further, when the department proposes to start new markets on highways, it requires the private sector to play a dominant role in investment and operations. Here, the proportionate revenue-sharing (PRS) model is preferred. As shown in Figure 2, this model depends on the private partner's capacity to play a significant role in several activities, including sourcing land, financing, and managing independently. The government may finance infrastructure to a maximum of one-fourth of the project's cost. Effective monitoring and assessment guidelines are essential for the model's execution.

PPP is a mutual contract between a public and a private entity to optimise resources, expertise, and functions, to benefit the farming community (Anonymous 2011). The respondents were asked about their level of agreement with the need for PPPs as well as the revenue-sharing model. The 180 respondents consisted of 36 officials, 72 traders/entrepreneurs, and 72 farmers. The importance of PPP's and farmers, traders, and officers is shown in Table 2. The table indicates a significant difference (0.092) among farmers, traders, and officers.

Post-hoc analysis was conducted using the Duncan method to understand the inter-group differences regarding PPPs. Table 3 are based on each group's interest in PPPs. The mean value for farmers was 1.58. Traders and officers were grouped separately with mean values of 2.47 and 2.02, respectively. The difference in mean values between farmers and officers/traders was significant (.245). This means that farmers have a low level of awareness of and interest in PPPs. Most of the APMC officials and traders preferred PPP's. However, farmers showed low interest in them. The study identified certain factors that were crucial to ensuring participation in PPP's. The follow-up discussion revealed that the authorities offered many concessions to farmers and women while selecting private players to maintain the cleaning and grading units, and that PPPs functioned successfully in relation to the operation and maintenance of the cleaning and grading units. As Alfen et al. (2009) state PPP has become a common procurement strategy in developed and developing countries.

Further, less than 10% of farmers use the facility despite having to pay only minimal cleaning and grading charges. This clearly shows the need for an extension intervention to create interest in and motivation for these partnerships. IFAD (2013) states that the FEDEC project enhanced the partnership level of micro-entrepreneurs through training in the selected value chains. According to the FAO (2016), Indonesia's palm oil case study highlights the essential role of farmer organisations or cooperatives at all stages of the partnership. The term public –private-producer partnership (4P) has recently emerged, highlighting the integral part that producer organisations can play in PPP projects. The term has been adopted in several developed countries such as Canada (VALGEN, 2012; OECD, 2014; Syngenta, 2014), to acknowledge producer organisations' contribution to coordinating and co-financing PPP activities through the fees collected (Syngenta 2014).

These results emphasise that the extension system must facilitate an entrepreneurial orientation through training, workshops, and incubators. As shown in Figure 3, the entrepreneurship approach connects different stakeholders in the chain. Farmers (men and women) form clubs at the village level. Clubs combine to form farmers' producer companies, and become a part of PPP to better utilise agricultural infrastructure (e.g., e-marketing, cleaning, and grading/cold storage). Farmer's producer companies have to unite and form a federation for branding and marketing. The extension system must facilitate farmers' development at the micro, meso, and macro levels and strengthen PPPs.

CONCLUSION

Agribusiness partnerships must consider different partners' strengths and areas of expertise to meet the farming community's requirements. Public partner must have a clear rationale for promoting PPPs, monitoring mechanisms, and a private party role. Potential PPP projects should establish value-for-money, and ideally generate more significant results than traditional program mechanisms. Effective agri-PPPs share risks fairly among partners and include risk-management mechanisms to guard the most vulnerable stakeholders. Many agri-projects implemented by the public sector lack operational and business orientations.

Similarly, private businesses are not well connected to farmers. Therefore, agri-PPP agreements should facilitate a symbiotic relationship between the public and private partners to benefit both the producer and the consumer. As PPPs are the future, transparency and fairness must be ensured to achieve a better outcome. A legally binding document must be developed and utilised for smooth functioning. These documents could specify the roles and responsibilities of both partners and users. Agri-PPPs should ensure the participation of growers, youth, women, and FPOs as private partners for better implementation. Finally, the revenue-sharing approach brings about business orientation among major stakeholders. We should ensure more participation of farmers, producer companies, youth, women, and weaker sections of the society in the agri-PPP.

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Power Sector of Assam: A Study on Financial Viability of State Power Utilities

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ABSTRACT

The power sector plays a crucial role in the development of an economy but at the same time it is also one of the neglected sectors when it comes to self adequacy and performance. The power sector reforms which came with the new Electricity Act in 2003 brought many hopes. But in the subsequent years it was only found that such reforms could hardly bring any substantial difference in the already ailing state power sector companies. Nevertheless, the country has seen significant change in coverage of household by electricity during the last few decades. Electricity has reached deep interior villages in the country and the generation of power has also increased over the years. But amidst all these developments, the financial health of the state power sector units had been completely neglected. The power sector in Assam also underwent a restructure in pursuance with the new Electricity Act of 2003 and then again in 2009 to form three units namely Assam Power Generation Corporation Limited (APGCL), Assam Electricity Grid Corporation Limited (AEGCL) and Assam Power Distribution Corporation Limited (APDCL) engaged in the generation, transmission and distribution of power respectively in the state. But it was found that the financial health of each of these power sector units was very poor. These units incurred net losses in most of the years under study. The direct costs associated with the operation of these units were found to be so high that they could not afford other administrative costs leading into losses over the years. Besides, the tariff rates were also regulated by a regulatory commission i.e., Assam Electricity Regulatory Commission which hinders the process of hiking rates to recover costs. Further, the structure of long term funds and assets also reflected a poor condition with piling receivables and payables in these companies. Such high payables are leading to a negative net working capital and the companies are using its long term borrowings to fulfil its deficit in working capital. There is common notion that these companies are utility service providers of the public and their profitability are not a matter of concern. The real purpose is to provide electricity to every nook and corner of the country. But it must also be understood that losses are not an answer to service. Mounting losses are only depleting funds and in addition to that it becomes difficult to track their operational performance.

KEY WORDS: RESTRUCTURE, TARIFF, REFORMS, DEFICIT, PROFITABILITY.

INTRODUCTION

The power industry is the life blood of an economy be it an emerged economy or a developing economy. Sound and stable growth is always dependent upon its basic infrastructure which includes power. The economic progress in the past few decades has seen millions of people enjoy major improvements in their standard of living and material well-being and most of these changes



have been particularly visible in the emerging economies. Although, globalization and market liberalization have underpinned these developments, but we must not undermine the crucial role played by the power sector. Without power no country can build or run the factories and cities that provides for goods and services or jobs and businesses nor the basic amenities that make living a life more comfortable and enjoyable. Power is the "oxygen" that pumps the economy and is the life-blood of growth and development in this mass industrialization phase that emerging economic giants are passing through.

Statement of the Problem: The power sector has a pivotal role in the race of economic development. Therefore, the efficiency of the power sector units is an important issue for the sake of greater national interest. Particularly, the study on financial performance of the units is very much significant which is related to operating efficiency of



the unit. The researcher, through this investigation, has paid effort to study the problems related to liquidity, profitability and utilisation of fund for creation of assets, revenue generation and expenditure trend.

Review of Literature: (Yadav 2011) analysed the progress and problems of power sector in India and Andhra Pradesh. He also assessed the performance of APSPDCL and suggested measures for improvement in the power sector. The paper also highlighted the outcome of the various power sector reform measures undertaken in the state of Andhra Pradesh. In the similar line, (Jongpangkumla 2012) analyzed the workings and overall performance of the department of power in Nagaland in order to study the rural electrification in the state and identify the problem faced by the department in generation, transmission and distribution power in the state. The paper examined the organizational and management patterns of the department and evaluated the effect of electricity management in the management of revenue. The study found out that Nagaland does not have any major generation projects and therefore power requirement of the state depends mainly on central sector. The growth rate of the installed capacity has been slow and inadequate during the last 20 years under the study in the state.

Table 1. Analysis of revenue per rupee of expenditure								
UNITS	2011-12	2012-13	2013-14	2014-15	2015-16	Average	c.v	COR
APGCL	0.9	0.99	1	0.98	1.04	0.982	5.2	0.98
AEGCL	0.86	1.26	0.99	0.87	0.76	0.948	20.3	0.57
APDCL	0.81	0.84	0.85	0.86	0.92	0.856	4.7	0.99

Source: Annual Reports of APGCL, AEGCL and APDCL

Table 2. Revenue from Operations on Expenditure (Rs. in crores)								
PSUs	Particulars	2011-12 (in Rs.)	2012-13 (in Rs.)	2013-14 (in Rs.)	2014-15 (in Rs.)	2015-16 (in Rs.)	Avg Ratio	CV
APGCL	Revenue from Operation	433.96	459.7	547.05	617.5	679.7	0.95	5%
	Expenditure	491.8	479	578	649	664.9		
	Ratio	0.88	0.96	0.95	0.95	1.02		
AEGCL	Revenue from Operation	391.14	536.45	456.03	462.52	537.92	0.83	22%
	Expenditure	496.8	473.9	527.5	636.3	823.7		
	Ratio	0.79	1.13	0.86	0.73	0.65		
APDCL	Revenue from Operation	2046.5	2301.8	2777.2	3190.1	3664.39	0.76	6%
	Expenditure	2914.9	3140.4	3577.8	4120.04	4473.07		
	Ratio	0.70	0.73	0.78	0.77	0.82		
Source: Annual Reports of APGCL, AEGCL and APDCL								

The financial position of the state power section has worsened over the years even though its physical performance has improved slightly over the years. (Purkayastha 2012) drew an overview about the power scenario and reform process in the country and several other power related issues. Taking a note on the happenings around the country as a base he dived deep into the power sector restructuring in Assam. He also analysed the operational progress and financial implication of such restructuring in the power sector while (Mishra 2013) presented value chain analysis of power sector in India with regard to the current scenario as well as the future prospects. The paper also highlighted that there is a requirement for surge in electricity supply to sustain the rapid economic growth in India and suggested to efficiently manage all the

components of value chain. (Bhaskar 2016) studied about the development of power sector and the various power sector reforms in Andhra Pradesh. It also dealt with the private sector participation in power sector development and consumer preference.

The study observed that considering the power scenario in the state it is of urgent need to stress on increasing the capacity and maximising the power generation and (Sarangi, et.al. 2019) evaluated the sustainability of the Indian electricity sector using a sustainable development framework. The study employed 11 indicators representing three economic, environmental and social dimensions of sustainable development and analysed 12 Indian states over a decade period. The findings of study suggested that the sector is moving towards sustainability although

deviations exist in the performance of individual states and individual dimensions (Kumar & Majid (2020). Presented the significant achievements, prospects, projections and generation of electricity. They also presented the challenges in investment and employment opportunities due the development in the sphere of renewable energy in India. The various obstacles were also identified and the recommendations were made to various stakeholders for improvement of the present situation.

Objectives of The Study

The study has the following objectives:

- To analyse the revenue and expenditures of the 1. power sector units of Assam;
- 2. To examine the working capital status of these power sector units;
- To assess the profitability of the power sector 3. units.

RESEARCH METHODOLOGY

The research study is mainly explorative and analytical in nature based on secondary source of information. Exploration would be made into the profitability, liquidity and other financial aspects of the power sector units which would be analysed to derive correct inferences.

Data presentation tools: The data collected have been presented through charts and diagrams for better interpretation by the users.

Quantitative tools applied: The researcher applied trend analysis, ratio, percentage, annual compounded growth rate, index number and correlation co-efficient for interpreting the data.

Significance Of The Study: In a country which can boast of commercial supply of power just 11 years after it was invented, the present scenario is very painful. Again our subcontinent is bestowed with all requisite resources for generation of power. Proper management and distribution of power is very essential to ensure efficient and uninterrupted supply of power. The power sector needs greater attention and systematised planning. The power sector in Assam has undergone great revamp in the last two decades with the Assam State Electricity Board being unbundled into five separate entities which was further merged and formed into three organisations namely Assam Power Generation Company Limited (APGCL), Assam Electricity Grid Corporation Limited (APGCL) and Assam Power Distribution Company Limited (APDCL). There is a tremendous change in the structure of power sector of Assam which has been splitted into three units. Now it is questionable that whether after the reforms, the power sector units are performing well or not. Thus, an evaluative study with regard to the financial aspects of the three power sector units of Assam is pivotal. Financial efficiency of the power sector units can ensure operating efficiency in distribution and generation of power.

Table 3. Net Working Capital of Power Sector Units (Rs. in Crore)							
PSUs	2011-12 (in Rs.)	2012-13 (in Rs.)	2013-14 (in Rs.)	2014-15 (in Rs.)	2015-16 (in Rs.)	Average (in Rs.)	
APGCL	-30.85	37.8	-27.51	-166.09	-26.21	-42.57	
AEGCL	384.93	474.07	542.23	623.75	419.7	488.94	
APDCL	619.73	-9072.41	-721.37	-1550.09	-1540.42	-2452.91	
Source: Annual Benerits of ADCCL AECCL and ADDCL							

Source: Annual Reports of APGCL, AEGCL and APDCL

Analysis of Revenue and Expenditures of Power Sector **Units:** Revenues are generated in the power sector units by providing services to the customers. But, the power sector units of Assam are diverse and they carry on their operations in diverse fields like generation, transmission and distribution. APGCL is engaged in the generation of power which is sold to AEGCL who transmits it to APDCL for distribution to each and every household of Assam. AEGCL transmits power from APGCL and delivers it to APDCL which forms their revenue from operations. APDCL comes last in the chain whose principal business activity is to transmit the power purchased from APGCL and other power generating companies to different household and firms in Assam. All these power sector units have also other incomes along with income from business operations.

Revenue generation depends on expenditure incurred by the corporate units. If a corporate unit is running efficiently, the expenditure of this corporation will have definitely high correlation with revenue. Table 1 shows that the expenditure of APGCL and APDCL have high correlation with revenue, i.e. 0.98 and 0.97 respectively, whereas, AEGCL shows moderate correlation coefficient i.e. 0.57.It implies that the expenditure of AEGCL was not leading revenue effectively. Since, the revenue from operation is pivotal to evaluate the performance of the corporate units; therefore, the researcher has attempted to investigate the trend of the ratios in between revenue from operation and expenditure. It has been observed that the growth of revenue against expenditure was not steadily upward in all the aforesaid corporate units. The Table 2 exhibits that the coefficient variance of the ratios was more (i.e., 22%) in case of AEGCL in comparison to APGCL and APDCL. It again signifies the instability of AEGCL in revenue earning from business operation.

Table 4. Liquidity position of the power sector units (Rs. in Crores)								
PSUs	Ratios	2011-12	2012-13	2013-14	2014-15	2015-16	Average	CV
APGCL	Current Ratio	0.92	1.1	0.93	0.76	0.96	0.93	12.97
	Cash Position Ratio	0.24	0.33	0.4	0.24	0.3	0.3	22.28
	Current Assets to Total Assets	0.23	0.24	0.22	0.28	0.29	0.25	12.47
	Current Assets to Fixed Assets	0.3	0.31	0.28	0.39	0.42	0.34	17.87
AEGCL	Current Ratio	1.71	1.84	1.9	1.99	1.49	1.79	10.93
	Cash Position Ratio	0.74	0.56	0.56	0.52	0.3	0.54	29.15
	Current Assets to Total Assets	0.57	0.52	0.48	0.48	0.45	0.5	9.18
	Current Assets to Fixed Assets	1.37	1.15	0.97	0.97	0.84	1.06	19.14
APDCL	Current Ratio	1.22	0.28	0.84	0.71	0.74	0.76	44.71
	Cash Position Ratio	0.72	0.14	0.38	0.29	0.26	0.36	62.09
	Current Assets to Total Assets	0.56	0.53	0.57	0.44	0.46	0.51	11.71
	Current Assets to Fixed Assets	1.3	1.17	1.02	0.84	0.86	1.04	19.2
Source: Annual Reports of APGCL, AEGCL and APDCL								

Another noticeable fact is that though the average amount of revenue earning of APDCL was more than other two power sector units during the period of the study, the average revenue from business operation of this power sector unit against per rupee of expenditure was lowest among all the power sector units of Assam.

Net Working Capital: Although Net Working Capital is not really a ratio it is often employed as a major tool to assess a company's liquidity position. It is expected that a firm should have a sufficient net working capital in order to be able to meet the claims of its creditors or other recurring needs of the business. Table 3 exhibits the net working capital of the various power sector units of Assam (Sarangi et al., 2019).

It can be found that APDCL reported a very high negative working capital. In the year 2012-13 its net working capital was Rs - 9072.41 crores. Although this negative net working capital came down to Rs -1540.42 crores in 2015-16, it has to be mentioned that APDCL had a negative net working capital during four years under study except in 2011-12 where it has a net working capital of Rs 619.73 crores. APGCL also had a similar picture with a negative net working capital in all the years of study except 2012-13 where it had a net working capital of Rs 37.8 crores. The net working capital of APGCL was Rs -166.09 crore in 2014-15. However it came down to Rs -26.21 crores in 2015-16. It suggests that these two power sector units were resorting to long term borrowings for their operational requirements. AEGCL however maintained a steady net working capital with an average of Rs 488.94 crores during the year of study. Its net working capital in the year 2011-12 was Rs 384.93 crores which rose to Rs 623.75 crores in the year 2014-15. However it came down to Rs 419.7 crores in the year 2015-16 but it had been able to maintain some steadiness in its net working capital (Yadav 2011).

Liquidity Position Of The Power Sector Units: The theory of liquidity says that an enterprise is liquid, if it holds

assets that could be converted into cash or sold by bearing minimum cost or reduction in value. Liquidity at the corporate level is twofold, internal and external. At the internal level it indicates the convertibility of the assets into cash and at the external level it indicates the availability of a ready market where such assets could be converted into cash. The existence of a market highly influences the liquidity of a corporate entity.

The current Ratio of a firm measures the short term solvency or liquidity. It indicates the amount of current assets value against current liability payable. It reflects that APDCL (0.76) and APGCL (0.93) had a very poor liquidity position as it indicates that the current assets are insufficient to meet the current liabilities. These clearly indicate the fact that these power sector units are using a major portion of their long term borrowing to finance their operations and maintenance. In case of AEGCL (1.79) the position was comparatively much better (Rao 2014). It could be found during the study that AEGCL (0.54) had a good cash position ratio while APGCL (0.30) had the lowest among the power sector units. It is worth mentionable in this context that APDCL (0.36) has about half of its current assets in the form of cash and cash equivalent. It can thus be deduced from this fact about the extent to which the current liabilites of APDCL is covered by current assets.

The variation in cash position ratio was also highest in case of APDCL (62.09%) while the lowest variability was reported in APGCL (22.28%). A high ratio of current assets to total assets will lead to access amount blocked up in current assets and adversely affects profitability and operations. APGCL (0.25) maintained the lowest ratio while APDCL (0.51) had the highest current ratio to total assets. It implies that the position of APGCL is better than that of AEGCL and APDCL. AEGCL (1.06) had the highest ratio followed by APDCL (1.04) and in both these units the current assets exceeds the fixed assets. This was mostly because of high amount of trade receivables in both the power sector units. In addition to that APDCL also had a huge amount blocked in the form of cash and cash equivalent during the period under study. APGCL (0.34) maintain a substantially low ratio of current assets to fixed assets. It is also worth mentioning that APDCL (19.20%) and AEGCL (19.14%) had shown fluctuating behavior in its ratio current assets.

Effectiveness of the Power Sector Units in Utilising Its Current Assets and Working Capital: The liquidity ratio generally relates to the liquidity of the entire firm. However liquidity can be examined in a better way to determine the rate at which current assets are converted into cash, such ratios are the turnover ratios or activity ratios. Activity ratios are determined on the basis of revenue from operations, hence these ratios are also known as turnover ratio. It indicates the rate on intensity with which the capital employed is circulated in the process of business operation. These ratios show the efficiency with which working capital and inventory is utilised to generate revenue. Higher the turnover ratio better is the utilisation of resources, which enables the firm to earn higher profits (Purkayastha 2012).

Table 5. Effectiveness of Working Capital of the power sector units (Rs. in Crores)								
PSUs	Ratios	2011-12	2012-13	2013-14	2014-15	2015-16	Average	CV
APGCL	Inventory Turnover Ratio	5.8	5.62	11.74	9.12	4.09	7.27	42.61
	Trade Receivables Turnover Ratio	5.8	5.62	11.74	9.12	4.09	7.27	42.61
	Working Capital Turnover Ratio	1.31	1.2	1.6	1.25	1.14	1.3	13.81
	Cash from Operations to	0.12	0.05	0.15	0.03	-0.08	0.056	157.45
	Revenue from Operations							
AEGCL	Inventory Turnover Ratio	6.03	22.46	20.64	23.4	31.81	20.87	44.76
	Trade Receivables Turnover Ratio	1.54	1.48	1	0.94	0.92	1.18	26.11
	Working Capital Turnover Ratio	0.46	0.58	0.46	0.44	0.49	0.49	11.09
	Cash from Operations to	0.19	-0.04	-0.03	-0.15	0.01	-0.003	-4553.8
	Revenue from Operations							
APDCL	Inventory Turnover Ratio	17.57	15.71	13.71	11.85	10.94	13.96	19.53
	Trade Receivables Turnover Ratio	4.29	3.9	3.8	3.9	3.71	3.92	5.73
	Working Capital Turnover Ratio	0.7	0.76	0.81	0.94	0.95	0.83	13.35
	Cash from Operations to	-0.06	-0.2	0.18	0.04	0.05	0.002	6232.66
	Revenue from Operations							

Source: Annual Reports of APGCL, AEGCL and APDCL

Table 6. Profitability Analysis of the power sector units (Rs. in Crores)								
PSUs	Ratio	2011-12	2012-13	2013-14	2014-15	2015-16	Average	CV
APGCL	Gross Profit and Loss Ratio	0.23	0.2	0.28	0.25	0.31	0.26	15.71
	Net Profit and Loss Ratio	-0.11	-0.01	-0.15	-0.002	0.001	-0.06	-128.5
	Operating Profit Ratio	-0.05	-0.06	0.04	0.05	0.11	0.02	375.6
AEGCL	Gross Profit and Loss Ratio	0.28	0.42	0.3	0.1	-0.09	0.2	97.33
	Net Profit and Loss Ratio	-0.16	0.2	-0.01	-0.14	-0.32	-0.09	-222.2
	Operating Profit Ratio	-0.06	0.22	0.01	-0.11	-0.26	-0.04	-421.73
APDCL	Gross Profit and Loss Ratio	-0.08	-0.02	0	0.01	0.05	-0.01	491.25
	Net Profit and Loss Ratio	-0.17	-0.16	-0.17	-0.16	-0.03	-0.14	-45.96
	Operating Profit Ratio	-0.11	-0.05	-0.04	-0.03	0.02	-0.04	-121.28
Source: Annual Reports of APGCL, AEGCL and APDCL								

The inventory turnover ratio of AEGCL (20.87 times) had the highest inventory turnover ratio, but it also had the highest variation of 44.76% during the year under study. Although 8 times is considered to be an ideal inventory turnover ratio and most of the power sector units have a ratio more than or around that ideal ratio, it cannot be significantly concluded about a good liquidity position. The inventory turnover ratio of APGCL

was 7.27 times while that of APDCL was 13.96 times. It must be understood that the power sector units are not trading concerns and do not necessarily require to maintain a high inventory. Inventories at the disposal of the power sector units are mostly spares and operations and maintenance materials which compliment the transmission process. The power sector units of Assam generate, transmit and distribute power to the households and firms within the state. APGCL sells power to APDCL and thus most of its receivables are from APDCL. AEGCL transmits the power from the power plants to power station maintained by APDCL and thus their receivables also comprise mostly from APDCL. APGCL (7.27 times) has the highest turnover ratio among the power sector units while AEGCL (1.18 times) has the lowest.

In the year 2013-14, APGCL had a turnover ratio 11.74 times but it came down subsequently to 4.09 times in 2015-16. As a result, in case of APGCL it had been found to have a variation of 42.61% in its trade receivables turnover ratio. The revenue of both these power sector units is generated from APDCL and they could not maintain a strict credit control policy towards APDCL. APDCL (5.73%) however had maintained a reasonable trade receivable turnover ratio among the power sector units of Assam during the period under study. Among all the power sector units APGCL (1.30 times) had the highest working capital turnover ratio while AEGCL (0.49 times) had the lowest. However, the degree of fluctuation was also the lowest in case of AEGCL (11.09%). AEGCL had a very low working capital turnover ratio and that remained subsequently stable during all the five years under study. The investment of funds in working capital of AEGCL is almost double its revenue generation in a financial year. This must be seriously considered by the management so that such working capital can be reduced to avoid unnecessary blockage of funds and pressure on profitability. AEGCL must improve their credit policy and at the same time improve their working capital turnover ratio (Kardam 2016).

Surprisingly it could be found that some of the power sector units had a cash outflow during the years under study. Such a result is a clear indication of the degree at which these power sector units perform. In case of AEGCL (-0.003), the average ratio of the 5 years under study indicated a negative figure. Among all the power sector units APGCL (0.05) could be said to have the best ratio of cash from operations to revenue from operations. It reported a positive value in four out of five years under study. In any way, concluding about the power sector of Assam, such a ratio of Cash from operations to Revenue from operation points at serious anomalies.

Profitability Analysis Of The Power Sector Units: Profitability is the primary basis for any managerial decision. It has much more managerial uses than profit itself. It is the measure of overall organizational efficiency in achieving business goals. Not only to the organization as whole, it is also employed to measure departmental efficiency in case of organization in many departments. Profitability also helps to ascertain the level of activity at which the optimum position can be attained. Often it is found that profit increases with the rise in the level of activity but the rate of profitability comes down. In such a case the onus is on the managerial body to find out the level of activity at which both profit and profitability reaches the highest level. The profitability analysis also ensures an appropriate product mix and sales mix. Measurement of profitability or quantification

of profitability is very crucial for any business enterprise (Mushahid 2018).

Table 5 exhibits the gross profits of the power sector units. It could be found that during the years under study APDCL could not maintain even gross profit during 2011-12 and 2012-13. During the 5 years under study APDCL had an average gross loss ratio of -0.01. APGCL however maintained a gross profit during the years under study with average of 0.26 from 2011-12 to 2015-16. The gross profit ratio of APGCL is very low and it is impossible to cover the administrative and selling expenses with such a low gross margin profit. APGCL could earn a net profit only in the year 2015-16 whereas AEGCL earned profit only in the year 2012-13. APDCL could not exhibit profit in the period of the study (Kumar & Majid 2020).

The net results of these power sector units were fluctuating too due to instability in the cost incurred by different activity centres. Further, it could be found that both AEGCL and APDCL had operating loss ratio (i.e., net average loss) during the year under study. APGCL was the only power sector unit of Assam which could maintain an operating profit ratio. During 2015-016 APGCL had operating profit 0.11. Such operating losses are mainly due to extremely high cost of functioning. APDCL could not even maintain a gross profit and thus the question of an operating profit does not even arise. APGCL had an average gross profit ratio of 0.26 during the period under study which came down to a 0.02 as the operating profit ratio. This brings to light the high amount spent on functioning of the organizations. In the year 2012-13 AEGCL had an operating profit ratio 0.22 which was the highest among all the power sector units of Assam. However, it had shown a highly fluctuating behaviour with a coefficient of a variation of 421.73%. The operating profit ratio of AEGCL in the year 2015-16 was - 0.26 (Jongpankumla 2015).

CONCLUSION

During the years under the study, the power sector units earned losses in most of the years. The growth in expenses was found to be more than the growth in revenue in some case. The power generating unit did not have any significant growth in the power generating capacity. In addition to that, it also had depletion in its fixed tangible assets. The financial health moved from worse to worst but the most surprising fact was that such losses were highly variable. One company earns a very high profit during one of the years under study from a huge loss in the previous and again plunging into losses in the next year. This highlights the unpredictability of returns. The liquidity position of all the companies was very poor.

The power sector units had a negative working capital in most of the years under study. The proportion of direct expenses was so high that it left very small margin to cover the operational and administrative expense. Most of these power sector units had a high dependence on external borrowing and grant but the total amount of reserves are continuously depleting due to recurring losses. Further, some of the power sector units have a high amount of trade receivables which reduces its dependence on own funds. There has been a continuous increment in the grants received by the power sector units but such operational inefficiencies are consuming such grants year after year and is not leading to any kind of value addition in the power sector units. The various stakeholders namely, the Government, Regulatory Commission and the power sector units must go through serious consideration to revive the power sector units.

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Climate Change in Urban Areas: A Case Study of Mysuru City

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ABSTRACT

In climate change research studies, trend analysis has played a remarkable role for almost the past 3 decades. The study aims to find out the variations in climate parameters for Mysuru City. The climate variables were examined for annual and seasonal trends for Mysuru City for the period 1980-2020. To determine the increasing or decreasing trend in climate data along with their statistical significance, both parametric test (linear regression) and non-parametric tests (Mann-Kendall and Sen's method) were used. In the current study, the statistically significant increasing trends were detected in annual, winter, and monsoon maximum temperature series and annual and monsoon minimum temperature series. Besides tmax and tmin during summer and tmin in winter does not show any discernible trend. The annual and summer rainfall and relative humidity during summer show a significant increasing trend.

KEY WORDS: CLIMATE CHANGE, STATISTICAL SIGNIFICANCE, CLIMATE VARIABLES.

INTRODUCTION

Climate change, in general, ascribed to the intensification of greenhouse gas emission and anthropogenic activities have a consequential effect on hydro-meteorological variables, which includes runoff, precipitation, streamflow, temperature, soil moisture, and relative humidity, and their effects manifest as sudden jumps or trends (Mehan et al., 2016) (Sen, 2012) (Yilmaz et al., 2020). As a result of greenhouse gas emissions, the warming of our planet is presently indisputable and in comparison to the preindustrial period, the earth has warmed by 0.74°C due to a large rise in CO₂ concentration in the atmosphere (Asfaw et al., 2018; Toprak et al., 2013b). Average global surface temperatures are predicted to increase by around 0.4-5.8°C by the end of the century, potentially affecting ecosystems and the Earth's hydrologic cycle (Mooij et al., 2007) (Shetkar & Mahesha, 2011).

Climate change is wreaking havoc on small-scale subsistence farmers on account of their low adaptive ability and their reliance on rain-fed agriculture, which

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is more climate-sensitive (Asfaw et al., 2018). In an agricultural-dependent country like India climate change remarkably affects the economy of the country to a notable extent. The frequency and severity of extreme events have risen significantly as a result of climate change (Intergovernmental Panel on Climate Change 2007).

The existence of a deterministic trend in the examined time series reveals knowledge on future development or changes in the process (Sen, 2014; Toprak et al., 2013a). With the increasing importance of climate change assessment, trend identification has become a focus of research (Brunetti et al., 2001) (Sen, 2014) (Toprak et al., 2013b). To explore climate change scenarios and magnify climate impact research, trend identification is a useful area of study for both hydrology and climatology (Cryosphere et al., 2013) (Karpouzos et al., 2010). The current study aims to investigate the impact of climate change on hydrometeorological variables such as precipitation, temperature, and relative humidity for Mysuru City by investigating the existence of a significant trend.

Study Area: Mysuru is located on the southern tip of the Karnataka state and it is the second-largest city in the state, situated at 12°15' to 12°21' North latitude and 76° 36' to 76° 42' East longitude having an elevation of 770 m (2530 ft) from the mean sea level covering an area of 286 sq. km. The city is bordered by the states of


Geethalakshmi S & Manjunath

Kerala, Tamilnadu and is flanked by the state cities of Chamarajanagar, Mandya, and Mercara. The city has the Kaveri river flowing to the north and Kabini to the south. According to the Koppen climate classification, Mysuru has a tropical savanna climate (Aw). The average annual rainfall of the city is 800 mm.

3. Database: The data used for the study include precipitation data records for Mysuru City collected from the Indian Meteorological Department. Temperature and relative humidity data records from National Centers for Environmental Prediction spanning from 1980 to 2020 and covers 40 years. Mysuru City is considered to have 3 distinct seasons; summer lasts from March to May, monsoon lasts from June to October, and winter lasts from November to February. The City has prolonged summer and shortened winter season, a part of the summer season is considered as monsoon due to a greater number of rainy days.

METHODOLOGY

The data obtained is thoroughly checked and screened. The temporal trends of rainfall, temperature, and relative humidity were analyzed using the parametric test (linear regression) and non-parametric tests (Mann-Kendall (MK) trend test, and Sen's estimator of slope). A linear trend line was fitted to examine the increasing/ decreasing trend in a time series using the least square curve fitting. The significant trend in the time series data was determined using the MK trend test and Sen's estimator of slope was used to quantify the trend obtained from the MK trend test. The linear trend in the time-series was determined using Microsoft Excel and to analyze the existence of significant trends in the time series MK trend test and Sen's test was performed using XLSTAT software.

Linear Regression Analysis: The parametric test is based on the least square principle. The least-square curve fitting technique was used to fit linear trends in the time series data. The linear trend between the climate data (Y) and time (X) is given by the following equation.

 $Y = A + B(X) \tag{1}$

Where Y is the climate data at time X. B is the computed slope coefficient out of the record series. The increasing/ decreasing trends in the climate data are determined by the positive/negative value of the slope coefficient.

Mann-Kendall (MK) Trend Test: The most widely accepted non-parametric test is the MK trend test, which determines the presence of significant trends in the time series data. The MK test statistic S is given by the formula.

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^{n} sgn(b_j - b_k)$$
(2)

Where b_j and b_k are measurements obtained at time j and k, n is the number of observations.

The function sgn $(b_i - b_k)$ is computed by

$$sgn(b_{j} - b_{k}) = \begin{cases} +1 \ if \ (b_{j} - b_{k}) > 0\\ 0 \ if \ (b_{j} - b_{k}) = 0\\ -1 \ if \ (b_{j} - b_{k}) < 0 \end{cases}$$
(2)

The statistic S is asymptotically normal when $n \ge 8$ having mean zero and variance computed by the formula.

$$\operatorname{Var}(S) = \frac{[n(n-1)(2n+5) - \sum_{p=1}^{m} c_p(c_p-1)(2c_p+5)]}{18}$$
(4)

where m = number of tied groups c_p= number of data points in the tied group The Mann-Kendall Z is computed by the formula

$$Z_{S} = \begin{cases} \frac{S-1}{\sqrt{Var(s)}} & \text{if } s > 0\\ 0 & \text{if } s = 0\\ \frac{S+1}{\sqrt{Var(s)}} & \text{if } s < 0 \end{cases}$$
(5)

The positive/negative value of the z signifies the increasing/decreasing trend in the time series. The null hypothesis (H₀) of no significant monotonic trend in the time series data is accepted if $-z_1-\alpha/_2 \ge z \le z_1-\alpha/_2$) at the user-specified significance level of α . Otherwise, the alternate hypothesis of having a significant trend at the significance level is accepted.

4.3 Sen's Slope Estimator: Sen's slope estimator is used to measure the trend obtained from MK trend test. The slope of all the time series data pairs is given by the formula (Sen, 1968).

$$B_i = \frac{(a_u - a_v)}{u - v} \tag{6}$$

Where a_u and a_v are data values corresponding to u and v (u>v) respectively.

RESULTS AND DISCUSSION

5.1 Maximum Temperature (t_{max}): The maximum temperature for the city varied in the range of 26°C in monsoon to 30°C in summer with a mean value of 28°C. The standard deviation (SD) of the maximum temperature for the study area varied in the range 0.42°C to 0.55°C with the coefficient of variation (CV) ranging from 1.51% to 1.88% (Table 1). The CV for winter was relatively less compared to annual, summer, and monsoon. The t_{max} time series were analyzed using a linear regression

model and the rate of change is defined by the slope of the regression line (Asfaw 2018). The outcomes of the regression analysis show that the annual, winter, and monsoon maximum temperatures show an increasing trend excluding the summer season, where a decreasing trend can be observed (Fig 1). As shown in Table 2 the results of MK trend test revealed that tmax for annual, winter, and monsoon seasons have been increasing from 1980 to 2020 significantly at a 95% confidence interval. The summer maximum temperatures also show a decreasing trend, but not statistically significant. The obtained results from Sen's estimator of slope for the period 1980-2020 (Table 2) revealed a high degree of similarity between the results obtained using the Mann-Kendall trend test, linear regression, and Sen's slope method.

Table 1. Fundamental statistics of annual and seasonal climate parameters for Mysuru							
	Statistic	Annual Average	Winter	Summer	Monsoon		
Maximum Temperature							
in °C	Range	27-28	27-28	29-30	26-27		
	Mean	28	28	30	26		
	SD	0.50	0.42	0.55	0.49		
	CV (%)	1.83	1.51	1.88	1.86		
Minimum	Range	24-25	23-24	25-26	24-25		
Temperature	Mean	24	24	26	24		
in °C	SD	0.42	0.5 0.5	0.5	0.22		
	CV (%)	1.73	2.11	1.97	0.91		
Rainfall in	Range	428-1604	5-651	73-402	45-868		
mm	Mean	818	87	212	236		
	SD	250	114	77	165		
	CV (%)	30.58	131.78	36.79	70.07		
Relative Humidity in	Range	75-82	61-73	66-80	88-94		
0/0	Mean	78	65	71	91		
	SD	1.39	2.55	2.93	1.49		
	CV (%)	1.78	3.91	40.86	1.64		

Table 2. Basic statistics of Mann-Kendall test and Sen's slope estimator								
	Statistic	Annual Average	Winter	Summer	Monsoon			
Maximum Temperature	Bi	0.012	0.008	-0.003	0.022			
	ZS	3.628*	2.549*	-0.707	4.347*			
Minimum Temperature	Bi	0.006	0.006	0.001	0.009			
	ZS	1.393***	1.179	0.168	2.213*			
Rainfall	Bi	3.286	0.455	1.713	-0.520			
	ZS	1.282***	0.764	1.483***	-0.247			
Relative Humidity	Bi	0.026	0.025	0.107	-0.017			
	ZS	1.202	0.753	2.842*	-0.955			
Bi: Sen's slope estimator, Zs: Mann-Kendall statistic * Statistically significant trends at 5% significance level.								

*** Statistically significant trends at 20% significance level.

5.2 Minimum Temperature (t_{min}): The t_{min} for the city varied in the range of 23°C in winter to 26°C in summer with a mean value of 24°C. The SD of the t_{min} for the study area varied in the range 0.22°C to 0.5°C with CV ranging from 0.91% to 2.11%. The coefficient of variation was relatively less in monsoon compared to

other seasons (i.e., annual, summer, winter). The results of regression analysis for minimum temperature show a fragile upward trend for both annual and seasonal scales. The monsoon tmin and annual tmin reveal +ve trend, which is statistically significant at 5% and 15% significance levels.



The obtained results are compatible with a similar study by researchers at the Indian Institute of Science (IISc), Banglore(Sonali & Nagesh Kumar, 2013) which detected that the faster rise in minimum temperature trend compared to maximum temperature over most parts of India can be attributed to natural climate variability.

5.3 Rainfall: The rainfall value for the city varied in the range of 5 mm in winter to 868 mm in monsoon with an average of 818 mm. The SD of rainfall for the study area varied in the range of 77mm to 250 mm with CV ranging from 30.58% to 131.78%. The CV was relatively more in winter compare to annual, summer, and monsoon scales. The corresponding regression line is also plotted for the rainfall time series (Fig 3). The positive trends are evident with annual, winter, and summer scales excluding monsoon rainfall, which shows a negative trend. The annual and summer rainfall shows a +v trend, which is statistically significant at a 20% significance level as shown in Table 2, whereas winter and monsoon rainfall does not reveal a statistically significant trend.

5.4 Relative Humidity (RH): The relative humidity for the city varied in the range of 61% in winter to 94% in monsoon with a mean value of 78%. The SD and CV for RH vary in the range 1.39% to 2.93% and 1.78% to 40.86% as shown in Table 1. The CV for the summer season is more compared to other seasons. The linear trend analysis for the RH time series indicates that the annual, winter and summer RH reveals a +ve trend (Fig 2), whereas monsoon relative humidity shows the -ve trend. The outcomes of the MK trend test (Table 2) portrayed that the RH for the summer season has been increasing for the period 1980-2020.

CONCLUSION

The results of this study led to the following findings:

- The results of maximum temperature trends clearly show an increasing trend on an annual scale. The warming trend has been noticed in the winter and monsoon season, whereas the -ve trend is revealed for the summer season. The exact reason for the phenomenon can be attributable to the increase in anthropogenic activities leading to global warming. The atmosphere is stable during the winter months. As a result, there will be a more pronounced impact of anthropogenic activities causing more warming in the winter months.
- The analysis of minimum temperature trends revealed the increasing trend of minimum temperature both in annual and seasonal scales. Minimum temperatures are showing pronounced increasing trends as that of maximum temperatures for the city were evident from the results.
- The use of the trend analysis context to the rainfall

time series for the study area has resulted in declining trends of monsoon rainfall and increasing trends of annual, summer, and winter rainfall. The declining trend of the city's monsoon may indicate an influence of urbanization on precipitation linked with enhanced anthropogenic activities due to urban expansion and population growth.

• The outcomes of trend analysis revealed that the relative humidity shows +ve trend for annual, winter, and summer for the city and the decreasing trend during monsoon season.

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Geethalakshmi S & Manjunath

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Cov-19 Incidence Detection Using Efficient Intelligent Multi Agent System Based on Dynamic Unsupervised Feed-Forward Neural Network

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ABSTRACT

Nowadays Corona Virus Disease, that it has been breaking out since 2019 (COV-19) which is outset from Wuhan of China, is a critical problem to research in the world. COV-19 is consistently infecting wave after waves in a variety of symptomatic way. We propose an Intelligent Multi Agent Systems (IMAS) based on the dynamic unsupervised feed forward neural network (DUFFNN) model, which authors believe that even after vaccine inventions repeatedly the infections are spreading in terms of second wave and so on, it has great potentials to apply in detecting the current status of the COV-19 in the world and predict its future and prevent. The IMAS framework has two flows. First flow includes earning knowledge of the existing symptoms, diagnostic techniques and treatment of the deadly pandemic of the COV-19. Second flow includes detection of the number of patient cases, risk of the disease and the polluted spots, that they can help infected to monitor and control the COV-19 risk and parameters. The proposed experimental results show that the DUFFNN model and consequently its semi-clustering have the best efficient results 98.99% and 99.97% accuracy respectively, which are the best results in this area by comparison with different related methods.

KEY WORDS: ARTIFICIAL NEURAL NETWORK (ANN) MODEL, DYNAMIC UNSUPERVISED FEED FORWARD NEURAL NETWORK (DUFFNN) MODEL, INTELLIGENT MULTI AGENT SYSTEM (IMAS), CORONA VIRUS DISEASE 2019.

INTRODUCTION

In several applications of real time research domains, like banking mastercard transactions, multi agent intelligent systems, and medical informatics, use online nonstop data that are updated frequently. The casual occurrence of ordinary problems of such domains are assortment, memory storage, searching data transactions, data transfer, visualization and analysis of huge capacity of such data including data noise and therefore the high magnitude of the info. Data processing may be a



technique of the knowledge detection process in databases (KDD), that's the techniques of analyzing the info, exploit the knowledge, potentially useful information supported the relationships between data values during a huge rational databases, recognizing meaningful patterns and rules out of very great deal of knowledge. Accordingly, clustering methods in data processing are not to identify the distinguish structure and determine the knowledge of the info, so as to group the specified data implicitly.

Considering the info area is a web non-stationary, the web Online Dynamic Unsupervised Feed-Forward Neural Network (ODUFFNN) clustering methods must support online incremental learning. In these environment, the info are often seems to be highly huge, continuous and uninterrupted input file, the distributions of knowledge aren't known and therefore the data distribution might modify over the period of time. Incremental learning signifies to the power of frequently training a network using new data or deleting unnecessary data, without



terminating outdated prototype patterns. The ODUFFNN clustering technique has capability to regulate the randomly fluctuating data, correct its algorithm and modify automatically during a feasible approach to new settings of the world over time dynamically for processing of both data and therefore the knowledge. The ODUFFNN capable to supply accommodations and crop the info and rules without terminating old knowledge, algorithm to coach variety of clusters and density of each cluster without predetermining the principles . Further, the ODUFFNN method must control time, memory space and accuracy efficiently (Asadi et al., 2019).

The ODUFFNN clustering are founded on the Unsupervised Feed Forward Neural Network (UFFNN) clustering methods. The UFFNN clustering methods are usually apply Hebbian learning, or competitive learning, or the combined the both techniques. The similarities between Hebbian and competitive learning are unsupervised learning without error signal, and strongly related to biological systems. Though, competitive learning just one output must be active; such , only the winner weights are updated in each period of your time. With contrast, no constraint is imposed by neighboring nodes in Hebbian learning, and every one weight is updated at whenever period. Competitive learning uses vector quantization (VQ) through clustering (Asadi et al., 2019).. The static UFFNN clustering methods are supported the VQ and K-means. K-means clustering model partitions nodes supported the Centroid-Based technique. Linde-Buzo-Gray algorithm (LBG) may be a VQ algorithm to realize an honest code-book and is probabilistic model on long training.

The VQ is applied for probability density functions modeling by the distribution of prototype vectors. The Growing Neural Gas (GNG) model and Self-Organization Map (SOM) are samples of the UFFNN clustering. The GNG method can follow dynamic distributions by adding nodes and deleting them within the network through clustering by using the function parameters. SOM maps multi-dimensional data onto lower dimensional subspaces, with the geometric affiliations between points indicates their similarity, on the idea of a competitive learning algorithm (Bobek 2006). The weights are adjusted and supported their proximity of the "winning" nodes, that's the foremost closely appear as if a sample input.

The ODUFFNN method	The ESOM	The DSOM	The DUFFNN
Essential forms	SOM and GNG, Hebbian	SOM	Hebbian and ESOM
		Townson of a Commuter of an Indian	Starts without any node
Several dauntless features	Begin without any node	weights	Input vectors are not stored during learning
	Automatic Update with online input data		Automatic Update with online input data
	Operates the nodes with weak	Elasticity or Flexibility property	Operates the nodes with weak
			Possible to crop the thresholds
(Advantages)			Initialize non-random weights
	Possible to crop the		Non-sensitive to the order of the data entry
	thresholds		Mining BMW
			Clustering during one epoch without updating weights
	Clustering during one	Faming Post Match Unit (PMI)	Able to retrieve old data
	epoch	Earning Dest Match Onti (BMO)	Able to learn the number of clusters
Time Complexity	$O(n^2.m)$	$O(c.n.m^2)$	$O(n^2)$
Memory Complexity	$O(n^2.m.s_m)$	$O(c.n.m^2.s_m)$	$O(n^2.s_m)$

Effective ODUFFNN clustering method frequently employ the competitive learning as applied within the dynamic self-organizing map (DSOM), or competitive Hebbian learning as utilized in the Evolving Self-Organizing Map (ESOM) [10]. ESOM is made on using SOM and GNG methods. ESOM starts without nodes. The network updates itself with online admission, and if required, it creates new nodes through one training epoch. Almost like SOM, each node features a special weight vector. The strong neighborhood relative is driven by the space between connected nodes, hence, it's sensitive to noise nodes, weak connections and isolated nodes built on Hebbian learning. Therefore, if the space is just too big, it creates a weak threshold and therefore the connection are often pruned. DSOM is far almost like SOM supported competitive learning. So as to update the weights of the neighboring nodes, time dependency is detached, and therefore the parameter of the elasticity or flexibility is taken into account, which is learned by using trial and error. If the parameter of the resistance is just too high, DSOM doesn't assemble; and if it's too low, it's going to avoid DSOM to occur and isn't sensitive to the relation between neighbor nodes (Bouchachia 2007). If no node is close enough to the input values, other nodes must learn consistent with their distance to the input value. Also, the DUFFNN is an efficient single-layer method with one epoch training, data dimensionality reduction and therefore the capabilities to overwhelm the foremost declared problems, suitable to use within the communication network area. Within the DUFFNN, dynamically after admission of every new online input file, the code book of non-random and real weights and other important information about online data as essentially important information (EII) are updated and stored within the memory. Accordingly, the exclusion threshold of the info is calculated on the idea of the EII and therefore the data is trained. Then, the network of trained nodes is updated. The training process is predicated on considering a linear activation function and therefore the exclusive threshold.





In Table 1, authors have planned to compare the DUFFNN clustering method with the ESOM and DSOM as affective current ODUFFNN clustering methods. With the respective algorithms, the time and memory complexities of the ESOM are O(n2.m) and O(n2.m.sm). The time and memory complexities of the DSOM are O(c.n.m2) and O(c.n.m2.sm). However, the DUFFNN method has better leads to the time and memory complexities which are O(n2) and O(n2.sm). Where the parameters c, k, n, m, sm are the amount of epochs, clusters, nodes, attributes and size of every attribute, respectively. The observation above reveals that the DUFFNN method more efficient than compared to other related methods.

Several litterateurs dedicated to enhance the UFFNN and ODUFFNN methods by the technique of using constraints

like class labels. The constraints of sophistication labels are supported the knowledge of experts and therefore the user guide as partial supervision for improved controlling the tasks of clustering and desired results. The Semi-ESOM and Dynamic Semi-supervised Feed Forward Neural Network (DSFFNN) clustering techniques are examples during this domain. so as to enhance the methods, many researchers manage and proper the amount of clusters and density of every cluster by adding and deleting the info nodes and clusters, thereafter clustering, the models assigned class label to the winning node and accordingly assigned an equivalent class labels to its neighbor nodes in its cluster. Each cluster must have a singular class label, if the info nodes of a cluster have different class labels, the cluster is in a position to be divided into different sub-clusters (Brachman et al.,1994).

Though, assigning the category labels to the info nodes between the clusters could be slightly ambiguous. The judgment of users are often incorrect through the insertion, deletion or finding the connection between nodes and assigning the category label to every disjoint sub-cluster. The DUFFNN clustering method has prediction success within the prediction of carcinoma patients' survival time, therefore during this work authors design to use this model so as to predict the COV-19 incident globally (Chakraborty 2010).



A. Intelligent Multi Agent Systems (IMAS) based on the DUFFNN model: The IMAS with a man-made Intelligent fundamental has great capabilities to be applied in various intents and applications. one among the many topics to use them within the real and virtual areas is to enhance an intelligent model that adopted the machine learning framework to unwrap the entire intricacy of incidence of disease like the COV-19 within the world. Intelligence is common terminologies wont to refer the mind activities, like judging, reasoning, planning

Raviraja et al.,

and learning. AI is predicated on smart behaviour, and artificial neural network uses it for learning of virtual environments. Intelligent Agent (IA) is predicated on the synthetic intelligence properties. Wooldridge in and Langseth enlightened several features of the IA, which are capable of flexible autonomous action to satisfy their design purposes, as follow:

Reactivity: IA obtains data of its area by its sensors, changes internal design objectives of its structure and has suitable actions with feedback periodically.

Pro-activeness: IA is in a position to point out goal absorbed behaviour by taking the ingenuity, responding to variations in their area so as to satisfy their design objectives.

Sociability: IA can cooperate with other agents for compromise and/or collaboration to satisfy their design objectives. Other properties of the IA are self-analysis,





learning, adapting and improving through interaction with the world (David et al., 1998).

Smart systems apply the multi agent technology to unravel the issues of study of intricate systems and smart management activities. The IMAS based learning combine collection of data from their area, recognition data, intelligent cluster data and prediction future data, selforganization, storage data, delivery data to knowledge management systems like Decision network (DSS) and Management data system (MIS). Padghan and Winikopff explained in the structure of multi agent system is usually covers the Actions, Percepts, Events, Goals, Beliefs, Plans, Messages and Protocols. Yoav & Kevin in and Michael clarified about agent based system and intelligent agent as two relevant streams and therefore the gap of a combined framework for blending these two. Bobek and Perko in presented that intelligent agents that are commonly applied in Intelligent Acquisition, Intelligent modelling and Intelligent delivery.

Presently, there's the shortage of a united framework for combination of the two applicable flows of intelligent multi agent technology and learning in real environment. So as to unravel the gap, experiment to think about DUFFNN clustering model as intelligent core of intelligent multi agent based online learning framework. The framework earns the knowledge from the respective environment and its behaviour are often recognized by the weights (Deng, & Kasabov 2003).

B. The Corona Virus Disease 2019 (C19): In this section. we review on the newest existing diagnostic techniques and treatment of the deadly pandemic. The Corona Virus Disease 2019 or since it is otherwise called COVID -19 may be a deadly viral occurrence that broke call at Wuhan city, China in December 2019. It's been classified under Severe Acute Respiratory Syndrome corona virus 2 or Sarbecovirus (SARS-2). The arrival of SARS-2 is taken into account because the third outcome of an exceedingly zootic corona virus that has been affecting the human population next to the acute acute respiratory syndrome corona virus (SARS) and therefore the Middle East Respiration Syndrome corona virus or Merbecovirus (MERS) within the twenty-first century. With the already prevailing knowledge of SARS and MERS infections, this review are often helpful in imparting novel insights and possible therapeutic objectives for combating the SARS contamination (Furao et al., 2007).



Further, the disease being zootic, it's believed that bats could be the possible favorite reservoir. The transmission routes to humans aren't yet known. There are not any clinically authorized vaccines or antiviral drugs that are currently available to be used against COVID -19 and pretty variety of attempts are being made with existing drugs like remdesivir, while few of the countries have come up with vaccines and trials were made with different scenarios of possible treatment with no confirmation on the effectiveness of the drugs, however the infection rate remains not under the control. Corona viruses are most of the world's leading transmittable ailment zoonotic pandemic which may be seen in people and also in animals along side a spread of scientific capabilities from asymptomatic path to fever, cough, gastrointestinal, hepatic, neurologic systems and importantly inflicting infections in breathing that needs to be admitted in ICU at hospitals. These viruses weren't into account as fairly pathogenic for humans till they were visible with









Table 2. Comparison the clustering results on the global data points by the DUFFNN, DSFFNN and related methods

The clustering method	F-measure	Epoch	CPU TIME (milliseconds)
DSOM	71.22	800	5', 30'' and 106
ESOM	93.04	1	3" and 102
Semi-ESOM	95.13	1	3" and 102
DUFFNN	98.71	1	16.80
DSFFNN	99.82	1	16.80

the severe acute respiratory syndrome (SARS) at the Guangdong state of China, where it broke out for the primary time in 2002 and 2003 (Germano 2003).

On before the above outbreaks, there had been the 2 most known sorts of case as SARS and MERS that have normally precipitated moderate infections in humans with an adequate system. Nearly ten years from it, SARS-2 this point, the opposite type notably pathogenic infected the humans in mass. At first, an unknown pneumonia case became detected on December 12, 2019. This virus was named as COVID -19 by WHO on 12th January 2019. As of 26nd August, 2020, a complete of 23,518,343 showed infected and 810,492 deaths are taken place as per the updates of WHO. While still the route of transmission to human is under speculation, it's believed to possess been transmitted possibly as zoonotic agent (from animal to human). Subsequent level of transmission from humans to humans was confirmed in Wuhan city after closing the market and evacuation of the cases in China. New cases of COV-19 spreading happened, primarily in several Asian nations and in many nations inclusive of the non Asian also as USA and France. Though the medical facilities have drastically improved now technically and clinically, the death-rate of COVID 19 is high, the sole available precaution to flee from this infection is social distancing, continuous usage of masks and sanitizing the touch.

The two outbreaks of SARS (SARS-e and SARS-2) were first found in Wuhan of China and both are believed to possess originated from the wild animal markets. Scientists studied the Wuhan corona virus ordering to different viruses and observed samples closely shows the similarities of bat corona virus. Scientists partially conclude that the corona virus inflicting SARS originated from a reservoir in bats. Within the case of this new outbreak, it had been traced and now-shuttered Huanan Seafood Wholesale Market in Wuhan, where several wild animals, along side raccoon dogs and snakes, were purchasable (Hebboul et al., 2011). the sole thanks to make sure, where the virus source from is to require samples of DNA from animals that are sold thereon market and from wild snakes and bats therein location. In 2003, SARS first became mentioned as a definite corona virus strain. The origin of the virus not clear, albeit the primary human infections are often traced returned to Guangdong in 2002.

The SARS-e virus spread to quite 8,000 influenza-like ailment infections in 26 countries with almost 800 deaths. The Wuhan corona virus has caused fear everywhere the planet. There are matters that aren't unusual among the corona virus spreading in China and therefore the 2003 SARS/MERS outbreak both belong to the corona virus family and every had been probably handed from animals to people on a wet marketplace. Corona viruses are zoonotic sicknesses which mean they unfold from animals to citizenry . Since wet markets put humans and animals-dogs, chickens, pigs, rats, civets, and more-in near touch, making loop for an epidemic to spread in wholesome. Bats had been the authentic hosts of SARS, and doubtless this corona virus outbreak too. Bats and birds are considered pandemic- ability reservoir species for viruses. The animals were the first supply of Ebola; in 1976 it's killed 13,500 citizenry in additional than one outbreak (Hebboul et al., 2011).

To many, the contemporary epidemic sounds similar in 2003 while severe acute respiration syndrome (SARS-e) spread across the country, infecting quite 8,000 citizenry and killing 774 worldwide. However, at an equivalent time as an identical virus triggers the Wuhan corona virus after 10 years later and that they could also be not precisely the similar on (Hinton & Salakhutdinov 2006). Consistent with literature, early cases of COV-19 had been detected, with the people connected to the Huanan seafood and animal marketplace. In Wuhan 27 people were said to be affected, infected were the likely source of the fresh virus could are from animal. Etiologic investigations had been accomplished in sufferers who administered to the checkup due to similar virus infection (Jean & Wang 1994).

The weird records of excessive-risk of animal contact within the clinical histories of these sufferers have reinforced the likelihood of an infection moved from animals to humans. On January 22, 2020, novel COVID -19 has been declared to be emerged from wild bats and belonged to the beta corona viruses under group 2 that has Severe Acute Respiratory Syndrome Associated Corona Virus (SARS). Although COV-19 and SARS-e belong to the beta corona virus subgroup, similarity at genome degree is nearly 70%, and there exists a completely unique genetic organization that has been found to show genetic variations from SARS. Almost like the SARS epidemic, this outbreak in China has occurred in spring festival season, which is one among the famous traditional happening in China, for the duration of which nearly million people travel country wide. These favorable situations caused the transmission of this incredibly contagion thereby resulting in severe problems in prevention and control of the epidemic.

The duration of the Spring Festival of China was between January 17 and February 23 in 2003, when the SARS epidemic peaked, and this point the duration of infection peak was found between January 10 and February 18 in 2020. Wuhan, with an honest number of populations is that the center of the epidemic and also an important epicenter within the spring festival transportation network. The estimated sort of vacationers within the course of the 2020-2021 spring pageant has raised 1.7 folds whilst compared with the number traveled in 2003. This large-scale travel site with an enormous number of tourists has also created favorable conditions for the spread this difficult-to-control ailment. The Figure 1 shows the Epidemic curve of confirmed COV-19, by WHO region until 28th March, 2021, where it clearly specifics USA is majorly effected area even today after vaccination campaigns been held world wide.

C. Characteristics of COVID 19: Corono viruses contain

RNA as genetic materials and importantly every COV generally has crown like structure with peplomers with 80-160nM in Size and 27-32 kb positive polarity. It contains precise genes in ORF1which encode proteins for viral replication. The peplomers which are present outside the surface of the viruses is solely responsible for the attack and entry into host cells. The receptorbinding domain (RBD) isn't tightly attached among virus, therefore, the virus may additionally infect quite one hosts. Due to its high mutation the recombination rates also are too high. Individuals suffering from COV-19 are found to experience fever, cough, myalgia, fatigue, dyspnea, regular/ reduced leukocyte counts, and radiographic proof of pneumonia, which coincide with the symptoms of SARS-e and MERS-e infections. Hence, although the pathogenesis of COV-19 is poorly understood, an equivalent procedures adopted for SARS-e and MERS-e nevertheless can give us a lot of records on the pathogenesis of SARS-2 infections to facilitate treatment methodologies (Honkela 1998).

D. Transmission of COV-19: Corona viruses belong to relatives of viruses commonly located in various specific animal species, consisting camels, goats, cats, and bats. Rarely can animal corona viruses attack citizenry, but when humans are attacked, they need led to MERS, SARS within the past, and now to COV-19. Most respiratory viruses are spread through sneezing and coughing. Although the Chinese authorities turned down the chance of human-to human transmission at the start, substantial and sustained transmission among humans has now come to be apparent. Chinese scientists have recommended that a couple of infected humans may transmit the virus to others even before they develop contamination or experience any signs, causing an asymptomatic spread of the virus (Hsu 2003).

They need been found to spread among people that are in very close contact (approximately 2 feet). It's further noticed that spreading happens typically through respiratory droplets created while an infected person coughs or sneezes, almost like how influenza and different respiratory pathogens spread. Such droplets may additionally land in nearby humans' mouths or noses, or probably be inhaled into the lungs. Whether an individual can get COV-19 by way of touching a floor or object with the virus thereon, after which touching their own mouth, nose, or likely eyes, is currently unclear. Many viruses (which include measles) are notably contagious, at an equivalent time as different viruses are much less so. There are several investigations currently being administered to review the transmissibility, frequency, and other characteristics associated with COV-19.

II. The Framework Of Intelligent Multi Agent System Based The Duffnn Clustering Model: In this section, we propose an IMAS supported the newest efficient ODFFNN model that we believe it's great potentials to use during this area to detect the present status of the COV-19 within the world, so as to predict the longer term and stop . Our IMAS framework has two flows. First flow includes earning knowledge of the prevailing symptoms, diagnostic techniques and treatment of the deadly pandemic of the COV-19. Second flow includes detection of the amount of patient cases, risk of the disease and therefore the polluted spots that they will help us to watch and control the Covid19 risk.

During this phase, we compare the DUFFNN model with several strong ODUFFNN clustering so as to seek out the simplest efficient model during this area. Therefore, by using our intelligent framework, we discover hot polluted spots within the world, then manage the danger and parameters of the spread of the COV-19, and eventually we predict the longer term situation of this disease. Authors plan to solve the gap of lacking in one united framework for combination of two relevant flows which are IMA systems in world and learning systems. There are numerous topics during this system like intelligent acquisition, intelligent modelling and intelligent delivery. Figure 3 shows plan of intelligent multi agent based neural network clustering system.

Considering the info from everywhere the countries of the planet together health network. The proposed work plan to analyze and style the cluster the planet countries data. The countries data cluster to seek out hot polluted spots. The experiment to manage the danger of infection and finding the effective parameters, features of the symptoms and their weights. The traditional chart has several demerits in managing, data and earning the specified outputs like data-redundancy, data-concurrency while updating the database. Hence the traditional chart to be modified consistent with the IMAS based the DUFFNN. The management information agent gathers the info from area. Generally, the info is distributed and a system with several branches for collecting data is compulsory. Figure 4 shows the small print of the IMA based the DUFFNN clustering system.

The data collected in one source of database and clustered by IMA based efficient DUFFNN clustering model. The very fact data of background is stored in one database, and is controlled by the info Base Management System (DBMS) thru the DBA (Data Base Administrator). The IMAS clusters cases and predicts their states, supported different aims of the system and selected attributes, by sub-agents of the management information agent. The management IA communicates the reports of data to plan and manage the activation of the agent for applying in DSS, MIS, statistical and scientific system software, and other data management systems. The planning and rules to be updated and advanced reports are generated for the confirmation and action authorization. The Intelligent delivery generation of the advanced reporting supported experts opinions by using management and decision systems like MIS and DSS, and consequently ability to proactively reply to special events, to make a decision to update rules and plans. The IMAS has feedback for updating believes and rules too.

The First Flow in order to Earning Knowledge of the COV-19: Considering the case study, within the first flow of the IMAS, the proposed work intended to review and

analyze the COV-19 disease and therefore the refore the earned knowledge be saved and the data of the system are going to be updated. The second flow is employed and update the info from this phase too. The novel corona virus emerged from the Hunan seafood market at Wuhan, China during which bats, snakes, raccoon dogs, palm civets, and different animals are sold. There need to be a whole ban on utilizing wild animals and birds as a supply of food. Human-to-human transmission is occurring, which suggests that more COV-19 instances are predicted to be reported within the future, which may potentially purpose disruptions of world public health structures and economic losses. Abeit availability of vaccines in most of the developed countries are promising clinical trials and prevention strategies are developed fight against human infected corona viruses (Kamiya et al., 2007).

However, the rise rate of infected and mortality are still found from the remainder of the worlds, hence researchers are striving to develop efficient therapeutic techniques to deal with the novel corona viruses. Remdesivir, Lopinavir/ritonavir, Ribavirin, Chloroquine phosphate and Arbidol consequently as per the WHO report from 58 countries are making the come up the reliable vaccines and significantly blocked the COV-19 contamination in infected patients (Kasabov 1998). While the selection of bringing the residents from infected place by numerous nations and bad screening of passengers, have clothed to be the leading reason of unfolding virus in others nations.

There are many agencies working for the event of powerful SARS-CoV-2 drug and vaccinating the possible. However, there's a requirement for quick human and animal-primarily based trails as those vaccines still require few months for commercialization, which recently happening with covaxin in India. Besides the event of green drug, a way to diagnose SARS-CoV-2 in suspected patient is additionally required. Therefore, an accurate and rapid diagnostic package or meter for detection of SARS-CoV-2 in suspected patients is required, because the PCR based testing is high-priced and time consuming. The therapeutic techniques utilized by China people, must even be employed by other countries to regulate the pandemic disease as a prevention of the further infection (Kohonen 2000).

Methods to Detect COV-19:

Nucleic acid detection or RT-qPCR: Real Time qualitative Polymerase chain reaction (RT- qPCR) and highthroughput sequencing are the foremost efficiently used technologies to spot COV-19 in real-time. The assured COV-19 entity approach for SARS-2 is virus blood culture and high-throughput sequencing of the entire genome. The software excessive-throughput sequencing techniques in diagnosis are only a few thanks to its excessive cost. RT-qPCR is that the maximum used powerful and direct technique for detecting pathogenic viruses in respiratory secretions and blood. RT-qPCR proves and also confirmed high responsiveness and specificity for SARS and MERS contamination. Thus, it's vital to reinforce the detection of RT-qPCR for SARS-2 contamination sensitivity (Kulkarni et al., 2003).

High Throughput sequencing: The MagEx STARlet assay ready computer permits excessive-throughput magnetic bead-based totall RNA extraction of biological samples The PCR (polymerase chain reaction) assay prepared computer is pre-configured and qualified to automate excessive-throughput pre-PCR sample setup using the today's Centers for Disease Control and Prevention (CDC) protocols. Both assay equipped workstations are designed to figure with any provider's assay chemistry, like those supposed for qualitative detection of the corona virus.

ELISA, An enzyme-linked immunosorbent assay, also called ELISA or EIA, may be a make sure detects and analyzes antibodies within the blood. Currently, realtime polymerase chain reaction (RT-PCR) assessments genetic fabric to hold out corona virus testing. However, those assessments have low costs of specificity and sensitivity and pose dangers related to specimen series and sample dealing. POCT of IgM/IgG is one among the world's first rapid point-of-care Test (POCT) lateral float immunoassays for the analysis of corona viral infection . It also can be wont to check human serum or plasma samples. This clinical examination are often used for fast screening of the virus which may be symptomatic or asymptomatic. CT Scans is one essential supplementary diagnostic procedure . For an individual with an excessive scientific intuition of SARS-2 contamination with positive RT-qPCR result, a mix of frequent chest CT scan and RT-qPCR tests probably be beneficial. Specially the high resolution CT (HRCT) for the chest is vital for an early diagnosis and assessment of severity of the ailment in people infected with SARS-2. Several researches have examined chest CT images of patients infected with SARS.

The standard CT photos show bilateral pulmonary opacities, often with a rounded morphology and a peripheral lung parenchyma distribution. Peripheral predominance within the lungs is clearly visible in people infected with SARS-e and MERS-e infections, and therefore the same is observed within the case of SARS-2 contamination. However, the CT scan technology might not serve the aim in majority of the cases emerging from a highly prevalent area thanks to its high cost. Further, CT scans additionally have some shortcomings, which include indistinguishability from different viral infection and therefore the hysteresis obtained of ordinary CT imaging. Given the shortcomings of the presently used macromolecule detection and CT scans for the analysis of COV-19, clinical laboratories need to apply some immunological detection kits that specialize in viral antigens or antibodies as quickly as viable. Currently, POCT of IgM/IgG and ELISA kits for SARS-2 had been evolved and pre-tested by means of some groups and have proven higher detection fees than macromolecule detection, but there's still no product or posted article.

C. Prevention: Hygiene and Cleaning - The First Defence: Even though presently lesser availability of the vaccine

to the remainder of the planet and handy to fore stall a contamination with COV-19 there are not any control over the infection rate. The satisfactory thanks to safeguard from infection is to forestall the virus being released. However, CDC (Center of Disease Control) additionally recommends ordinary defensive measures to save lots of from respiratory viruses with. it's suggested to avoid near contact with sick people, reduce contact with lips, nostril and mouth with unwashed fingers and a number of other precautionary safety measures are being widely given awareness to follow. There's no approved clear antiviral treatment for an infection of COV-19. People infected with COV-19 will obtain medical remedy to help in symptom relief. Treatment for severe cases includes remedy to take care of essential functions of the organ. This guidance is meant for persons with showed or suspected COV-19 contamination, along side those who don't got to be hospitalized and who can also obtain care reception. Below are prevention measures for people with confirmed or suspected COV-19 infection, who don't got to be hospitalized and individuals with COV-19 contamination who've been hospitalized and who are considered to be medically safe to travel domestic after discharging. The physicians and public doctors are deciding whether the infected could also be handled reception (Langseth et al., 2005).

D. Current treatment techniques for COV-19: Similar to SARS-e and MERS-e, there are currently no medically proven desired antiviral agents to be administered for SARS-2 infection. The supportive remedy, which includes oxygen remedy, conservation fluid management, and the use of broad-spectrum antibiotics to cowl secondary bacterial infection, remains to be the maximum essential management method. There are 92 vaccines and 58 new, 45 antibodies, 20 Anti-viral, 12 cell-based therapies, 5 RNA-based treatment and 52 other solutions currently being explored to fight the new corona virus SARS-CoV-2. The latest graph is shown in Fig 4 the newly infected verses newly recovered.

Further, Viral focused inhibitors: Remdesivir, an adenosine analogue which will aim the RNA-dependent RNA polymerase and block viral RNA synthesis, which has been a promising antiviral convict to an enormous selection of RNA viruses (consisting of SARS/MERS-e) infections in cultured cells, mice and nonhuman primate models. Remdesivir and chloroquine had been established to inhibit SARS-2 correctly in vitro. Hence, other nucleoside analogues, consisting of favipiravir, ribavirin and galidesivir are often doubtlessly clinically relevant con to SARS-2. Chymotrypsin-like (3C-like protease, 3CLpro) and papain-like protease (PLP) are non-structural proteins, which have an important feature for corona viral replication and may inhibit the host innate immune responses. The 3CLpro inhibitors, like cinanserin and flavonoids, and PLP inhibitors, inclusive of diarylheptanoids, are different attractive selections to combat against SARS-2.

Antibody and plasma remedy has also been trialed and reported that there are numerous convalescent sufferers

donating plasma con to SARS-2, simply as SARS-e and MERS-e trials. A SARS corona virus-specific human antibody can bind potently with the receptor-binding domain (RBD) of SARS-2 and has the potential to be evolved as candidate therapeutics of SARS infections. There are several vaccination techniques towards SARS-e, MERS-e tested in animals, including a stay-attenuated virus, viral vectors, inactivated virus, subunit vaccines, recombinant deoxyribonucleic acid, and proteins vaccines. Several new pharmaceutical drugs, which include HIV tablets and stem cells, had been testified in a number of the scientific trials. However, the threat of the second or the third wave is predicted and still there are new infection and deaths are being recorded worldwide. The doctors are being in search of the post vaccine study and effect of revolutionized effect of the virus.

E. The Second Flow based on the DUFFNN Model as the **Intelligent Core:** The second phase of the framework designed to apply to handle data, rules, plans, and future prediction. Fig 6 shows the detail of the DUFFNN clustering method:

Pre-processing: The DUFFNN method considers a neighborhood of the memory called Essential Important Information (EII) and initializes the EII by learning and storing the mean, deviation and non-random weights of every online input file without storing any input file within the memory. The code book of weights is completed by training online data supported the load Linear Analysis (WLA) technique. Accordingly, the unique BMW vector is mined from the code book of the weights and stored because the EII. WLA pre-processing may be a combination of knowledge pre-processing of the web input file so as to think about the input value within the range (0,1) and cleaning the info like MinMax technique; and pre-training by computing BMW. the quality Gaussian distribution (SND) and therefore the Best Match Weight (BMW) vector generate the mean vector of the code book of the non-random weights. Fine tuning process refers to modifying the weights accurately so as to succeed better results of clustering the input file, includes smoothing the weights and pruning the weak weights so as to dimension reduction.

The topology of single layer DUFFNN includes that the amount of layers and nodes are clear which contains of just an input layer with n nodes equal the amount of attributes of input file and an output layer with just one node. The units of the input layer are fed by the traditional data values from the info pre-processing stage. When the model obtains the acceptable weights, the input layer is fixed with weights connections to the output layer for learning without updating the weights. Each unit applies a related weight component of the BMW vector. The output layer consists of a unit with a weighted sum function for calculating the particular desired output without using any class label. The training of the DUFFNN is passed just in one epoch and is predicated on non-random weights, with none weight updating, activation function and error function like mean square error. The edge as output is calculated by consuming normal values of the input file and therefore the BMW vector. Thanks to use the mean of the weights for calculating the BMW, the range and properties of the input file values cannot dominate the values of the thresholds. After clustering the info node by the DUFFNN, the proposed method considers the category label as constraint so as to enhance the accuracy of the results of clustering, and alter to the dynamic semi-supervised feedforward neural network (DSFFNN) model.

F. Datasets:

In this research, we apply several datasets from various sources in order to find effective elements to find the best accuracy results and prediction of the COV-19 incident disease, as follow:

World Health Organization (WHO) with 259 records of global countries.

- https://www.who.int/emergencies/diseases/novelcoronavirus-2019/situation-reports
- National Centers for Environmental Information. Daily data of the average temperature was obtained.
- https://www.ncei.noaa.gov/access/search/datasearch/global-summary-of-the-day
- Natural earth. http://www.naturalearthdata.com/ downloads/110m-cultural-vectors/
- The dataset of COV-19 from Kaggle as "Novel Corona Virus 2019 Dataset". https://www. kaggle.com/ sudalairajkumar/novel-corona-virus-2019-dataset/ (updated version 147)
- The Humanitarian Data Exchange (HDX). https:// data.humdata.org/dataset/novel-coronavirus-2019ncov-cases (live updated)

For an experimental results, the attributes of population, size of country, average temperature, average humidity, sex, age are used, also the Corona disease cases includes confirmed and death cases that are considered based on global world countries. The dataset includes two classes of infected and death (Rougier & Boniface 2011).

III. Experimental Results and Evaluation: IMA based DUFFNN clustering system has capability of predicting future status of patients and spread of the COV-19 disease and showing complex relations between components of systems. Authors mean to use datasets and models mentioned within the previous sections and present the respective results. the present status of the COV-19 on 28.03.2021 in world countries map is as follow in Fig 7; recorded Globally, as of 2:11pm CET, 28 March 2021, there are 125,781,957 confirmed cases of COVID-19, including 2,759,432 deaths, reported to WHO. As of 25 March 2021, a complete of 462,824,374 vaccine doses are administered. Among which the countries within the region of Europe, South-East Asia, Eastern Mediterrenean and Western Pacific found continuously increasing infection rate along side mortality. Following Fig 6 showing the present status of the countries map by WHO.

Raviraja et al.,

We have consider the dataset of the Covid19 cases collected by World Health Organization (WHO). This dataset includes 259 records of global countries with the confirmed and deaths cases from 31 January 2020 until 25 March 2021 as shown in Figure 7. For an experimental results, we apply several attributes from different sources as shown within the section 2-3 Datasets. So as to implement the DUFFNN, DSFFNN and other related ODUFFNN methods, the primary got to pre-process and clean the info. Compute the clustering accuracy of the DUFFNN on the info points, by using F-measure or balanced F-Score function with 10 folds of the test set. Figure 9 show the ultimate computed weight vector components (BMW) of the received global world dataset by using the DUFFNN clustering method. the info has two class labels: infected and death.

The weight of every attribute shows what proportion the attribute is effective within the output results and explained hence selected few attributes from different datasets that cause the output result's more accurate so as to predict the status of COV-19 within the world countries. As shown within the Fig 8, the effective items considered are population, sex, age and confirmed cases. However, the weights show that race, average of temperature and average of humidity are normal and aren't very effective. For the experiment, authors here during this research compared the results of the DUFFNN and DSFFNN methods with the results of several related ODUFFNN methods. Within the ESOM, by considering the parameter set $P = \{\varepsilon, \delta, \gamma, Tp\}, \varepsilon$ as distance threshold, δ for controlling the spread of the neighborhood, γ as a little constant learning rate, Tp because the steps of learning time, and β as forgetting constant, we considered: β = 0.8, $\varepsilon = 0.005$, $\delta = \varepsilon$ and $\gamma = 0.005$. Within the DSOM, the experiment considered that the parameters ε the speed of learning and δ control distance from the BMU because the elasticity: $\varepsilon = 0.100$, $\delta = 1.25$. Table 2 shows the speed of processing on the idea of the amount of epochs and therefore the accuracy on the idea of the density of the F-measure for the worldwide data points.

Table 2 demonstrates, the DSOM clustered the info points with 71.22% accuracy by the F-measure after 800 epochs during 5', 30" and 106 milliseconds. The ESOM clustered the info points with 93.04% accuracy by the F-measure after 1 epoch during 3" and 102 milliseconds. The Semi-ESOM clustered the info points with 95.13% accuracy by the F-measure. The DUFFNN clustering method clustered this data set with 98.71% accuracy by F-measure during 1 epoch and 16.80 milliseconds and DUFFNN clustering method clustered this data set with 98.71% accuracy. The DSFFNN clusters method clustered with 99.82%. Fig 9: Comparison of the prediction of the amount of the COV-19 cases per day within the global world by using different current strong ODUFFNN clustering methods Based on the DSFFNN clustering prediction, the map of world for the COVID 19 disease incidence probable be very almost like map in Fig 6 of the WHO report with 99.76% accuracy. The DSFFNN clustering accuracy are going to be close 100% when the important values of dataset are reported by the countries.

CONCLUSION

This research work has successfully proposed an Intelligent Multi Agent Systems supported the DUFFNN model that has two streams. First stream includes earning knowledge of the newest existing symptoms, diagnostic techniques and treatment of the deadly pandemic of the COV-19. Second flow includes detection of the amount of patient cases, risk of the disease and therefore the polluted spots, that they will help us to watch and control the COV-19 risk and parameters. The experimental results show that the DUFFNN and consequently DSFFNN method have the simplest accuracies of 98.99% and 99.97%, respectively. The DUFFNN method are ready to show the load of every attribute that used during clustering. Therefore, it's possible to seek out an affective items that cause more accurate leads to order to prediction. For future work, authors extending the study to use other attributes and parameters from different sources which will be extract better clustering results with higher accuracy.

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Test and Experiment of Bio-Medical Image Restoration Using Enhanced Image DCT Fusion Techniques

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ABSTRACT

The Image fusion is the process of integrating many images to generate a new image. In comparison to the source photos, the resulting image has greater information. The method of picture fusion has replaced clinical image combining as a relatively common practise these days. Medical imaging systems may be employed to provide complete sensory input, as well as diagnose and treat patients. To improve the accuracy and reduce the unpredictability of diagnosis, a bio medical images combines many pictures into a composite image. Image fusion is one of the most emerging research areas in recent time as the image has very significant role in various research work as well as in biomedical needs. There is various method which can have the capabilities to fuse the deformed image with certain level of accuracy. Centralized sensors have captured the images from two or more shots of one target. Further a refined image could be constructed through the image fusion and proposed DCT technique over the biomedical images. This research explored the DCT technique with auxiliary technique which fused the biomedical images through MATLAB GUI. The programming code has been build behind the GUI, which has been integrated with DCT technique.

KEY WORDS: IMAGE FUSION, MULTI-FOCAL IMAGE, DCT TECHNIQUES, BIO MEDICAL IMAGES.

INTRODUCTION

To expand on this definition, it, picture fusion involves combining uses several pictures to create a new image. more detail is presented in the output picture than is contained in the source images Clinical image combination has shifted to the technique of image fusion has, which is a very common practise these days. In order to supply all sensory input and to diagnose and treat, medical imaging systems may be used. Medical picture blends several photographs into a composite image to increase the accuracy and diminish the randomness of diagnosis. In addition to these two domains, image domains, image fusion takes place at a point in time. Spatial domain takes advantage of the fact that each pixel is made up of a multitude of its individual values and has additional values in the spectral domain. a method that



classifies sets of functions that deal with areas rather than the discrete points in space are F.T, DWT, DCT, Hadamard Transform, and the methods that deal with points in the spectral domain are DWT, and DCT (Delsy et al., 2020).

The picture of a certain scene may have missing data and two pictures of the same location may have opposite data. Although these two figures are shown as separate for the sake of simplicity, the processes and methods of fusion can allow for a better understanding. Thus, to picture fusion is used to improve spectral, spatial, or temporal, or also spectral or spatial resolution It is used in a number of fields, including remote sensing, satellite imagery, medical surveillance, field surveillance, and hidden weapons detection. Certain various techniques such as simple averaging, Stationary Wavelet Transform (SWT) (Aymaz & Köse, 2017), Discrete Wavelet Transform (DWT), Cosine Transform (DCT) (Babu & Rao, 2017), etc. In good image fusion algorithm algorithms, each image's data should be retrieved from all contributors. It can minimise the number of new artefacts and reduce the noise.

Much of the time, the sensor images are inaccurate. The misalignment of the picture is caused by a variety of causes, including sensor geometries, sensor locations, and



sensor temporal capture rates that vary. It's possible that one source picture is a subset of another. It's possible that the same picture was captured by various cameras or sensors at different angles. Registration is the act of aligning source images in order to balance spatial correspondence between them, and it is a research subject in and of itself. Multiview, multifocal, multitemporal, and multimodal photos may all be used as source images for image fusion. Photos of the same scene taken at various periods are known as multi temporal images. In multimodal picture fusion, source images of various modalities are given. Multimodal images include CT and MRI pictures (Pichler et al. 2008), visible and infrared images, SAR and PAN images, and so on. Multi-focus image fusion combines photographs taken from the same view point but with separate focal settings to create a single image with all objects in focus.

One way to process the input images is to determine a source picture is to be expanded or another is to be completed domain expansion or frequency processing. Single-scale fusion approaches are used in the spatial context, while multi-scale fusion methods are used in the frequency domain. Picture processing in the spatial domain is performed with each and every pixel in mind. This pixel-based technique is used for image enhancement in filters including smoothening and sharpening (Daniel et al., 2017). Spectral transform methods are used to improve or modify images in the frequency domain. Using mathematical transformations such as DWT, DCT, DT-CWT, or NSCT, each source image is decomposed into a series of pictures. The fused coefficients are then calculated using a set of fusion laws. Finally, the inverse transform may be used to obtain the fused file. Fusion laws can be carefully framed in multiscale decomposition and reconstruction (Ma et al. 2018). If the fusion laws are ineffective, valuable knowledge from the source images will be lost, and new artefacts may be introduced. Image fusion may be categorised as feature level, judgement level, or pixel level fusion depending on the methodology used.

Feature level fusion applies the laws to regions instead of handling an image as a whole rather than using a set of dealing with it as a collection of pixels. Pixels are viewed as objects of their own right or as well as being areas of interest (ROI). The photographs are divided into various segments to yield a set of areas. Segmentation produces a finite closed interconnected series of segments. An alternative to the simple neighbourhood algorithm is the watershed. Segmentation is used after the operations to obtain region properties such as coloured areas, bounded areas, branches, margins, corners, patterns, and patterns. If the sub-target segmented spatial frequencies and target characteristics have been computed, the combined region's features are applied to the segmentation process is carried out.

Because several regions are sampled, the fused image would be a picture that has been given preference to the highest probability of including them, according to their arrangement around the original source pictures. Centralized sensors are programmed to render decisions and can or noncentralized ones are operated, but all methodologies operate according to their own data and determine decisions are redirected to a central fusion module. All is done centrally, but no decisions get out of the core seats. As opposed to this, in a centralised sensor system, in decentralised systems, each node makes decisions based on the local data it collects from nearby nodes. Fuzzy logic is a classifier, various kinds of voting classifiers are also have been applied, and Bayesian processes, and so on and so forth (Velmurugan et al. 2018).

II. Review of Literature: (Sreeja & Saraniya 2021), present a multi-focal image in the cosine transform (expanded cosine images) which recently become highly popular for the increasing requirements on domain homogenization because of low complexity. is in fact, the method of fusion by DCT is most valuable in visual sensor networks (or where images have to be encoded), where the data is most likely to be troublesome. Spatial approaches have been used in a number of research projects to examine the issues in DCT (a 2D image data representation domain). It has been stated in the upcoming work that the energy of correlation in the DCT domain will be used as the criterion for fusion. The findings of the suggested technique are scrutinised by other techniques to see whether they can indeed mitigate those types of block selection errors and whether they can be verified using quantitative measurements. (Majhi & Pal (2021), introduced a scheme for image retrieval is proposed which takes advantage of block-level geometric features is described in this paper.

The block level features are removed after DCT and second level features are obtained in the first level element, picture block part computation, each block's magnitude is converted to an AC coefficient that allows for further significance in making an image come through. typically, in the design, the AC components are assumed to have the second level of features and then the DC features are implemented to obtain the higher ones After the first stage of matrix expansion, singular vectors and left singular vectors are generated from the AC components. SVD is then performed on the expanded components to create the second level.

Because the value on the matrix on the left contains just a single data point, certain mathematical parameters are calculated for the second stage of the scheme on determine values to the corresponding columns to the right. to all first and second stage functionality Wherever it may be, more importance is attached to the first (high level) aspect, wherever it may be, more emphasis is provided to the lesser feature, i.e. Also, all three-dimensional attribute extraction is performed separately gives the described in this model for three sets, providing more distinguished categories for the final scheme. using the five established techniques is done to calculate similarity of the various distances for their retrieval; after which, the findings are evaluated to determine the effectiveness of the proposed retrieval strategy on the contrary, retrieval work in the picture domain performs well due to the increasing by 50% with increased experimental difficulties, the findings are consistent with prior results. (Yadav & Amhi2021), introduced Several techniques for lossless image fusion are investigated and described in this dissertation, most notably Image Threshold Expansion, De-combination, Comb-Warp, Comb-Warp Threshold, and Comb-Warping Thresholding.

One of the primary purposes of this work is lossless image fusion algorithms that use tree structure background simulation as a key concept. To be more specific, they have to use distinct Cosine transform coefficients, their position in the picture, a variation of that sense, as well as a strength of samples, and their degree of contribution to the image, makes a difference, respectively. The study in this thesis involves analysis using DDCT background model, estimation, and assignment for DDT tree structure, as well as well as fusion and image retention for image reconstruction, the biggest benefit is efficiency, but other benefits include new types of non-destructive analysis, which will improve background modelling, and improving quality techniques that have better scalers for various gray-scale images: scientific, remote natural pictures. There has been a major growth in transmission of images in computer and smartphone.

This study is explored image fusion research through DDCT very significantly. (Vakaimalar & Mala2019), introduced a multi-focus pictures that show more aspects of the same scene taken from various angles in two or more cameras. As a result, this approach is about producing a good-quality picture, the authorship candidate, discrete cosine transform and spatial frequency expansion are combined to find the individual with greater clarity. The algorithm suggested has no limitations as far as the number of photos is concerned. The second stage computes the average and maximum values from all the photos and processes the values only to the ones that are between these values. Then the two input images are first expanded by the Discrete Cosine Transform (DCT) followed by inverse Discrete Fourier Transform (IDFT). DCT coefficients are expanded to their greatest/smallest extent and image fusion is accomplished using spatial frequency. Expanding the second stage of the algorithm, such as in the design of the Stationary Wavelet Transform, the Principal Component Analysis, and spatial fusion is useful in certain prior algorithms, such as regularisation.

A new type of analysis proves that the new algorithm outperforms other methods in terms of image compression, utilising standard measurements as well as DCT and the most recent and efficient DCT techniques.(Vanitha et al. 2019), introduced a modern approach focused on fourth-order partial differential equations and discrete sine transform in stationary wavelet transform space (SWT) is explored for FPDE and MRI multimodal imaging. The first step is to expand the source images into base and information images by using a fourthorder differential equation. A final picture is obtained by taking the average of information photos based on their principal components. Next, the base images are used as the starting points for SWT decomposition. In this case, the four sub-band coefficients are computed using the Discrete Cosine Transform (DCT). The subsampling expansion phase is employed to acquire large sub-band coefficients. The final output is obtained by applying the inverse Discrete Cosine Transform (IDCT) followed by the inverse Squared Error Transform (SWT). The proposed methods for realising the fusion are compared with the actual ones to determine their similarities through analysing the output outcomes, it seems that the proposed approach does well in terms of quantitative metrics like mean, standard deviation, such as F-Measure, M-Measure, and T-measure. (Rao et al.,2019), accomplished an article over the photos which are associated; computed tomography (CT) scan, along with a magnetic resonance imaging (MRI) provide a clearer and more informative representation of the existing picture.

In this article, numerous wavelet-based fusion methods are used, such as the discrete wavelet transform (DWT) and two others that use a different approach to the discrete cosine transform (DCT) as verification of accuracy of evidence; and CV-based and the stationary wavelet fusion (SW) include DWT in an incidental fashion and CV variation in image processing methods include, but SW verification to DCT consistency are used in CV-based and stationary wavelet fusion image processing, a few SWWT. Pleomorphic measurement metrics are used to distinguish unfused results that can be had from the separate ones that are imparted by these techniques of fusion Fused out of DWT accompanied by SWT applied to DCT image processing results in this DCT var is what performs the SWT in an expanded technique When potentiality DCT features are applied to an output, there is value-added data available by models created from models using fused techniques that help with the delivery of outcomes. Applying DCT, the concert layer bases are quick and less DCT in reality-grounded likeness computations.

A detailed procedure for DCT-based approach is available to discover different and expanded views of the same thing is illustrated and analysed in this attempt, as DCT fused results outweigh the other fusion methodologies. (Paramanandham & Rajendiran 2018), introduced a novel fusion method for combining infrared and visible imaging techniques is introduced in this publication. In other words, the audience would still have to make the additional effort to piece the sensor outputs together. A technique for imaging two or more channels in a single picture, known as discrete cosine transform (DCT) is suggested for this paper to allow for security applications which integrates the infrared and visible channels to generate a single insightful merged image (WBIFI). The weighting method in particle-swarm length optimization is applied to particles (small pieces of data) is done with particle swarm optimization (PSO).

Tushar & Nayak

These special weighting constants are used to combine visible and infrared DCT coefficients to fabricate new images for printing. The inverse DCT technique is used to produce the fused or expanded images. An adaptive histogram equalisation process is used to get a more comprehensive interpretation of the picture while at the same time as it best distinguishes the objective. Although various quantitative measures are used in this context, the relative statistics such as the standard deviation, spatial frequency, entropy, and gradient mean are assessed. The findings demonstrated the algorithm's superiority over existing well-known approaches such as expandable writing and skip- wave learning, published in existing literature. (Mahapatra et al. 2018), introduced an Image Fusion which has no movement, and complicates the work of the wireless sensor nodes since they have to wait to get their sources.

If there are photographs available at the source, they may be of low quality, or they may include redundancies. Using picture fusion techniques, a clearer and smaller image may be produced that depicts the origins of the unclear and diffused image. The method discussed in this paper uses domain variance as a key variable to take into account more fully different regions while seeking to expand attention into a multi-focal picture. Due to the versatility of our approach, this methodology, their product can be used in real-time applications. To the experiment's already shown outcome. They have now added further evidence. The latest validation of their approach has obtained, as of its accuracy and sophistication. (Amin-Naji & Aghagolzadeh 2018), introduced relevant knowledge from the inputs and pulling it together to work on a common target are two separate, but complementary approaches to a goal. With varying depth of field, multiple camera focal depths may be used to get distinct photographs.

Many strategies that use a multi-focal picture fusion with various focal points have recently been applied, because of the discovery of how to quantify the focal points in the spatial domain. System-sensor systems because DCT imagery can be effectively be displayed as separate sharpened with no user control over the gain. As far as studies on DCT domains are concerned, most scholars are concerned, the most are focusing on calculations for defocus and domain-expansion. This entailed substituting the spatial domain processes with DCT processes, hence, a lot of scientists used new and developing methods which performed spatial domain expansion. This may lead to limitations when working in DCT domains, since of previous studies only employ such appropriate blocks of the optical signal sources based on their focus measuring criteria. as opposed to prior work which recommended only for specific energies. As it has been shown that these suggested approaches do not need appropriate block selection, these disadvantages are important. By using the approaches, they recommend, to see outcomes in a fair to extremely favourable as compared to the results of the ones previously used.

Kulkarni & Bichkar (2018), attempted to combine details

from separate pictures of a scene to extract valuable information. Many different data-processing methods, such as the Discrete Cosine Transform (DCT), Kritèktela Transform (K-T) and the Walsh Transform (WT), have been used in image fusing operations. Using these transformations, this paper can help to analyse the consistency of the result. used previously to evaluate image quality with indices that involve, respectively, mean, variance, RMSSIM, mean squared error PSNR, and MSE, but they can also look at one additional measure: peak signal-to-to-noise ratio (PSNR).

This article takes an opportunity to compare these fusion methods in order to provide a definitive understanding of their strengths and weaknesses. Additional analysis of some standard image files indicates that DWT and DCT performs well in comparison to the other standard methods. (Amin-Naji et al., 2017), introduced an optimal way of merging of images in the Discrete Cosine Transform (DCT) can be achieved by using lowcomplexity expansion, which uses a small amount of time and resources. In digital sensor networks, it is particularly difficult to expand and reduce many image files as they are stored in JPEG format (VSN). This paper reports a lower complexity image quality than usual image expansion for wide-field image fusion using DCT in which the performance image quality is increased. A current implementation of our proposed approach is ideal for real-time implementations since it's made in the DCT domain. It is very stable, as long as there is nothing to distract it.

This approach is based on the Singular Value Decomposition (SVD) of 8×8 space, which decomposes 8 block magnitudes into their singular values. To obtain the geometric mean (a mean that is a multiple of the most singular values out of 8), they use an expanded criterion for singular value identification. the block that most strongly resembles the target block of other than the rest of the blocks is chosen to serve as the centred This is when these blocks are employed in the construction of the final picture. This algorithm works in both the DCT (discrete cosine transform) and PTS (progressive transmission scan) domains. A number of studies and trials comparing the proposed approaches and the results with those of the prior methods in noise-filled and quiet settings have been performed, and the results have all shown an improvement in picture quality and stability. (Babu & Rao 2017), attempted to fuse several images for the single picture representation (measured using different instruments such as MS and Panchromatic and Panchromatic), and the goal is to communicate greater detail and variety about the signal intensity and the various signal contributions of different sensors.

T verification using two DWT extended versions, varia). In this article, discrete cosine transforms (DCT) and specialised DWT techniques are analysed and checked against the implementation of stationary wavelet transform variants (known as T variance checks), referred to as ST called a (which is also a variation of) dubbed stationary transform. Actualization of these findings, achieved by a combination of expansion and assessment methods, are inspected using conventional measurements. In general, the practical implementations, DCT proper discrete and image expansions may be done using the grounded-expansion rules of the general DCT, whereas the resulting process images are more detailed and performant. This investigation, by way of the semantic Web user vocabulary toolkit, elucidates a practise of radiating coloured system-integrated images and shows that best SWT fused effects are superior to those of other fusion methods. (Kaur et al., 2015) presented a valuable knowledge from more than one perspective on image fusion.

Use PCA to detect components from motion images to see performance benefits and gains with a measure of rapidness of both speed and effectiveness in real-time for such devices. a multi-dimensional representation (PCA, emphasis) is suggested that has a great capacity to represent the variation in a picture in an approach which can be fused together using domain-specific multi-focus images A new approach to alleviate the AC-specific problems encountered due to the discrete cosine transform is presented in this article, one that incorporates alternate current normalisation techniques (which is known to be inherently strong in the Cosine domain) into the discrete cosine transform (DCT) domain to minimise artefacts that result from the latter. Since sharpness could be reduced as a side effect of the fusion, improved results were obtained by incorporating an enhancement algorithm that takes care of the issue.

III. Image Fusion with DCT (Discrete Cosine Transform) Techniques: There are various image fusion techniques like DCT (discrete cosine transform) (Ravi & Krishnan, 2018), discrete wavelet transforms (DWT) (Jinju e al. 2019), Walsh Transform (WT) (Kekre et al. 2012) and Discrete Fourier Transform (IDFT). These techniques already used to find the image enhancement through Image Fusion techniques. Existing techniques has no integrated platform to provide a generation of quality Images from hazed images. This research needs a use friendly interface which has to perform the Image fusion with more techniques in single interface system.



METHODOLOGY

As the above methodology illustrate that the fusion process with DCT (Discrete Cosine Transform) with subsidiary enhanced support fusion techniques (Optional Method). The image has been divided as 8*8 matrix

298

pieces. Then The filtering process of the fused method has been applying to get the best pixel level of the changed information. Finally compute the fused images and display the merged images as final best extracted Fused image with the optional method.

IV. Multi-focus Image Algorithm

Start function (multi-focus);

{ Select Img 1 & Img 2; Pixlet Img1 & img 2; Covert_Low_Info rgb2gray (Img1 & img 2); Display ImgSize (Img1 & Img 2); Level-Shift: DCT; Div (Img1 & Img 2)/8*8; Fused_Img= Fused DCT+Variance+SVD+CORR (Img1 & Img 2); Image_Out= InverseDCT (FusedImg); Show (Image_Out);

Éxit Function (multi-focus);



Figure 2: Image 1 and Image 2 (Both of same in different angle hazed image)



V. Result and Simulation: The GUI has been designed in MATLAB and all formulation has been coded behind the interface. The above figure is the basic layout designed to perform the image fusion using GUI designed MATLAB Layout for user end. This has two inputs of image suing the selected button as one has left and right side. As the above simulation illustrate the fusion image at the end of process achieved which has best pixels of the selected image 1 and image 2. The GUI has various method of DCT with VARIANCE, VARIANCE+CV, CORR, CORR+CV,

Tushar & Nayak

SVD, SVD+CV, SVD+CV, CORR_ENG and CORR_ENG+CV. Each method has been successfully tested and perform on the images (Data based Taken from GitHub).

Figure 3: Fused image out after the apply the DCT+ Var+ CV.



VI. Significance of the Research: As the bio medical images feature visibility is offered as a method to assess the quality of a picture. This strategy is restricted by the fact that the human visual system is impacted by the contrast. Therefore, the visibility of image may be more closely approach to general considerably greater visibility. It is offered a medical picture fusion strategy based on the DCT transform. The suggested strategy was shown to be effective based on the results of the experiments. In the fusing of data, it beats traditional fusion approaches. photographs of various medical conditions the suggested image fusion method is as follows:

a. Proposed method is effective, efficient, and practical.

b. The suggested strategy is capable of preserving the crucial structure.

c. Medical diagnostics applications are very applicable due to various method in the User GUI.

CONCLUSION

The Image Fusion integrates a lot of pictures and produces a new picture. The final picture contains more information than the original photographs. The image fusion approach has replaced the clinical picture which nowadays combines as a rather regular practise. Medical imaging systems may be used both for the whole sensory input and for the diagnosis and treatment of patients. A bio medical image combines multiple photos with a composite image to increase accuracy and lessen the unpredictability of the diagnosis. Fusion of images is one of the rising fields of study in recent years since the picture plays a very important function both in different research and medicinal demands. The visibility of a biomedical pictures is presented as a way of assessing the quality of an image. Because the human visual system is influenced by contrast, this method is limited. As a result, the image's visibility might be closer to that of the general population. A medical image fusion technique based on the DCT transform is available. There are many methods that can fuse the distorted picture with specific precision. Two or more shots of a same target have been captured by centralised sensors. Through image fusion and a suggested DCT approach of biological images provide improved images through MATLAB GUI. The DCT technology and its subsidiary technique on biomedical images were fused successfully in this research.

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Prediction of Physicochemical Properties, Bioactivity, Pharmacokinetics, Drug-Likeness and Synthetic Accessibility of Phenyl and Isoxazole Azo Dyes

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ABSTRACT

The prediction of physicochemical properties, bioactivity score, pharmacokinetics, drug-likeness and synthetic accessibility of computationally designed phenyl and isoxazole azo dyes was carried out using Molinspiration Cheminformatics and SwissADME. All the compounds were identified as drug-like molecules based on assessment of physicochemical properties and ADME. Among all, 2-hydroxy-5-(phenyldiazenyl)benzoic acid was predicted as enzyme inhibitor. Two new isoxazole azo compounds, 2-hydroxy-5-((5-methylisoxazol-3-yl)diazenyl)benzoic acid and 2-hydroxy-5-((3-methylisoxazol-5-yl) diazenyl)benzoic acid, showed better physicochemical properties, pharmacokinetics and synthetic accessibility comparable to the standard drug Balsalzide.

KEY WORDS: AZO DYES, AMINOISOXAZOLE, BALSALAZIDE, DRUG-LIKENESS.

INTRODUCTION

Azo dyes are characterized by the presence of azo group (-N=N-) in their structure, conjugated with two distinct or identical, mono/polycyclic aromatic or heteroaromatic system. They have a wide range of applications in pharmaceutical, cosmetic, food and textile industry (Ali et al., 2018). Various medicinally important drugs containing azo moiety are Prontosil, Phenazopyridine, Sulfasalazine, Olsalzine and Balsalazide. Prontosil was the first azo dye to treat bacterial infections successfully, which contain an additional sulphonamide functional group. Phenazopyridine was used to relieve the symptoms caused by irritation of urinary tract. Sulfasalazine, Olsalzine and Balsalazide were used for the treatment of inflammatory bowel disease, consists of salicylic acid functional group in their structures. Upon oral administration, these drugs are delivered intact to colon where they cleaved by bacterial azoreductase into an active anti-inflammatory agent 5-aminosalicylic acid.



Isoxazole is a five membered heterocycle containing oxygen and nitrogen atoms at the adjacent position. Isoxazole compounds possess broad biological activities such as antibacterial, antifungal, antiviral, anticancer and anti-inflammatory activities. Several therapeutically active drugs consist of isoxazole ring, which includes Sulfamethoxazole, Sulfisoxazole, Oxacillin, Cloxacillin, Dicloxacillin, Flucloxacillin, Leflunomide, Valdecoxib, Parecoxib, Muscimol and Ibotenic acid. In the literature, synthesis of few isoxazole azo dyes were reported from 5-amino-3-methylisoxazole or 3-methyl-4Hisoxazol-5-one and phenyl diazonium salts (Hamama et al., 2017) (Banpurkar et al., 2018). It was reported that 3-aminoisoxazole undergo diazotization using strong hydrochloric acid and the resulting diazonium salt couples with activated aromatic molecules (Duff 1981; Quilico 1962).

In silico study represent relatively a new method of research investigation. To reduce time and chemical consumption in drug discovery and development, a large variety of *In silico* or computational methods were developed with the objective of predicting physicochemical properties, biological activity, drug-likeness and also the ease of synthesis from the chemical structure. Hence, the present study is aimed to design computationally different phenyl and isoxazole azo dyes containing phenol, salicylic acid, o-cresol and resorcinol moieties.



Further, it is aimed to predict the physicochemical properties, bioactivity score, pharmacokinetics, druglikeness and synthetic accessibility of computationally designed compounds and the standard drug Balsalazide using free online software.



MATERIAL AND METHODS

• ChemDraw Ultra 12.0

- Molinspiration Cheminformatics
- SwissADME

The software used for the *in silico* studies of phenyl and isoxazole azo dyes as well as standard drug Balsalazide include:

ChemDraw Ultra 12.0 used for the generation of structure, nomenclature and SMILES notations. Molinspiration Cheminformatics (https://www.molinspiration.com) was used to calculate physicochemical properties like miLogP, molecular weight, number of rotatable bonds, hydrogen bond acceptors, hydrogen bond donor, and TPSA of title compounds. The percentage of absorption estimated using the equation %ABS = 109 – (0.345 X TPSA) (da Silva et al., 2015). Molinspiration Cheminformatics was also used to predict the bioactivity score of title compounds as GPCR ligands, ion channel modulators, kinase inhibitors, nuclear receptor ligands, protease inhibitors, and enzyme inhibitors. SwissADME (http:// www.swissadme.ch) was used to evaluate individual ADME behavior and drug-likeness of the compounds under investigation. SwissADME web tool also used to predict medicinal chemistry friendliness properties, particularly synthetic accessibility (Daina et al., 2017).

Table 2	Table 2. Predicted physicochemical properties of the compounds (1-13)									
by Mol	by Molinspiration Cheminformatics									
S.No	miLogP	MW	HBA	HBD	Volume	n Violation	nrotb	TPSA	%ABS	
1	3.65	198.22	3	1	182.57	0	2	44.96	93.48	
2	4.04	242.23	5	2	209.57	0	3	82.25	80.62	
3	4.49	212.25	3	1	199.13	0	2	44.96	93.48	
4	3.36	214.22	4	2	190.59	0	2	65.18	86.51	
5	2.48	203.20	5	1	176.55	0	2	70.99	84.51	
6	2.87	247.21	7	2	203.55	0	3	108.29	71.64	
7	3.32	217.23	5	1	193.11	0	2	70.99	84.51	
8	2.19	219.20	6	2	184.56	0	2	91.22	77.53	
9	2.48	203.20	5	1	176.55	0	2	70.99	84.51	
10	2.87	247.21	7	2	203.55	0	3	108.29	71.64	
11	3.32	217.23	5	1	193.11	0	2	70.99	84.51	
12	2.19	219.20	6	2	184.56	0	2	91.22	77.53	
13	2.75	357.32	9	4	301.57	0	8	148.65	57.72	

(miLogP: n-octanol-water partition coefficient, MW: Molecular weight, HBA: Hydrogen bond acceptor, HBD: Hydrogen bond donor, n Violations: Number of violations, nrotb: Number of rotatable bonds, TPSA: Topological polar surface area, %ABS: Percentage of absorption)

Table 3. Prediction of bioactivity score ofthe compounds (1-13)							
S.No	GPCRL	ICM	KI	NRL	PI	EI	
1	-0.42	-0.01	-0.31	-0.85	-0.60	-0.12	
2	-0.21	-0.04	-0.16	-0.43	-0.30	0.03	
3	-0.48	-0.18	-0.29	-0.75	-0.62	-0.21	
4	-0.33	-0.27	-0.23	-0.79	-0.67	-0.05	
5	-0.60	-0.13	-0.35	-1.30	-0.91	-0.39	
6	-0.35	-0.14	-0.19	-0.81	-0.56	-0.18	
7	-0.63	-0.26	-0.31	-1.17	-0.88	-0.42	
8	-0.48	-0.39	-0.31	-1.07	-0.95	-0.31	
9	-0.43	-0.35	-0.27	-0.94	-1.04	-0.26	
10	-0.21	-0.32	-0.13	-0.56	-0.66	-0.08	
11	-0.46	-0.46	-0.24	-0.83	-1.00	-0.31	
12	-0.32	-0.59	-0.23	-0.73	-1.07	-0.19	
13	0.13	-0.01	-0.01	-0.18	0.15	0.12	

(GPCRL: GPCR Ligand, ICM: Ion channel modulator, KI: Kinase inhibitor, NRL: Nuclear receptor ligand, PI: Protease inhibitor, EI: Enzyme inhibitor)

RESULTS AND DISCUSSION

The 2D structures of phenyl and isoxazole azo dyes along with standard drug Balsalazide (compounds 1-13) were drawn using ChemDraw Ultra 12.0. Their nomenclature and SMILES notations were generated and presented in Table-1.

Molinspiration Cheminofrmatics tool kit was used for the calculation of physicochemical properties of phenyl and isoxazole azo dyes as well as standard drug Balsalazide (compounds 1-13). The data presented in Table-2. The results revealed that all the compounds obeyed the Lipinski's rule of five (miLogP <5, molecular weight <500, the number of hydrogen bond acceptors <10 and hydrogen bond donors < 5), thus indicating good bioavailability on drug administration. TPSA and %ABS predict the transport properties like intestinal absorption and blood brain barrier (BBB) penetration. The estimated TPSA for isoxazole azo compounds (5-12) was greater than 60 indicating good GI absorption but not BBB penetration. The phenyl azo compounds 1 and 3 have low TPSA (< 60) indicating the BBB penetration. The data revealed that the standards drug Balsalazide (13) have high TPSA and low %ABS value. This indicates very large amount of the drug accumulate in the colon after oral administration and then cleaved by bacterial

azoreductase into an active drug 5-aminosalicylic acid. Among the series of phenyl and isoxazole azo dyes, compounds 6 and 10 have high TPSA values and low %ABS values. Therefore, large amount of isoxazole azo compounds 6 and 10 may enter colon after oral administration and cleaved to 5-aminosalicylic acid.

The bioactivity score of phenyl and isoxazole azo dyes along with standard drug Balsalazide (compounds 1-13) was predicted by Molinspiration Cheminformatics. The values were listed in Table-3. A molecule having bioactivity score more than 0.00 expected to be active, while values between -0.50 and 0.00 are expected to be moderately active and if the score is less than -0.50 considered as inactive. Except compound 2, all the phenyl and isoxazole azo dyes (compunds 1, 3-12) were moderately active as enzyme inhibitors. The compound 2 and standard drug Balsalazide were bioactive as enzyme inhibitors. All the phenyl and isoxazole azo dyes were moderately active as GPCR ligands, ion channel modulators (except compound 12) and kinase inhibitors. All the phenyl and isoxazole azo dyes except compound 2 were inactive as nuclear receptor ligands and protease inhibitors. The standard drug Balsalazide was predicted as moderately active ion channel modulator, kinase inhibitor, nuclear receptor ligand and bioactive GPCR ligand and protease inhibitor.

S No		Pharmaco	kinetics		I)rug-likeness	Synthetic
5.10	GI absorption	BBB permeant	P-gp substrate	Log K _p (cm/s)	Lipinski	Bioavailability Score	Accessibility
1	High	Yes	No	-4.84	Yes	0.55	2.24
2	High	No	No	-5.03	Yes	0.56	2.13
3	High	Yes	No	-4.68	Yes	0.55	2.14
4	High	Yes	No	-5.48	Yes	0.55	2.52
5	High	Yes	No	-5.57	Yes	0.55	2.87
6	High	No	No	-5.96	Yes	0.56	2.75
7	High	yes	No	-5.57	Yes	0.55	2.86
8	High	No	No	-6.10	Yes	0.55	2.98
9	High	Yes	No	-5.75	Yes	0.55	2.94
10	High	No	No	-5.96	Yes	0.56	2.78
11	High	Yes	No	5.57	Yes	0.55	2.93
12	High	No	No	-6.10	Yes	0.55	3.05
13	Low	No	No	-6.92	Yes	0.56	2.47

SwissADME web tool was used to estimate the physicochemical properties, pharmacokinetics, druglikeness and medicinal chemistry friendliness especially synthetic accessibility. The results revealed that the predicted physicochemical properties were found similar to the results obtained with Molinspitation Cheminformatics. The results of pharmacokinetics, drug-likeness and synthetic accessibility were presented in Table-4. The data indicated that the phenyl and

isoxazole azo dyes have good GI absorption, whereas the standard drug Balsalazide has low GI absorption. The compounds 2, 6, 8, 10, 12 and Balsalazide do not have BBB penetration, as evidenced by an intuitive graphical classification model BOILED-Egg.

All the compounds including Balsalazide were predicted as non-substrates for the permeability glycoprotein (P-gp). The estimated Log Kp (with Kp in cm/s) values of all the compounds were highly negative indicating less skin permeation. The compounds 2, 6, 8, 10, 12 and Balsalazide were identified as non-inhibitors of the most important cytochrome P450 isoenzymes (CYP1A2, CYP2C19, CYP2C9, CYP2D6 and CYP3A4). All the compounds obeyed Lipinski's rule and have the calculated bioavailability score between 0.55 and 0.56 indicating the drug-likeness. The SwissADME synthetic accessibility score of the compounds was comparable with the standard drug Balsalazide and lies between 2.13 and 3.05. This indicates synthesis of all the compounds was not difficult.

CONCLUSION

Computational tools have become increasingly important in drug screening and design. In the present study, eight new isoxazole azo dyes and four phenyl azo dyes containing phenol, salicylic acid, o-cresol and resorcinol moieties were designed comoputationally. The physicochemical properties, bioactivity score, pharmacokinetics, drug-likeness and medicinal chemistry friendliness of the designed compounds were predicted using Molinspiration Cheminformatics and SwissADME. All the designed compounds were identified as drug-like molecules. Among the series, phenyl azo compound (2) was active as enzyme inhibitors. The newly designed isoxazole azo compounds (6 and 10) having salicylic acid moiety showed better pharmacokinetics, druglikeness and synthetic accessibility similar to the standard drug Balsalzide. Therefore, these compounds can be synthesized by a retrosynthetic approach and evaluated for the biological activity using suitable in vitro and in vivo models to develop them as drug candidates for the treatment of bacterial, fungal and viral infections as well as cancer and inflammation.

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Early-Stage Lung Cancer Detection Using Machine Learning

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ABSTRACT

Lung cancer is an increasing syndrome in India as well as in the world. The international agency for research says that 5.5% of cancer patients in India are sick by lung cancer. Research is going on for predicting lung cancer detection at early stage using Computer Aided Systems. The dataset plays a important role in clinical research. If the data set contains a missed value, then we may get inaccurate results. To fill the missed values there are many number of imputation techniques. In this study Mean Imputer and KNN Imputer were used to impute the missing values. The classifiers compared are Support Vector Machine, Logistic Regression, Naïve Bayes Classifier, K-Nearest Neighbor and Decision Tree Classifier. These classifiers are compared based on accuracy. The confusion matrix is displayed for all five classifiers. At first imputation technique is applied and the accuracy of the classifiers is measured and then feature selection is done. On the selected features Principle Component Analysis (PCA) is used to increase the accuracy of the classifiers and the new accuracy of the classifiers is measured. The best combination of imputation techniques and machine learning classifiers is found to predict lung cancer. When Mean Imputation method is applied algorithms have achieved good accuracy and Decision Tree high accuracy.

KEY WORDS: IMPUTATION, CONFUSION MATRIX, PCA.

INTRODUCTION

Lung cancer is a disease that is becoming as a pandemic in India due to many reasons air pollution, tobacco consumption and many other factors. As told earlier 5.5% of cancers are lung cancer which is indicating the seriousness of the disease. By predicting the chance of cancer one can avoid it. Prevention of cancer is a tough task and also an expensive thing. American Lung Association says that 25% of cancer deaths are due to lung cancer in 2018. World Health Organization stated in 2020 that most of the cancer deaths are due to lung cancer. We need a system that predicts the chances of lung cancer before it affects the person badly.



Many types of researches were done in predicting lung cancer. One way is by using CT scan images and the other way is by considering statistical data. The CT scan way of predicting is expensive when compared to statistical way because CT scan images are required in huge amount which is a difficult and expensive thing for research. By using the statistical data given by the lung cancer affected people, a try is made to construct a system that tries to predict the chances of cancer for others which is less expensive but may not be accurate as of the CT scan way of predicting. The system build takes the input and checks any missing values that are present in the data and fills the missing data. Missing values are filled with two techniques Simple imputer and KNN imputer. Then five machine learning techniques are implemented on the data and the accuracy of them is noted.

Then feature selection is done and principal component analysis is used so that the dimensionality of data is reduced and the complexity of the system decreases. The five machine learning algorithms are applied again and accuracy of them is found. The work concludes which imputation technique is best and which Machine Learning algorithm works well. The above process is applied for



two standard datasets from the UCI repository and Data. world repository (Ada et al., 2013).

The authors are motivated to choose the work because of increase in number of lung cancer patients continuously. This work helps them to check the chances of lung cancer and also find the best imputation method and best Machine Learning classifier to predict the lung cancer. As the CT scan way is expensive and the statistical way of predicting this is cheap and can be easily available to every common man. Everyone can give the required data and check the chances of cancer (Delen et al., 2005). Working of classifiers on different datasets tested in the study. The main idea of the system built in the study is to fill the missing values with the appropriate values and apply principle component analysis on the data and feed to the machine learning algorithms and see the impact of principal component analysis on the accuracy of the machine learning classifiers and find the best Machine Learning algorithm.

A few challenges were faced during the process of study

- Datasets have only a few instances.
- Imputation methods used in the study works well only for some columns in the dataset.
- Feature selection is easy when there are few attributes but if attributes are more it is hard to select them.
- The selection comparison metric for machine learning classifier has become quite a tough task.

Measures were taken that the selected datasets have no missing values when feeding to the machine learning classifiers. If the value is filled with the wrong data type they are also considered as missing values and filled with appropriate values. The algorithms are fed with enough number of iterations so that no overfitting or underfitting occurs. Only suitable attributes are taken for prediction with no extra attributes. Many types of researches were done on predicting lung cancer and different systems were proposed. These systems were proposed based on different factors. The systems are divided based on the data they take to predict (Dana & Shubair 2016).

CT Scan Images: This system uses CT scan images of the lungs to predict the lung cancer.

These images have an area that indicates the presence of lung cancer. If the area of the lung cancer is greater than the specified threshold area then it is considered as lung cancer otherwise as no lung cancer. The images are fed to the Convolutional Neural Networks and this trained model is used to predict lung cancer. Statistical Data: This system uses the statistical data collected from different persons. This data involves different types of attributes. This type of data is required in huge amounts to train and test. The data is given to the machine learning classifiers to make predictions after training. There are many machine learning classifiers present but a suitable one is used. Data pre-processing is also a major task in this system. This system also gives good accuracy. Many machine learning algorithms are widely. The imputation methods are not so effectively used in the preprocessing of the data. The system proposed uses two imputation methods and fills the missing data. This system finds the best one among them. After imputation principal component analysis is applied to the data then the machine learning algorithms Support Vector Machine, Decision Tree Classifier, Logistic Regression, Naïve Bayes Classifier and K-Nearest Neighbors are trained with the data, and predictions are made. The best algorithm among them is chosen based on accuracy.

Objectives

- 1. To find the best imputation method among Simple imputer and KNN imputer.
- 2. To find the best machine learning algorithm among five algorithms.
- 3. To reduce the dimension of the data by PCA and the complexity of the model.
- 4. To find the best combination of imputation method and machine learning algorithm.

Literature Survey: Lung cancer is becoming as a pandemic in the sophisticated world. Many types of research were done in the detection of lung cancer. This section deals with those researches and their modes of operations. M Sangeetha, S Mythili This system uses CNN to detect lung cancer. The input for this system is CT scan images. Preprocessing of images is done by BW Threshold. Segmentation of the image is also done then features are extracted from the pixels of images and then with this data the model is trained. The model is then used on the test dataset. Manjun BR, Athira V, Athul Rajendran In this system first feature extraction is done by Principle Component Analysis and then for classification Support Vector Machine is used. This system takes images as input. Feature extraction is done through correlation. If there is a positive correlation then it is directly proportional otherwise inversely proportional. Then SVM is used to separate these nonlinear data. The output is represented by a confusion matrix.

Negar Maleki, Yasser Zeinali, Seyed Taghi Akhavan Nikai In this system for feature selection genetic algorithm is used, and then for classification K-Nearest Neighbor classifier is used. The dataset is taken from the Data World site contains a thousand images. The missing values are imputed with the mean value of the respective column. The genetic algorithm is a 5 steps process. The performance metrics are specificity, accuracy and sensitivity. The distance in KNN classifier is measured by Minkowski distance. The accuracy attained is 96.2%. Shamreen Fathima Saddique, Sharmithra P, Justin Xavier D In this study five machine learning algorithms are compared. The algorithms are Naïve Bayes, Support Vector Machine, Logistic Regression, Random Forest and K-Nearest Neighbors. The tool used is RStudio and the programming language used is R. The performance measure used is the confusion matrix. The Naïve Bayes classifier has achieved the highest accuracy of 95.24%.

Radhanath Patra In this study four classification algorithms are compared. The algorithms are Radical Basis Function Network, j48 Classifier, Naïve Bayes Classifier and K-Nearest Neighbors. The dataset is used is from the UCI repository. The missing value is replaced with the value that is occurring mostly in the column. The RBF classifier performs better than other classifiers with 81.25% accuracy. Radhika P R, Rakhi.A.S.Nair and Veena G In this study three machine learning classifiers are compared. The algorithms are Logistic Regression, SVM, Decision Tree and Naïve Bayes Classifier. K-fold crossvalidation technique is used to split the data into test and train. The SVM has achieved the highest accuracy of 99.2%. Dana Bazazeh and Raed Shubair In this study three classification algorithms are used. The algorithms are SVM, Random Forest and Bayesian Networks. The tool used for classification is WEKA. K-fold crossvalidation is used to split the data. The performance metrics used are precision, ROC area, accuracy and recall. Random Forest has achieved a good accuracy compared to other classifiers (Gurcan et al., 2002).

System Design For MI Algorithms

Architecture: The system consists of the following steps i) The dataset is taken and then checked if there are any missing values in the dataset. ii) The missing values are filled with imputation methods like Simple imputer and KNN imputer. The data is then divided into train and test datasets. iii) This dataset is used to train the machine learning algorithms. The accuracies of the ML algorithms are measured over a test dataset. iv) On these datasets, Principal Component Analysis is applied and this data is used to train the ML algorithms. v) The new accuracies are measured and compared with old ones. The best imputation method and machine learning algorithms will be found based on the accuracies of the systems.

Modules: The study is mainly divided into 3 distinct parts. The flow chart of the model is represented in the figure 1.

- Data Preprocessing
- PCA
- Machine Learning Algorithms



Data Preprocessing: In this section data preprocessing is done. It also includes collecting the data on lung cancer

suitable for the study. Finding the missing values and filling them with approximate values. Splitting the data also plays an important role it is also done so carefully. Application of Principal Component Analysis is done on the data. By applying PCA one can reduce the complexity of the program and also the dimension of the data.

A) Data Collection: Two standard datasets are collected for the study. One dataset is collected from the UCI repository and the other dataset is collected from data. world repository. The dataset from the UCI repository has 961 instances and 6 attributes. These attributes describes the cause of lung cancer. This dataset contains some missing values in each column. This dataset contains 516 benign and 445 malignant rows. The dataset taken from the data world contains 1000 instances and 25 attributes. The attributes describe different conditions that cause lung cancer. The resulting class contains three sub-classes high, medium and low. The algorithms have to predict the person belongs to any of the three classes. The dataset is placed in Google drive so that it is easily accessible by the Google colab to run the code. The path of the dataset in the drive is specified then colab accesses it.

B) Collecting Data from CSV files: The dataset taken from different repositories is in the form of CSV files. The data in the CSV files is loaded by using the Pandas library. The function read_csv is used to load the data from a CSV files to an object. By using the object can perform any action on the data like reshaping and resizing. Example code: data = pd.read_csv("lung_cancer data_world.csv').

C) Finding the missing values in the dataset: At first, any missing values are present in the dataset are checked. The dataset taken from the UCI repository has the missing values in each column (Janee et al., 2018). The total number of missing values in each column are noted. To check the missing values at each column there is a function isnull() which checks each value in the dataset is null or not. The sum of missing values at each column is given by data.isnull().sum() this gives the sum.

Ex : data.isnull().sum() column_a 2 column_b 5 column_c 31 column_d 48 column_e 76 column_f 0 dtype: int64.

D) Finding the missing values with different data type: The function used above has a limitation. It only checks any missing value is present or not but doesn't check any different type of object is present in the dataset. For example, a column support integer data type if there present any string data type the above function it doesn't count so to mark such values as missing values those have to be mentioned explicitly. The explicitly mentioned words are checked with each value in the dataset if any matching is found then they are marked as a missing

Sreedevi et al.,

value. Otherwise, consider it as a valid value.

E) Filling the missing values in the dataset: There are three ways of filling the missing values.

i) One way is by dropping the columns with the missing values. This technique is used for datasets with a huge amount of data that is datasets having more than ten thousand rows. This can be done by using the dropna() function. By this, the columns with missing values can be dropped (Kourou et al., 2015).

ii) The second way is statistical one in this the statistical methods are used to fill the data. The statistical methods include mean, median, mode (most_frequent) and constant value. In the Mean method, the mean value of the column is placed in the place of the missing values. In the median method, the median value which is the middle value of all the values in the column is placed at the missing place. In mode or most frequent method, the value that is occurring more number of times is placed in the place of missing value. In the constant method, the constant value or the fixed value is placed in the place of missing value. In this study, the Mean method is used to fill the values (Mandhir 2014).

Ex: SimpleImputer(missing_values=np. nan,strategy='mean',verbose=0) # ['mean', 'median', ' most_frequent', 'constant']

s_imputer.fit(data.iloc[1:,0:5]) # fit function fits the data
with missing values

s_imputer.transform(data.iloc[1:,0:5]) # the transform function fills the missing values with the appropriate statistical value.

iii) The third way of filling the missing value is constructing a new model that fills the missing values. In this technique, the rows without missing values are treated as train data and rows with missing values are treated as test data. The missing values are predicted. All the columns except the missing value column are treated as input attributes and the missing value column is treated as output attribute. In this way, all the columns with the missing values are filled. Some techniques are Iterative Imputer and KNN Imputer. In this study, the KNN Imputer is used. In the sklearn library, there is a module impute by which the KNNImputer module can be imported by which imputation can be performed. The KNN imputer works the same as the KNN algorithm. In this technique we specify the number of neighbors to be checked to fill the value. The imputer first finds the nan_euclidean_distances between the tuple with the missing value and tuples with no missing value tuples. The tuples which are having less distance are taken and the column with the missing value is filled with the average value of the selected short distance tuples of a specified number. In this way, all the missing values in the dataset are filled (Manjun et al., 2021).

Ex: KNNImputer(n_neighbors=10) #KNN finds ten most similar tuples by nan_euclidan distance and finds the average the value of ten tuples. impute_knn=impute_ knn.fit(data.iloc[1:,0:6]) data.iloc[1:,0:6]=impute_knn. transform(data.iloc[1:,0:6])

The output is the dataset with filled values.

In this study SimpleImputer which is the Mean method and KNNImputer are used and the best imputation method among both is found (Sangeetha & Mythili 2021).

F) Feature Selection: In the datasets selected for the study, one has 6 attributes and the other has 25 attributes. All the attributes may not be useful and also some of the attributes may be dependent on one another. To remove the attributes that are not useful and dependent on one other the process called feature selection is used as shown in Figure 2. Feature selection can be either explicit selection or calling a function to select the attributes based on some model. In explicit selection, the attributes necessary for the prediction of lung cancer can be specified on observation or importance. The function also selects the attributes necessary for the prediction of lung cancer.



The feature selection model used in the study is Select From Model. In this technique, the estimator assigns importance to attributes and specifies some threshold if the value of the specific attribute is below the threshold the attribute is discarded otherwise the attribute is selected. This method has two ways of selecting the features L1 based and Tree-based feature selection. In this study L1 based feature selection is used. The Logistic regression and LinearSVC are used for classification with these the sparsity is controlled. The larger the sparsity more features are selected. Sklearn has modules LinearSVC and SelectFromModel by which the feature selection can be made (Bhagyashree 2019).



Ex: LinearSVC(C=0.5,).fit(A,B) SelectFromModel(lsvc, prefit=True) transform(Z).

G) Principal Component Analysis: It is used for reducing the dimensions of the data. The data is projected onto the lower dimension. PCA is done in 3 steps. In step one is standardization of the given data. In step two computation of the covariance matrix is done so that we can find is there any relation between the attributes. In step three eigenvectors and values of the covariance matrix are computed by this the principal components are found. In this way, the important features are selected and complexity is reduced. In this study, the PCA module is used from the sklearn library decomposition module shown in figure 3.

H) Splitting the Dataset: Each dataset taken for the study is divided into train and test datasets. The training data is 80% of the data and for testing 20% of the data is used. The dataset is divided in such a way that the result attribute has equally divided the classes malignant and benign. This process is done by the train_test_split module in sklearn Library (Radhanath 2020).

Machine Learning Algorithms: In the study done here, five machine learning algorithms are used. These algorithms are trained and tested over the dataset and compared. The imputation methods are discussed before in this section the working of the machine learning algorithms is discussed.

i) Logistic Regression: It is a classifier that separates the data linearly. With logistic regression, the data can be linearly separated. In this study, the logistic Regression used is imported from sklearn. To train the model fit() function is used. To predict target values predict() function is used. The logistic Regression is a sigmoid function as shown below in figure 4. The formulae of the logistic function are represented below h(x) = sigmoid (Z)

Sigmoid = $1/(1+e^{-x}) X=w0+w1x1+w2x2...+wnxn+b$

Where wi = weights, xi = input and b is bias.

By changing the w and b values the curve can be fit and make the classification required. By changing the value of b the curve can be moved left or right on the x-axis. By changing the value of the w the slope of the curve can be changed as required to make the classification of the data (Negar Maleki et al., 2020).



 $P(c \mid \mathbf{X}) = P(x_1 \mid c) \times P(x_2 \mid c) \times \cdots \times P(x_n \mid c) \times P(c)$

ii) Support Vector Machine: Support vector machine is a classification algorithm that separates the data into two groups. The lung cancer data is divided into groups and classification is done as patient as cancer or not. It creates two hyperplanes one is close to positive points and the other to the negative points. The middle line is the margin line which helps in classifying the data as shown in figure 5. Margin line $(y) = (W^T)^*X + b$ where W is the slope of the line, X is input and b is the intercept. In this study, OneVsRestClassifier is used by taking one group and classify it against other groups. The fit function is used to train and predict is used to predict the values. Support vector machine helps in differentiating the data into groups. In binary classification, two groups are separated easily but in multi-class classification, one group is separated and predicted over other classes treating them as one class. The second dataset taken from data world has three classes (Radhika et al., 2019).

iii) Naïve Bayes Classifier: It is a probabilistic machine learning algorithm. It works on the Bayes theorem.

Sreedevi et al.,

It predicts that each row of data in the given dataset belongs to the particular class by calculating the probability of data of each class. The class with the highest probability is chosen and the respective class is predicted. P(c|x) is the probability of data to belongs to that class the formulae is shown in figure 6. In this study, GaussianNB is used. It works for the continuous values, follows the normal distribution. The fit function trains data and predicts the function predicts the data.

iv) Decision Tree Classifier: The decision tree is a tree-like structure. The root node indicates the resultant class. The internal node indicates the conditions which lead to the root nodes that are to the resultant class. The decision is a set of if-else statements where several if-else statements are put together as shown in figure 7 in the form of a tree. This set of statements checks the values and form conditions. This if-else 17 condition seems to be easy but it requires a lot of work to put such statements together to make a classifier. In this study, the function used is DecisionTreeClassifier. The Decision tree classifier is a process where tree-like if-else statements are marked. The fit and predict function train and predict the output.



v) K-Nearest Neighbor Classifier: It classifies the data by the measure of similarity between the data. This algorithm divides the data into groups and forms the groups into different classes by giving them class labels as shown in figure 8. Initially, the number of neighbors is given along with some classes. Then the algorithm divides the data into groups by iterating on the data by measuring the distance between the data points. The points assigned to the class with the least distance from them. The distance measurement can be Manhattan or Euclidian distance. In this study, the function used is the KNeighborsClassifier function. The fit function trains the model and the predict function predicts the output.

Confusion Matrix: Confusion Matrix is the 2D box shown in figure 9 that contains four separate classes the classes are defined as True positive if the output predicted and output of original class is true then this section increases the count by 1. False Positive if the output predicted is true and the original output is false then this section increases the count by 1. False Negative if the output of the predicted class is false and the output of the original class is true then this section increases the count by 1. True Negative if the output of the predicted class is false and the output of the original class is also false then this section increases count by 1. By using these four parameters we calculate accuracy, recall, precision, sensitivity and other factors. The confusion matrix is calculated for all five algorithms in the study.



Training and Testing: In this work, after preprocessing of the data which includes filling the missing values, the data is then sent to the training and testing part of the study. Before training and testing the data is split into train and test part. Then the data is given to the machine learning algorithms and the accuracy of all the five algorithms is noted then the feature selection is applied to the data and required features are selected. The principal component analysis is applied to the dataset. This new dataset is sent to machine learning algorithms and the new accuracy of the algorithms is noted.

Table 1. Comparison of Imputation Methods				
	KNN	Mean		
column_c	2.6	2.72		
	3.3			
column_d	1	2.79		
	2.8			
column_e	2.7	2.91		
	3			

Training: Two imputation methods applied on the dataset the Simple Imputer and KNN Imputer. The five machine learning algorithms Logistic regression, Naïve Bayes Classifier, Decision Tree Classifier, K-Nearest Neighbor and Support Vector Machine are trained with

the preprocessed dataset. The respective fit() function is used to train the algorithms (Shamreen et al., 2018).

Testing

Imputation Methods: Imputation of the data by two methods is shown in table 1 the point to be noticed is the KNN Imputer fills the missing values with different values but Mean Imputer fills the data with only one value. KNN imputer takes the average value of specified number of similar tuples. Similar tuples are found with the nan_eculidian distance. So the value changes from tuple to tuple based on similar tuples. As shown in table 1 for column_c the KNN imputer puts the values of 2.6 in one tuple and 3.3 in the other tuple. In column_d and column_e, the same process is repeated. Only two tuples are taken as an example the process works similar for all the missing value tuples. The Mean imputer puts the same value in all the missing value tuples of respective columns (Yuksel et al., 2013).

Table 2. Comparison of ML algorithms							
	Logistic Regression	SVM	Naïve Bayes	Decision Tree	K-NN		
Before PCA	0.84	0.81	0.79	0.75	0.78		
Mean Imputer	1	0.98	1	1	0.93		
After PCA (a,b,e,f)							
Before PCA	0.83	0.81	0.79	0.77	0.78		
KNN Imputer	1	0.97	1	1	0.89		
After PCA (a,b,d,e,f)							

Table 3. Comparison of ML algorithms on Data world dataset								
	Logistic Regression	SVM	Naïve Bayes	Decision Tree	KNN			
Before PCA								
(26 features)	0.97	1	0.91	1	1			
After PCA								
(23 features)	1	1	1	1	1			



Machine Learning Algorithms: The comparison of results of Machine Learning Algorithms is shown in table 2 is for the dataset taken from the UCI repository. The five

ML algorithms not achieved good accuracy before the application of PCA. Logistic Regression has achieved an accuracy of 84 percent on the dataset with Mean imputation applied to it. Mean imputation works well before PCA is applied. After application of PCA Logistic regression, Naïve Bayes and Decision Tree has achieved an accuracy of 100 percent in both imputation methods. KNN achieved an accuracy of 89 percent least of all the five algorithms. PCA has changed the efficiency of the algorithms a lot. By PCA the complexity of the dataset also decreased. Only 4 features are used after feature selection for PCA they are BI-RADS assessment, Age, mass density, Severity (Karhan & Tunc 2016).

The working of algorithms on data world dataset has a quite different role as shown in Table 3. SVM, Decision Tree and KNN have achieved 100 percent accuracy without the application of PCA. After the application of PCA, all the five algorithms have achieved 100 percent accuracy by using 23 features among 26. The confusion matrix of all the algorithms on the UCI dataset is shown in figure 10. The numbers shown are in percentage of data belongs to that category may be True Positive, False Positive, True Negative and False Negative.

CONCLUSION

The study aimed to find the best imputation method and

Sreedevi et al.,

best machine learning algorithm. The Mean imputation technique is effective compared to KNN imputation technique. This conclusion was drawn because the accuracies of algorithms in Mean imputation method are better than KNN imputation method. Before application of Feature selection and PCA the five algorithms had low accuracy. After application of feature selection and PCA the algorithms performed well on both the datasets. The five algorithms have achieved 100% accuracy on Data world dataset. The algorithms Logistic Regression, Naïve Bayes and Decision Tree have achieved 100% accuracy on the UCI dataset. When comparing both the datasets Decision Tree works well. Naïve Bayes and Logistic Regression also give good results. The study, at last, concludes that Mean Imputation for missing values with the Decision Tree algorithm gives good achievable results.

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Exploration and Prediction of Crime Data Through Supervised Machine Learning Algorithms

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ABSTRACT

The technique of obtaining meaningful information or knowledge from vast data sources is known as machine learning. Large quantity of information is gathered throughout criminal investigation process and only valuable information is necessary for analysis. So, Machine Learning may be employed for this purpose. Selection of certain Machine Learning approach has larger effect on the outcomes achieved. This is major rationale for the performance comparison and selection of top performing Machine Learning algorithm. Classifying instances using a Decision Tree is a basic notion that anybody can comprehend. It is a Supervised Machine Learning as Decision-Tree-Classifier (DTC) in which the data is segregated according to a particular parameter and supervision is continually performed. Machine learning has only recently begun to find greater adoption in both research and practise, and as a consequence, the bulk of current implementations employ data mining and Decision-Tree-Classifier (DTC) approaches. These specific computations have an accuracy of over 43 percent, which is very excellent when consider that are judging crimes from massive data and places.

KEY WORDS: CRIME DATA, SUPERVISED MACHINE LEARNING ALGORITHMS, DECISION-TREE-CLASSIFIER (DTC).

INTRODUCTION

Citizens in most nations have a duty to alert the police of crimes in progress, but some forms of crime may be handled by specialised law enforcement authorities. Crimes are usually investigated at three distinct phases: when the first discovery that a crime has occurred, when a suspect is identified, and before evidence is adequate to accuse the culprit in court. The majority of criminal incidents are reported by citizens and not law enforcement personnel (e.g., victims or witnesses). If there is no recognisable victim, such as obscenity, then crimes involving subjects' agreement (e.g., trading in illegal substances or prostitution) and those without, such as murder, are less likely to be uncovered unless the authorities investigate.

Controversial measures are sometimes necessary in order to discover crimes of this kind. Law enforcement authorities have access to a wide variety of different

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scientific tools to help them locate or identify suspects, as well as to further establish the link between the suspect and the crime. Since the late 1980s, DNA fingerprinting of biological evidence (e.g., hair, sperm, and blood) has been possible to dismiss an individual as a suspect with 100% certainty or be a substantial evidence method of determining if a person is guilty. Paper, glass, paint, and other substances are good sources of information when analysed using microscopic or chemical methods. Certain fibres that were detected on the victim or on the site of the crime might be examined to find if they resemble fibres from the suspect's clothes. If it's shown that the paper on which the document was written was created using an obsolete manufacturing process, the document might be considered a forgery. However, the amount of time and money it takes to create massive databases like these is something to keep in research.

1.1 Suspect identification: A criminal's modus operandi, or technique, may sometimes aid to identify them, since many criminals follow a similar routine in committing their acts. The techniques used by burglars to enter a home, as well as the sort of stuff taken, or the sort of fraud used, may all point to the perpetrator of a crime. When it comes to visual identification of a stranger, the victim is almost always able to do so as well. Victims or witnesses who feel they identify the perpetrator are often shown an album comprising several mug shots of



various offenders. The identity of a suspect determined in this method is often requested to take part in a lineup, when witnesses are shown with individuals with comparable traits.

The witness is then asked to choose the culprit. Although academics have long recognised that evewitnesses are often inaccurate, they didn't necessarily expect many of the false convictions that occurred were because of inaccurate eyewitness identifications (Arunima Kumar, Raju Gopal, 2015), (Bachhety et al., 2018). In that people of one race may have trouble recognising those of another race, scholars believe that cross-racial identification leads to mistaken identification. Additionally, following the occurrence, post-incident assimilation is critical because witnesses might radically shift their impression of the offender based on new information. When there is an attempt to commit a crime, the tension associated with it, plus the presence of a weapon, all reduce the trustworthiness of eyewitnesses. Also, such academics have expressed worry that criminal-justice authorities may use normal eyewitness identification methods to influence witness identification so as to maximise the chances of a certain suspect being identified.

However, in the past, authorities in the criminal justice system were mostly resistant to enacting changes that would raise the accuracy of identifications, since such measures would result in fewer identifications overall. As DNA evidence began to be used more effectively in the late 1990s, there was increased attention to instances where eyewitness misidentification had led to a wrongful conviction, including death penalty cases. During the early 21st century, law enforcement agencies were using practises that had been recommended by eyewitness researchers. For these procedures, witness advice to people who are unsure should be avoided, but instead, witnesses should be informed about the possibility of errors and/or made aware of all possible non-suspects in the line-up who might be a good candidate for identification. The line-up should be conducted by a neutral third party who is unaware of any details about the suspects.

1.2 Gathering evidence: Convincing the judge or jury is very vital in nations where the rule of law is firmly established, and this can only be done by gathering sufficient legally acceptable evidence to prove guilt. because the police have very clear knowledge that a certain person is accountable for a crime, but legal proof is lacking to demonstrate guilt (Chung-Hsien et al., 2011). In order to ensure they have all the required evidence; the police use a wide range of investigative tools and methods. In the course of an investigation, it is vital to search a suspect's person or property. Only if there is "probable cause" or "reasonable basis for suspecting" evidence discovered may a search be carried out under the laws of most common-law countries.

If a police officer approaches and says that he or she wants to conduct a search, it is permissible unless the officer refuses to identify himself or herself and has no acceptable basis for the search. A person randomly stopped on the street in the United States may be patted down for a firearm even if there is no indication that they are armed. In most cases, searching a private residence requires the issuing of a search warrant by a court or magistrate. The law only allows for a search warrant to be obtained if the authorities have solid grounds to believe that the precise evidence sought will be located on the premises. Under typical circumstances, a warrant restricts the scope of the search to one location. Because of the use of a search warrant, items collected during an investigation are often kept by the police for use as evidence in any following trial.

1.3 Crime and its Pattern: Crime is a universal social fact that exists in all civilizations at all times. Regardless, similar themes and patterns seem to persist regardless of time and location. Rural and agricultural civilizations with little economic growth. They may be openly condoned and even justified (David & Suruliandi, 2017; (Hussein et al., 2020) (Hussein, 2019). Societies as they modernise and grow more economically sophisticated are unable to tolerate violent actions since these actions become infrequent. The most valuable property often includes items like land and animals, and hence there is less property crime. Because of economic progress, valuable, portable commodities proliferate, and as a result, there is an explosion in theft of such commodities, coupled with an exponential growth in methods of theft. Criminologists have also investigated different police techniques to determine their efficacy.

A significant research study found that arresting the perpetrator often reduces future violence, but has the opposite effect in many instances. A significant amount of research had a significant impact on the way domestic violence is handled in many police agencies. Criminologists have also begun to focus on interventions that aim to lower the chances that particular groups of individuals become criminals (Jain et al. 2020) (Hussein & Croock 2019). Many elements within biology, psychology, and society enhance the probability of antisocial behaviour, and a focus on long-term crime reduction via social policy that incorporates these variables has been shown effective. A good example is several effective programmes focused on high-risk groups, such as lowincome or unmarried moms, who provide pregnant women with prenatal care, postpartum home visits by nurses, and early childhood education for their toddlers. As adolescents, these interventions have been shown to minimise delinquent behaviour (Jayapratha et al., 2018) (Mittal et al., 2018). Research has shown that providing preschool education to high-risk youngsters reduces the likelihood that they would offend as adolescents and adults. Criminological research is more likely to be relevant to the establishment of future crime policies, given the increased scrutiny of these programmes by the research community.

1.4 Types of Crime

1.4.1 Fraud Detection: The word "fraud" is often used to describe misdirecting or taking unfair advantage of

someone. Any illegal, deceptive, or misleading conduct, omission, or concealment (whether or not a violation of an obligation or trust) is considered a fraud. Check fraud, online selling, insurance fraud, and credit card fraud are some of the several sorts of fraud. Check fraud is issuance of a check when enough money is not there in an account; Internet sale fraud means selling fake items; Insurance fraud is claiming fake insurance for damage to a vehicle, medical bills, and other purchases (Baesens et al., 2021).

1.4.2 Traffic violence: Vehicle operation is governed by laws, which lead to traffic infractions. As the number of automobiles in cities increases, so does the volume of traffic, and this, along with an increase in traffic offences, produces more severe property damage and increased risk of injury or death for the people who use the roads. Traffic infraction detection technologies are essential to avert such problems (Beland & Brent, 2018).

1.4.3 Sexual assault: When it comes to committing a criminal attack, it's not whether or not contact is really made, but whether or not the target knows about the threat. There are several types of sexual attacks, including:

Simple Sexual Assault: This consists of physically restraining someone and making them engage in any sexual activity without explicit consent. When it includes the utilisation or threat of the utilisation of a weapon or injury to an outsider, it is known as sexual assault with a weapon.

Aggravated Sexual Assault: This is when a victim sustains bodily harm, such as being ripped apart, mutilated, severely beaten, or near death from a sexual assault. Non-physical, oral ambush resulting in mental, and furthermore mental harm.

II. Literature Review: (Singh et al. (2019), presented novel methodology to collect the eyewitness's visual perception as a symbolic representation, in addition to mugshot detection. It enables the detection of criminal physiognomy and face traits. Symbolic representations are modelled via an approach which utilises rough set theory. Through this methodology, they get an instinctive understanding of how criminal minds absorb incomplete and inaccurate information. To check whether our suggested model was right, they utilised a mug picture dataset comprising of 300 offenders faces from the Chinese University of Hong Kong (CUHK). For the visual representation of the 300 faces of criminal CUHK, they used the services of 105 students from the Indian Institute of Information Technology, Allahabad, who were considered eyewitnesses.

To prove the theory, the researcher used two modes that are similar to forensic drawings. (Hussein et al. 2020), offer two different hybridization strategies in this work. First, they integrate the Viterbi algorithm with Baum Welch for crime prediction, which leads to the creation of the Viterbi-Baum-Welch hybrid algorithm. In this second example, the technique considered here is a decision tree (DT) augmented with the Viterbi algorithm, which is used to determine the criminal identities of individuals found in the Iraq and India crime dataset. Their prior work is used as a basis for this project. The primary objective is to help improve the outcomes of the model, and getting an accurate model is a side effect.

The findings demonstrated both objectives had been achieved in an effective manner (Jain et al. (2020). Today, all contemporary cities confront a significant criminal issue on their highways. Criminals often turn to road transport as a means of getting away. Due to the absence of proof, theft and other crimes remain unsolved. Tracking cars and criminals still needs a lot of resources to be effective. They come up with a viable machine learningbased criminal detection system employing text and facial recognition algorithms to foil the aforementioned problem. Once these technologies are shown to be effective at parking lots, toll stations, airports, border crossings, etc., they widely used. The text recognition technology uses the characters that appear on Indian number plates to extract the characters and use this as the prediction. At the same time, facial recognition has the capability of performing face recognition on select face areas and mapping the facial features associated with criminals to a database. The research presented in this paper features a proposed system that targets to deliver improvised outcomes to be successful in the majority of cases, even with extreme time constraints and accuracy. Also, it is designed to deliver the successful detection of crime, even under normal working conditions, with machine learning algorithms such as KNN, SVM, and face detection classifiers. Tayal et al. (2015), developed a collection of tools called data extraction, which is comprised of many modules.

They call these modules "tools," and they include data pre-processing, clustering, Google map representation, classification, and WEKA implementation. DE's first module, throughout the time period of 2000-2012, pulls numerous crime datasets from criminal Web sources and organises the data into structured files. The second module, which DP calls DP Cleans, Integrates, and Reduces Crime Data, is creating structured 5,038 crime occurrences. They use 35 present criminal characteristics to represent each of these situations. To ensure that the criminal database is easily accessible, safeguard procedures are adopted. The process of generating two crime groups based on comparable criminal characteristics is investigated using k-means clustering. K-means is helped by Google Maps, which enhances visualisation. Using KNN classification, criminal identification and prediction are studied. The outcomes of our study are verified using WEKA. WEKA certifies the development of two criminal clusters with an accuracy of 93.62 and 93.99 percent.

This is an example of our way of making society better. It assists in the solving of crimes and the identification of offenders, helping to reduce crime rates. (Mittal et al. (2019), illustrate the patterns of crime in India change according to population growth and urban development.

Shruti & Singh

According to authors, the increase in crime incidents, particularly those against women, children, and those in poorer socioeconomic statuses, is a cause for concern for the Indian government. For a better understanding of crimes in India, there is an official database known as the National Crime Records Bureau (NCRB) as well as an application known as Crime Criminal Information System (CCIS) that can be used to look up information and create reports on crimes. Criminals thrive in an environment of chaos and disorder; thus, the police have to comb through extensive amounts of crime data in order to identify contributing elements. Thus, methods are required that can swiftly and effectively identify the elements that influence crime. Because of this, the discipline of machine learning has arisen in the last few years. An analysis of the impacts of the economic crisis on criminal activity in India are being studied in this article, which utilises several machine learning approaches on crime data. For several Indian states, the study has tracked the impact of unemployment rates and GDP on theft, robbery, and burglary. Additionally, Granger causality has been computed between crime rates and economic indices. Finally, it is concluded that a rise in unemployment results in an increase in crime, hence the only way to manage crime is to increase job possibilities.

Prabakaran & Mitra (2018), introduced the data mining is the discipline concerned with discovering designs or patterns in a large dataset. This is done using processes that include machine learning and database techniques converging to create one system. In addition to the many sectors listed above, it may be used in almost any industry, such as future healthcare, market basket research, education, manufacturing engineering, and criminal investigation. With respect to this, crime investigation is a somewhat intriguing application in which criminal characteristics are used to improve the quality of life for the community. A study compiled this information from numerous data mining methods found in this sector. This work may lead to more efficient crimeprediction and analysis systems.

Qayyum & Dar (2018), presented the data mining methods to detecting links among data, and machine learning and artificial intelligence methods are very useful when applied to massive datasets. One of the popular areas in data mining nowadays is crime detection, which has distinct patterns of criminology uncovered. It consists of many stages, beginning with criminal characterisation until pattern detection. Various criminal detection strategies have been covered in the literature for this purpose. The approaches utilise in this study are useful for crime detection in general, and they have decided to employ well accepted data mining approaches to fulfil this goal. The research is provided with a tabulation of the different techniques' strengths and weaknesses. This methodology is only for specialised usages, such as identifying the social relationships and roles of criminals in any network.

The survey would be a resource for criminologists to locate cutting-edge crime detection strategies that use data mining and a list of both advantages and disadvantages. (Dutta et al., 2017), presented the identity crime is defined as crimes in which someone disguises their identity, therefore obtaining sensitive information about the subject, and as such, it is a sort of identity theft. In this study, credit card application-related identity crime is mostly discussed. In order to overcome the limitations of the current non-data-mining approaches for identity theft, a new data-mining layer of defence has been developed. Communal Detection and Spike Detection methods are used in this unique technique for identifying frauds in apps. (Pavithra & Suresh 2019), presented an article on fingerprints.

They found at the crime site are valuable investigative information. The proposed fingerprint recognition system contains a deep machine learning and Convolutional Neural Network, a kind of deep learning most often used in areas like natural language processing (CNN). The images are collected from crime scenes using a variety of ways, such as advanced photographic technology and chemical and physical processing procedures. Afterward, they are stored in the database. The photographs taken from the crime scene are often fragmentary, and therefore it is difficult to group them into different categories. Prior to processing, fingerprint pictures must first be processed using suitable enhancement techniques. The minutiae (the little, seemingly insignificant details) are taken from the fingerprint scans. Pre-processed data's features are used as inputs into the CNN for training and testing the network. 80% accuracy in the criminal database was shown utilising experimental database software. (Srivastava et al., 2013) illustrated that the Crime scene investigators which rely on stains for numerous kinds of criminal investigations, including rape, murder, theft, and burglary.

Crime scenes often yield stains including blood, semen, saliva, and lipstick. The evidence of lipstick might be detected on clothes, paper, cigarette butts, skin, or anything else. For the criminal identification, questioned lipstick stains might be compared with the suspected one. In the current investigation, Thin Layer Chromatography (TLC) has been used to identify the Lipstick stains. (Hussein et al. 2019), In crime detection, data-mining approaches, which may be improved using a variety of methodologies, are used. Classifying and improving the structure is done using the clever way with this work, the decision tree algorithm. This approach is used to compare two datasets: criminals in Iraq and India. The proposal's purpose is to detect offenders via mining utilising an approach that incorporates smart search. Through adjusting the size of the tree, they get greater results than those obtained by standard mining techniques. (Karve et al. 2019), introduced the HOG Face recognition.

The purpose of this article is to help the police department help criminals better identify themselves start the recognition process by utilising the sketch and visual features that they have provided to generate photos of their faces. To put it simply, our imagery is hyperrealistic. The picture obtained in the preceding step is used to provide face identification. They have selected the Generative Adversarial Network as our model here. A generator and a discriminator are used to teach the model the association. In order to solve the identical problem, they are utilising a context-based Generative Adversarial Network. Once the process of face identification is finished, they use it to identify the individual from the face picture. HOG Face recognition is used for this. They worked to help the police force decrease their time spent on drawing and time spent on criminal identification.

2.1 Problem Statement: Using machine learning technology (von Lilienfeld, 2020), finding relationships and patterns across different data is straightforward specially in big data types. The research in this exploration involves pattern of crime through Machine learning. Also, data visualization helps analyst complex data set. But still exploration in Indian context has been missing.

METHODOLOGY

Using machine learning technology (Von Lilienfeld, 2020), finding relationships and patterns across different data is straightforward specially in big data types. The research in this exploration involves pattern of crime through Machine learning. Also, data visualization helps analyses complex data set. But still exploration in Indian context has been missing.

3.1 Domain overviews: The models can uncover and extract hidden knowledge about crime from a historical criminal data set. The crime pattern prediction model aims to use machine learning techniques on criminal data to aid in the prediction of crime patterns (Sandagiri et al. 2020). With hybrid models and data sets, the proposed models assist in crime pattern prediction and decision-making. This saves money and time in the modelling process, while also improving the accuracy of the results. This suggestion, such as machine learning techniques, appears to be promising as data modelling and analysis tools.

3.2 Existing System/Problem Statements: Major Problem in Review Papers was Not good Accuracy and not God comparison this practice produces unfavorable biases, errors, and a lot of wasted time. Clinical decision support integrated with computer-based criminal records in the proposed system (Data Sets). This reduced medical errors, improve individual safety, reduce unwanted practice variation, and lower crime rates. This suggestion appears to be promising as a tool for data modelling and analysis. This is a social problem because of the exponential penetration of video monitoring Surveillance is yet another part of our present-day lives, and it may be part of this research too.

3.3 Proposed Methodology

• Research Design.

- Data Pre-Processing
- Machine Learning, Supervised Learning, Classification Techniques
- Classification, crime pattern (Data Mining Techniques)
- Machine Learning Algorithms
- Significant Feature Selection.

3.4 Data Pre-Processing

[A.] Cleaning: Data that we want to process is not be clean, in the sense that it may contain noise or missing values, and if we process it, we don't get good results. To get good and perfect results, we must eliminate all of this, and data cleaning is the process to do so.

[B]. Transformation: This entails transforming data from one format to another in order to make it more understandable by using data normalization, smoothing, and generalization techniques, as well as aggregation techniques.

[c] Integration: Data that we do not need to process may come from multiple sources, and if we do not integrate them, it may cause a problem during processing. As a result, integration is an important phase in data pre-processing, and various issues are considered here to integrate.

[C] Reduction: When working with data, it can be complex and difficult to understand at times. To make them understandable to the system, we reduce them to the required format in order to achieve good results. The subject of the experiment is a set of variables that are kept constant while the subject of the experiment is a set of variables that are measured. This is more practical when conducting face recognition and detection because it monitors a subject's behaviors and patterns to determine whether the subject matches all of the details presented and has been cross-checked with previous data. It is a time-bound method of effect research that focuses on the relationship between the crimes and the criminals who produce actual outcomes.

IV. Data Collection and Preprocessing: This study's data came from the University of California at Irvine's data repository. The data from the UCI and the website Machine Learning Repository is open to the public. Many researchers have found that the Cleveland and Hungarian databases, in particular, are suitable for developing a mining model because they have fewer missing values and outliers. Before being submitted to the proposed algorithm for training and testing, the data is cleaned and preprocessed. The UCI Machine Learning Repository is a collection of databases (Dhankhar & Jain, 2021), domain theories, and data generators that the machine learning community uses to test machine learning algorithms empirically. The overall goal of our research is to improve our ability to predict the presence of heart disease. To obtain more accurate results, the UCI and repository datasets are used in this paper.

V. Proposed Techniques: Machine Learning and data

Shruti & Singh

analysis techniques that has been used to analyses crime data that has been previously saved from multiple sources in order to identify patterns and trends in crimes in recent years. Such investigations may aid in the speeding up of the criminal investigation process as well as the automated detection of offenders by electronic systems. The relation of crime detection and Machine Learning techniques (Salloum et al. 2020). Ultimately the Crime Detection using Machine Learning depends upon the selection of Selection of Data, Selection of Algorithms and Selection of platform to perform the result. accuracy of classification, correctly classified instances, true positive rate, false positive rate, precision, recall etc. The best performing algorithm then selected for actual crime and criminal Machine Learning. So, in general we develop criminal identification system that first classify the sample crime and criminal data in reference with various attributes and generate the classification rules. These classification rules used to identify the possible suspects of the crime. Then details of the suspect be retrieved from the database.



5.1 Criminal Identification using Machine Learning: Criminal identification system identifies the suspect of the crime based on the various attributes and the evidences found at the crime scene. To ensure the accuracy of the result, we create a sample dataset and then J48, Naïve Bayes and Machine Learning algorithms be evaluated against it. Their performance compared in reference with



Figure 4: Heat map of the crime data





5.2 Decision Tree Based Prediction Model: Decision tree is a compilation of guidelines for studying. Knowledge is split into two or three subsets for allowing inferential analysis. The toughest places to work in would be where people have severe conflicting views. It is split into

classes until there is just one instance in the leaves. This is achieved using the decision tree classification system. Decision trees are valuable because of their simplicity of discernment and implementation (Han et al., 2008). There is no need to make any pre-processing because the anomaly peaks do not influence the results. Furthermore, the differentiation between persons and groups is well defined. Highlighting is needless in this framework.







Scaling may produce unexpected effects when the characteristics are personalized. Decision trees succeed at managing discrete quantitative data sets. In this

case it muddles the interaction between elements and goals. Decision trees have a higher chance of displaying nonlinear results than linear ones owing to this factor. The decision tree contains many strengths but it still has drawbacks. Firstly, Decision Trees do not suit very well due to unexpected evidence and therefore do not forecast new knowledge well. Trunks of trees cannot be substituted because Decision Trees are starving algorithms.

5.3 Visual Exploration of Data: Execution of the India State wise crime data has been executed in Python. The data sets have the location of Indian crime state wise. Data attributes are Location, Block, Crime Type, Community Area, State wise presentation. Below figure illustrated the categorical attribute distributes.



3000 2500 2004 2006 2008 2010 2012 2014 2016 YEAR

As the figure below also illustrate that the mischief and offence against person. The time series data is from 2004 to 2016 of on record crime data. Heat map of the crime data where it ranges from 2003 to 2016 data. The lighter region belong the most crimed region and the dark side is the lesser crime region. The above figure presented the crime as Break and enter commercial from 2003 from 2016. This figure has two peaks as in 2004 where as the second in 2006 and two slumps as it appeaps in 2010 and 2012. After word it rise continoulsy till 2016. The above figure presented the crime as Break and Enter Residential/Others from 2003 from 2016. This figure has two peaks as in 2004 where as the second in 2004 where as the second in 2006 and two slumps as it appeaps in 2010 and 2012.

Shruti & Singh

two slumps as it appeaps in 2013 and 2016. The above figure presented the crime as Homosides from 2003 from 2016. This figure has four peaks as in 2004, 2007,2011 and the last in 2015 and slumps as it appeaps three times as in 2006, 2010 and 2013. The above figure presented the crime as Homosides from 2003 from 2016. This figure has four peaks as in 2006, 2008,2011 and the last in 2014 and five slumps as it appeaps in 2005, 2007, 2009, 2011 and the last in 2015.

The above figure presented the crime as Other Thefts from 2003 from 2016. This figure has two peaks as in 2009, and the last in 2016 and one slumps as it appeaps in 2013. The above figure presented the crime as Theft of Bicycles from 2004 from 2016. This figure has three peaks as in 2006, 2007 and 2013 and three slumps as it appeaps in 2004, 2008 and 2011. The above figure presented the crime as Theft of Bicycles from 2004 from 2016. This figure has one significant peaks as in 2004 and one significant slump from 2011 to 2013.



The above figure presented the crime as vehicle collsion or pedestrian struck (With Fatality) from 2004 from 2016. This figure has three peaks as in 2004, 2007 and 2012 and

a person from 2003 from 2016. This figure has two peaks as in 2007, and the last in 2011 and three slumps as it appeaps in 2005, 2010 and the last in 2014. The above figure presented the crime as Other Thefts from 2003 from 2016. This figure has two peaks as in 2009, and the last in 2016 and one slumps as it appeaps in 2013. four slumps as it appeaps in 2004, 2006, 2010 and 2014. The above figure presented the crime as vehicle collsion or pedestrian struck (With Injury) from 2004 from 2016.

This figure has four peaks as in 2005, 2010,2012 and 2015 and two significant slumps as it appeaps in 2008 and 2011.

Table 1. Comparison for Existing model and Proposed model					
	Existing model	Proposed model			
Platform	Python	Python			
Base Research	Crime Detection	Crime Detection			
Research Data	Chicago police department	India State wise crime data			
Data Type &	(Location, Block, Crime	Location, Block, Crime Type,			
categorical attributes	Type, Community Area)	Community Area, State wise presentation			
Method	Feature selection, ML	ML, Exploratory Analysis			
Testing Accuracy	78%	80% + for most of Data Sets			
Simulation Performed	Yes	Yes			
Regional Context	Chicago crime data set	Indian Crime statistics			

5.4 Prediction using Decision-Tree-Classifier (DTC): As the process to achieve Prediction has been illustration below. This process involves the Decision-Tree-Classifier (DTC) as the prediction algorithm opt form the machine leaning.

Now prediction has been executed through Decision-Tree-Classifier (DTC) on the taken data. This data has records of 512849 Which has been broken into 358956 train crime events as tanning purpose and 153839 train crime events for testing purpose as the general traditional ratio of 70/30. Further apply DTC found the accuracy of 43.16 on the given parameter of data.

Findings of the Research: Machine learning algorithms (Decision Tree Classifier) Used to Predict the crime. And exploration of visual data of crime record with simple statistics tools used through Python. A Decision Tree is a straightforward visual model for categorising cases. A Supervised Machine Learning method is one in which the data is continually divided according to a certain parameter. Only Data mining algorithms has been used in most of research and use of the Machine learning is the novelty of this investigation. As this has prediction accuracy of 43 % which is very ethicistic for the inspecting the crimes of very huge data and location. From the existing work this research has distinguish feature of prediction suing the supervised learning algorithm.

CONCLUSION

The machine learning method is concerned with extracting information or knowledge from huge data sources. It is via inquiry that a large quantity of information is obtained, and only information of value is necessary for analysis. Which therefore demonstrates the ability of Machine Learning to be employed for this purpose. While the choice of Machine Learning algorithm has a bigger impact on the outcome, one of the key reasons for doing comparative analysis and selecting the best performing Machine Learning algorithm is to improve performance. Classifying cases using a Decision Tree is a straightforward concept that everybody can understand. It is a Supervised Machine Learning in which the data is separated according to a given parameter and supervision is constantly applied. Machine learning has only just started to see wider usage in both research and practice, and as a result, the majority of current applications use data mining methods. These particular calculations have an accuracy of above 43%, which is rather impressive when consider that are evaluating crimes from enormous data and locations.

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Shruti & Singh

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Linking System Quality, Information Quality and Intention of Use to Student Satisfaction of Student Information System in China

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ABSTRACT

The substantial growth in China's education field has given a considerable boost to competition between many administrations within the sector. This study's primary motive is assessing international student satisfaction concerning the information systems in large numbers of universities situated in Jiangsu province, China. A self-structured questionnaire was used for data collection and analyzed through descriptive and inferential statistics. The study was analyzed based on user satisfaction within the system, information quality, and intention to use. This research analysis was to inspect the consequence of students' perceived ease of use, perceived usefulness, and intention to use the student information system. A sample of 400 respondents was chosen based on a proportional stratified sampling approach across the universities' various faculties. PLS- (SEM) approach was embraced for the investigation of data using PLS graph software. The major finding was that information quality and system quality has a considerable and critical effect on user satisfaction. Moreover, the intention of use has a considerable negative effect on student satisfaction.

KEY WORDS: STUDENT SATISFACTION, STUDENT INFORMATION SYSTEM, INFORMATION AND SYSTEM QUALITY, THE INTENTION OF USE.

INTRODUCTION

Technology has brought many changes in our everyday life, and education is one of the fields where the impact can be noticed. With digital technologies and the Internet growing rapidly, new learning methods were created. The progress in technology had reached a stage where new terms and concepts were introduced in the education field. Education is an important area for improving and promoting the standards and learning qualities; the Internet is used with great success. For students interested in studying in top universities abroad, Chine is always in the top 3 choices as it is the largest education hub of Asia and the third-largest education hub globally, with about



492,000 overseas students, according to the ministry of education. Situated in China, Jiangsu province is one of China's biggest regions concerning the number of universities and overseas students. Throughout the vital tasks, i.e., enrollment, housing, evaluation, registration, mark delivery, the offering of classes, and class schedules, the Student facilitation or information system helps handle student-related information. This study aims to assess overseas students' fulfilment concerning the information systems in large numbers of universities located in Jiangsu universities (Ahn et al., 2007).

In the management information system's discipline, contentment with IS (Information system) has been the main core of extensive research. It is mostly used as a substitute measure for IS success. With the work of, user satisfaction research got noticed, and it stayed in continuity through and work. As a structure and methodology for evaluating the powerful-dependent factor in IS (which stands for Information System) study, DeLone and McLean introduced in 1992 the performance methodology of the information systems ('DEtM IS performance model, Switzerland / Germany, 1992) as



a system. Almost 300 papers were referenced and used the Information System Performance Model in refereed journals from to. The Revised D&M Information System Performance Model was then introduced for DeLone & McLean in 2003 and evaluated these papers. For a qualitative approach of the Jiangsu province for a large number of the international students' satisfaction, a sample of 400 overseas learners was elected through a proportional stratified sampling technique.

The study was performed based on a self-structured list of questions and evaluated through inferential and descriptive. Use had to be positioned behind consumer fulfilment during the process sense; thus, constructively involvement with usage will trigger further projecting satisfaction level casually. A higher objective to use is continuously motivated by greater user contentment. The most commonly employed single-measure metric may be customer satisfaction. The student information system (SIS) provides postgraduate and undergraduate learners facilities, such as operative admission procedures, enrollment, reimbursement of university fees, appeal for housing, confirmation of assessment status, and relevant information about the university. Nevertheless, of this system's useful benefits towards overseas students, its effectiveness would still depend on the students' fulfilment. SIS efficiency can be assessed effectively only through feedback from consumers. Users can verify their expectations and determine their strength in the system's progress through the feedback as an indication and weighbridge. The vital criticize can only be made effectively through an investigation to determine (SIS) operators' unguarded views. The study will conclude which (IS) measurement pointers are perceived the most in consumers' satisfaction. The outcome would allow consumers to handle assets based on the satisfaction directories experiential initially (Alkhanak et al., 2011).

1.1 Research Objectives: Study for the factors that affect the student information system's use by international students studies in many universities located in Jiangsu province, China. The study was analyzed based on user satisfaction within the information and system quality and its intention to use. The purpose of this research analysis was to inspect the consequence of students' perceived usefulness, and perceived ease of use, intention to use the student information system.

2. Literature

2.1 System Quality: Considered as the processing characteristic of IS, the term also referred to as the measurement of the data handling framework itself. Delone and Mclean have distinguished: reliability, usefulness, responsiveness, usability, and adaptability as the foremost system quality components in a considerable number of studies performed in recent decades concerning the usage and execution of internet business. In the year 2000, Lin and Lu conducted that IS quality comprises the quality of information, reaction time, and access to the system. That, among which time, is the point of reference component of perceived usefulness. Negash, Ryan et al. affirmed that

the framework structure adopted the entire framework feature, which is significant for client fulfilment. He has verified that availability and accessibility are key components of system quality factors in designing a webbased client supporting framework. These two variables are the most dominant markers as far as client fulfilment. Our method for deciding system consistency in how an IS will procedure an incident. The evaluation parameters incorporate stability, the simplicity of utilizing the system, the extent of user-friendliness, convenience, and instantaneity (Ajzen & Fishbein 1975).

2.2 Information guality: Information guality was indicated in the idea of sort, level of detail, and the assortment of information chosen during the framework and advancement stages. Additionally, allude to the report's substance, which is viewed as a productivity estimation of the client's data quality. The information content includes understandability, accuracy, sufficiency, and relevance, while the configuration manner of presentation, timeliness, and information result. There is solid support in the writing to attach client fulfilment with the information's quality. The nature of data positively affects the usefulness of a website and perceived ease of use. Information quality alludes to having this distinctiveness: various, inclusive, comprehensive, correct, appropriate, applicable, and dependable. The same study found that information quality; system quality had a noteworthy effect on usefulness and ease of use. The standard of the data provided by the system is our model for defining information quality. The assessment criteria include dependability, accuracy, and correctness (Ajzen et al., 1991).

2.3 Perceived Ease of Use: PEOU stands for Perceived Ease of Use. As per Davis et al., how much an individual accepts that a specific program is liberated from physical and mental exertion is seen as easy to utilize. Unique utilization of PU and PEOU is affected by clients. It is found that the PEOU has huge ramifications for the satisfaction of the IS. For example, various research discoveries, for example, the reason for utilizing the E-govt stage, Twitter, and others, have affirmed the beneficial outcome of PEOU on specialized maintainability. In this examination, PEOU refers to how much understudies feel that it will be simple, reasonable, and adaptable to utilize the student information system.

2.4 Perceived Usefulness: PU stands for Perceived Usefulness. It has been built up utility to improve the program's proficiency, which would likewise positively affect the client's inspiration to utilize the system]. Grudin considers that usefulness is the issue of whether the system be able to use to get some desired target Perceived usefulness works satisfactorily in terms of client fulfilment. Seddon and Kiew declared that perceived usefulness is prognostic of client fulfilment, and Rai et al. watched that the ERP program's apparent adequacy has an affirmative relationship.PU in this study utility identifies with the level to which understudies feel it is significant for understudies to get the data required

through an understudy data framework that makes their life simple, and the program is helpful by and large.

2.5 Intention-to-use: For the reason that there's complexity in translating the multidimensional components of "use," DeLone & McLean contend that "intention to use" will be an advisable substitute measure in some contexts. "Intention to use" is an approach, although "use" is a manner. Intention-to-use is the client's conclusive choice to acknowledge or reject the service; the contributions were explained. The goal to utilize was one of the key factors utilized for assessing the utilization of a data framework or data innovation in most TAM-based models. The last component that shows the endorsement of innovation or technique.

2.6 User satisfaction: Agreeing with Doll and Torkzadeh, client fulfilment is "the affective approach towards a particular PC program". Seddon portrays the client fulfilment as "an emotional appraisal on a lovely and horrendous continuum of different outcomes (individual. hierarchical, the social effect of IS use)." User fulfilment is a helpful instrument for assessing the effect of IS and web/web benefits just as a key component in utilizing innovations. DeLone and McLean declared that client fulfilment among the system impacts intention to use, and this will be extraordinarily expanded if the accomplishment of individuals, affiliations, or associations is upgraded after the system is used. They additionally distinguished client fulfilment as the manner variable and revealed that client fulfilment is connected equally to intention to use and use Our model's assessment and fulfilment levels The criteria for evaluation embrace fulfilment with the interface, information, and general system performance.

MATERIAL AND METHODS

A detailed survey design was applied to examine the IS users' satisfaction indices amongst the international students (postgraduate and undergraduate) for a large number of Jiangsu province Universities in China. The sample of the respondents for this research includes overseas students from all faculties in the universities. This sample of 400 learners were chosen based on the proportional stratified sampling scheme across the universities' variety faculties. A self-structured feedback form regarding ISs was designed to collect the data. The survey was conducted directly (face to face) with the students, retrieving the questionnaires after distributing the questionnaire for analyzing it.

PLS-SEM approach was embraced for the investigation of data using PLS graph software. The IS scholarly network utilizes this product as a standard. The normal examination factor is determined as a framework by this product. As it were, the relationship of all elements to each other is determined. The PLS diagram likewise does the checking of the confirmative components. This procedure has been viewed as useful by numerous organizations and craftsmanship ventures, and the achievement in instruction is expanding through this type of arrangement.

3.1 Research Design: The study's survey was performed utilizing 5 point Likert's Scale as the survey designed. It debates the assembly of statistics from the consumers (international undergrad and postgrad learners) of their universities' IS. Their feedback is estimated to provide comprehension of evaluating the information system's user contentment level (Alkhanak et al., 1988).

3.2 Research framework: Figure (1) shows the forming of this examination procedure. Speculations for causal connections have been found in the bolt that connected latent variables. This model ordinarily had six factors (constructs), with four dependent variables and two independent variables.



 Table 1. The features of the respondents according to demographic

Variable	Dimension	Occurrence	Percent
Gender	Male	188	47.0
	Female	212	53.0
Age	17-23	202	50.0
	24-30	64	16.0
	31-44	133	33.3
	Other	1	0.3
Program	Bachelor	179	44.8
	Master	147	36.8
	PhD	74	18.4

Table 2. KMO and Bartlett's Test

ITEMS	КМО	Bartlett's Test of Sphericity
IQ	.745	1741.907
SQ	.903	3011.471
PEOU	.609	521.018
PU	.653	1072.287
IU	.688	636.494
SS	.740	1446.310

Zaineldeen et al.,

3.3 Hypotheses: The following theories are suggested in the present study, and these theories are based on historical literature and its context.

H1: Information quality has a considerable and affirmative impact on perceived ease of use.

H2: Information quality has a considerable and affirmative impact on perceived usefulness.

H3: Information quality has a considerable and affirmative impact on student satisfaction. H4: System quality has a considerable and affirmative impact on perceived ease of use.

H5: System quality has a considerable and affirmative impact on perceived usefulness. H6: System quality has a considerable and affirmative impact on student satisfaction.

H7: Perceived ease of use has a considerable and affirmative impact on perceived usefulness.

H8: Perceived ease of use has a considerable and affirmative impact on the intention of use.

H9: Perceived usefulness has a considerable and affirmative impact on the intention of use.

H10: Intention of use has a considerable and affirmative impact on student satisfaction.

3.4 Processing and Analysis of Data: SPSS18.0 is the coding and documenting of substantial polls. When the information got is given in frequency and rate, PLS-SEMs are regularly utilized for speculation creation in scientific science (Bailey 1983). After investigating the consider variables and their latent constructs on user fulfilment was implied in brilliant PLS Version 3.2.7 PLS-SEM is picked as the most popular sociology innovation, the most appropriate multivariate testing strategy.

RESULTS

4.1 Characteristics of Respondents Based on Demographics: Table (1) be evidence for the features of the students based on the demography. Almost all respondents were female, with 53%, and 47% were males. Age-wise, those aged 17- 23 contributed with the highest ratio of 50%, followed by age 24-30 16%. Those between 31-34 and other age were 33.3% and 0.3%, respectively 44.8% of respondents were bachelor student while 36.8% and 18.4% were masters and PhD scholars.

4.2 Confirmatory Factor Analysis (CFA): CFA is utilized to look at the origin and impact relationship among measurement variables and latent variables to affirm if such connection is steady through the observed data [39;40]. We tested for the standard method variation in our research; thus, the factor test was implemented, and EFA was applied for the test.

4.3 Reliability and Validity of Scales: EFA was employed through SPSS to measure the underlying factors associated. Bartlett's Test of Sphericity was utilized to measure the theory validity while the Kaiser-Meyer-Olkin (KMO) was applied to evaluate individual variables' sampling sufficiency. It is considering that the general of the KMO should be 0.6 or further for the variable analytical. The above outcomes exposed that both are substantial, and it is reasonable for the factor to analyze (See Table 1). The cumulative variation in the table demonstrations 74.50% for information guality, 90.30% for system quality, 60.90% for perceived ease of use, 65.30% for perceived usefulness, and 68.80%, 74% for the intention of use and student satisfaction respectively, which surpasses the minimum approval level of 60%. The table once more designates that Bartlett's Test of Sphericity is adequate for its correlation. These values constitute proof that there is convergent and discriminate validity (Table 3) (Bagozzi 1988).

Discriminant validity explained with the determination of each construct's certain variable is different match up to the rest of the constructs. The value for its crossloading in the latent variable is above the rest of the constructs. Table (3) above illustrations the discriminant investigation concerning the scales used in this research. A higher factor than some other structure in its scale is required for Discriminant analysis. All the scales in table (3) demonstrate the constructs loading superior to any other factor on their scales. Information quality on its scale had a value of about (0.95), and the intention to use had a value roughly (0.97) over some other structure on its scale. PEOU and PU had a value of (0.84) and (0.90) correspondingly, (0.96) for student satisfaction.

4.4 Measurement and structure equation modelling analysis

4.4.1 Verifications Validity of Convergent: Convergence validity identifies with test results' coherence as various techniques are utilized to determine the equivalent aspect. This paper utilized SmartPLS measurable program for confirmatory factor analysis. Table (4) demonstrates that latent variables of the model's standardized factor loading were within 0. 672– 0. 986, all-surpassing 0.5. All the variables in table (4) describe that the Cronbach's Alpha is over 0.70, indicating that all the table constructs have sophisticated reliability within the context of measurement. Fornell & Larcker clarified in their research that constructs validity measures how a measurement symbolizes and realistically associates the detected incident to the construct through the essential hypothesis (Baleghi-Zadeh etal., 2014).

In contrast, evaluation is made through discriminant validity and convergent validity. From Table (4), the estimation of Rho. Rho was calculated to appraise the reliability of the latent variables. As revealed in table (4), the estimate of Rho for each of the factors used substantially more than the concurred estimation of 0.5. The Average Variance Extracted (AVEs) is considered the essential measure for examining the convergent validity. Table (4) highlights the AVE values used as a measure for checking the validity. Minimum (AVE) requirement for convergent validity is 0.5. and the composite reliability (CR) has a minimum of 0.5 and 0.70, correspondingly confirmations that the convergent validity is satisfactory (Bamgbade et al., 2017).

Table 4. Validity and Construct Reliability						
FACTOR	ITEMS	LOADING	CRONBACH'S ALPHA	rho-A	CR	AVE
INFORMATION QUALITY	IQ1	.968	.974	.975	.983	.951
	IQ2	.986				
	IQ3	.971				
SYSTEM QUALITY	SQ1	.954	.975	.984	.980	.907
	SQ2	.962				
	SQ3	.966				
	SQ4	.957				
	SQ5	.931				
PERCEIVED EASE OF USE	PEOU1	.672	.808	.893	.884	.721
	PEOU2	.939				
	PEOU3	.911				
PERCEIVED USEFULNESS	PU1	.783	.888	.928	.932	.821
	PU2	.965				
	PU3	.958				
INTENTION OF USE	IU1	.883	.869	.884	.919	.791
	IU2	.932				
	IU3	.852				
STUDENT SATISFACTION	SS1	.951	.962	965	.974	.929
	SS2	.961				
	SS3	.979				





"The Fornell & Larcker model, besides cross-loadings, have been applied to measure discriminant legitimacy. The suggested standard is that a build ought not to

Figure 4: Graphical representation Average Variance Extracted (AVE)



reveal an equal variance as whatever other expansion that is further than its AVE esteem. Table (5) explains

Zaineldeen et al.,

the Fornell & Larcker standard trial of the paradigm in which the squared connections were distinguished and the other dormant associations developed. Table (5) determines that most of the links were small compared to the squared basis of the expected difference applied along the diagonals, proposing key discriminant legitimacy. This confirmation that each build's experimental variables demonstrated the given inert factor confirms the model's deviating accuracy. However, table(6) specifies that every watched variable's cross-loading was further than the between inter-connections of the construct of the numerous observed factors in the model. In this way, these findings stated the cross-loadings assessment ideologies and provided reasonable consent to the estimation model's discriminant validity. As this closes, the given model was predictable to be measured to satisfactorily unwavering reliability, discriminant validity, convergent validity, besides the study model's assessment (Chin 1998).

Table 5	Table 5. Checking Discriminant validity using Fornell-					
Larcker	"s measu	ure				
	IQ	IU	PEOU	PU	SQ	SS
IQ	0.975					
IU	-0.034	0.890				
PEOU	-0.015	0.791	0.849			
PU	0.963	-0.041	0.066	0.906		
SQ	0.571	0.027	0.039	0.544	0.952	
SS	0.974	-0.054	-0.046	0.939	0.536	0.964

Table 6. Cross Loadings

	IQ	IU	PEOU	PU	SQ	SS
IQ1	0.968	-0.032	-0.022	0.930	0.528	0.966
IQ2	0.986	-0.037	-0.033	0.959	0.563	0.961
IQ3	0.971	-0.030	0.012	0.929	0.580	0.922
IU1	-0.106	0.883	0.757	-0.113	0.023	-0.125
IU2	0.012	0.932	0.740	0.010	0.048	-0.014
IU3	0.016	0.852	0.594	0.005	-0.002	0.010
PEOU1	0.060	0.387	0.672	0.128	-0.016	0.048
PEOU2	-0.083	0.750	0.939	-0.014	0.041	-0.110
PEOU3	0.017	0.785	0.911	0.091	0.053	-0.016
PU1	0.645	-0.060	0.278	0.783	0.354	0.631
PU2	0.952	-0.030	-0.003	0.965	0.540	0.927
PU3	0.975	-0.031	-0.028	0.958	0.557	0.949
SQ1	0.478	0.082	0.066	0.450	0.945	0.449
SQ2	0.537	0.010	0.035	0.519	0.962	0.501
SQ3	0.501	0.060	0.067	0.479	0.966	0.467
SQ4	0.511	0.094	0.091	0.484	0.957	0.485
SQ5	0.653	-0.082	-0.048	0.623	0.931	0.616
SS1	0.881	-0.078	-0.048	0.847	0.464	0.951
SS2	0.986	-0.037	-0.033	0.959	0.563	0.961
SS3	0.943	-0.045	-0.052	0.902	0.519	0.979

4.4.2 Hypothesis Test: Commonalities were initiate in the path coefficients within the PLS and the standard b- coefficient in the regression investigation. The relevance of the theories was confirmed through the b-value. Estimation of dissimilarity in the subordinate construct intended for a unit variant in the autonomous construct(s) was designated by the value of b. For the theorized model, the b-value was computed for each path. The greater the b-value, the greater the large impact was distinguished on the endogenous latent construct. Yet, the importance level of the b-value had to be experienced by the T-statistics test. An assessment was done through the procedure to specify the hypothesis's significance. A bootstrapping implementation was performed for the study using 1000 sub-samples with no noteworthy changes to measure the path coefficient's implication and the T- statistics values. It is labelled in table (7).

Seven of ten hypotheses were accepted; this means H2, H3, H6, H7, H8, H9, and H10 had significant influence. Some of the hypotheses as H1, H4, and H5 were not accepted. In H1, we predicted that the quality of information has no critical impact on perceived ease of use. The outcomes in Table 7. and Figure (6) confirmed that the quality of information has (b=-0.055, T=0.778, and p = 0.437); therefore, H1 is worthless. The information quality substantially affects perceived usefulness (b=0.972, T=85.176, and p.

< 0.000), so H2 is valid. the impact of information quality on student fulfillment was affirmative and important (b=0.989, T=144.893 and p < 0.000) presents that H3 was sustained, H4 is invalid with (b= 0.071, T=0.879 and p = 0.379) give us evidence that system quality has no critical impact on perceived ease of use. the system quality has no considerable influence on perceived usefulness it is invalid (b=-0.014, T=1.098 and p=0.272), the result show that H6 system quality has a noteworthy effect on student satisfaction with (b = -0.028, T = 2.497, T = 2.497)P = 0.013, H7 is valid and perceived ease of use has a considerable influence on perceived usefulness (b=0.081, T= 3.592, p < 0.000). for H8 perceived ease of use has a considerable impact on the intention of use with (b =0.797, T= 20.013 and p < 0.000) so H8 is valid. H9 and H10 are valid the result show that perceived usefulness has a significant influence on intention of use also the intention of use has a significant impact on student satisfaction with (b = -0.094, T = 3.160 and p = 0.002), (b=-0.028, T = 1.837 and p = 0.066). In case if the beta coefficient is considerable, inspect the sign of the beta. If the beta coefficient is positive, the explanation is for every one unit increment in the indicator variable; the product variable will increment by the beta value. Sometimes, the beta has a negative sign; the explanation is that the product variable will diminish by the beta value for every one-unit increase in the indicator variable. The result shows that H6, H9, and H10 had a significant negative relationship.

4.4.3 Correlation Coefficient of Latent Variables: Table (8) deliberates the latent variable correlation coefficient. Table (8) discloses that a significant correlation happens

Table 7	Table 7. The importance of the path coefficient besides the T-statistics values				
Hypothesis path		Standardize beta	T Statistics	P Values	Action
H1	IQ -> PEOU	-0.055	0.778	0.437	Not Accepted
H2	IQ -> PU	0.972	85.176	0.000	Accepted
H3	IQ -> SS	0.989	144.893	0.000	Accepted
H4	SQ -> PEOU	0.071	0.879	0.379	Not Accepted
H5	SQ -> PU	-0.014	1.098	0.272	Not Accepted
H6	SQ -> SS	-0.028	2.497	0.013	Accepted
H7	PEOU -> PU	0.081	3.592	0.000	Accepted
H8	PEOU -> IU	0.797	20.013	0.000	Accepted
H9	PU -> IU	-0.094	3.160	0.002	Accepted
H10	IU -> SS	-0.028	1.837	0.046	Accepted



Table 8	Table 8. Correlations of Latent Variable					
	IQ	IU	PEOU	PU	SQ	SS
IQ	1.000	-0.034	-0.015	0.963	0.571	0.974
IU	-0.034	1.000	0.791	-0.041	0.027	-0.054
PEOU	-0.015	0.791	1.000	0.066	0.039	-0.046
PU	0.963	-0.041	0.066	1.000	0.544	0.939
SQ	0.571	0.027	0.039	0.544	1.000	0.536
SS	0.974	-0.054	-0.046	0.939	0.536	1.000

between two constructs; the latent endogenous and the latent exogenous (Delone 2004).

DISCUSSION

The main target of the examination is to analyze the variables impact using the student information system by international students study in a large number of universities located in Jiangsu province, China. The study was analyzed based on user satisfaction within the IQ, SQ, and IU. The study aimed to investigate the influence of students' PEOU, PU, and intention of using the student information system. Moreover, this study assessed SIS and how the learners understand its applications in completing their system demands. The finding displays the sustaining importance of the information on user

contentment. The IQ and SQ of IS impact customers' repeat of usage and satisfaction. Moreover, (Lin et al. point out that information system quality knows how to foresee users' (PU) successfully and (PEOU). Therefore, we hypothesize (H1) and (H4). For (H1), this study come across that IQ has no critical affirmative impact on PEOU. As a result, the abundant and constant information offer has no noteworthy affirmative impact on the student information system's ease of use.

According to Seddon, Information System is an accomplishment and a very effective model so; this relationship has been reinforced, where they substituted 'IS use' of DeLone and McLean's accomplishment model by PU. Seddon affirms that PU is impacted straightforwardly by beliefs regarding IQ. A short time later, Rai et al. analyzed and endorsed Seddon's and its changed models and figured out the impact of IQ on PU to be sure as well as gigantic. In this manner have also argued that increased information quality leads to improved usefulness; this way, we hypothesize (H2) IQ has a considerable effect on PU. The SEM outcomes confirm that the quality of information was determined as the 2nd biggest impacting factor within factors influencing perceived usefulness (Davis 1989).

Several prior examinations on Information System accomplishment have displayed support for the conflict that more elevated levels of information quality brief improved customer satisfaction. Hence, we hypothesize (H3) IQ has a considerable and critical impact on user satisfaction; the outcomes illustrate that the quality of information attribute had the major coefficient within the path context, i.e., b=0. 989 with thorough influencing learner satisfaction. For (H4), this study finds that SQ has no considerable affirmative effect on PU, with (b= 0.071, p-value =0.379). The solid connection between found system quality and perceived usefulness was found by Floropoulos et al. (2010). On the other hand, the impact of SQ on PU was found insignificant. The test considered was founded on Internet education and consequently couldn't be a key factor to distinguish perceived usefulness. We subsequently assume that (H5) System quality has a considerable and important effect on perceived usefulness; the study finds that the system

Zaineldeen et al.,

quality doesn't have any noteworthy affirmative effect on PEOU with (b =-0.014, p-value =0.272).

The earlier experimental conclusion has encouraged the affirmative and noteworthy effect of system quality on client fulfilment as tended in DeLone and McLean's model. In any case, Floropoulos et al. found it insignificant. Consequently, we hypothesize (H6) SQ has an affirmative and noteworthy effect on user satisfaction, the consider finds that SQ has a significant negative effect on user satisfaction, as we mentioned that in case the beta coefficient is a negative sign, the explanation that for every one-unit increase in the indicator variable, the product variable will reduce through the beta coefficient value. Several studies supported the positive association of PEOU with PU Hence we hypothesize (H7) PEOU has a positive and significant influence on PU; the result shows H7 is valid, and PEOU has a significant influence on PU (Doll 1988).

For (H8), we found that PEOU has a considerable impact on IU; the result shows perceived ease of use has a significant effect on IU. The meta-investigation figures out there's a clear impact of PU on IU as considerable. This relationship didn't analyze in the IS success model in education sector research as per our information. Taking into consideration the general performance of the relationship in IS study in and specifically, in embracing research, the subsequent hypothesis can be prepared (H9) PU has a considerable and noteworthy impact on IU, the result shows that PU has a negative and significant effect on IU, as well for (h10) the intention of use has a considerable negative effect on student satisfaction.

CONCLUSION

The study was analyzed based on user satisfaction within the information, system quality, and intention to use. The study aimed to investigate the influence of students' perceived ease of use, perceived usefulness, and intention of using the student information system. The survey was carried out directly with the international students' study in a large number of universities located in Jiangsu province, China. Retrieve of the questionnaires after the distribution; the data was found suitable for examining. A structural equation modelling (SEM) approach was utilized to investigate data using PLS graph software. For the theorized framework, the b-value was determined for each path. Yet, the implication level of the b-value had to be verified with the T-statistics test. An evaluation was made to identify the relevance of the theories. Seven of ten hypotheses were accepted. Some of the hypotheses as H1, H4, and H5 were not accepted. Moreover, we discussed that Sometimes the beta has a negative sign; the explanation is that the result variable will diminish by the beta value for every one-unit increase in the indicator variable. The result shows that H6, H9, and H10 had a significant negative relationship with user satisfaction.

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To Assess the Factor Responsible for Episiotomy Wound Healing Among Post Natal Mother

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ABSTRACT

Pregnancy is a long and very exciting special journey for an antenatal woman. Maternity services should support the mother, her baby and her family during this journey with a view not only to their short-term safety but also to their long-term well being (UK Department of Health 1993).Objectives: 1. To assess the factors responsible for episiotomy wound healing among postnatal mother. 2. To associate the assessment of level of healing of episiotomy wound among postnatal mothers with selected demographic variables. Present quasi experimental quantitative study was conducted to assess the factors responsible for episiotomy wound healing among postnatal mothers. 60 subjects were selected based on the inclusion and exclusion criteria and non-probability convenience sampling technique. Structured observational checklists were used as tools to collect the data. The analysis of data shows 71.66% of the postnatal mothers of anaemia, 10% of the have vulvovaginitis, 23.33% of had urinary tract infection, 1.66% of had surgical site infection, 8.33% of had perineal tear, 6.66% of had before episiotomy, 100% of had after episiotomy, 1.66% of had obesity, 11.66% of had hypothyroidism, 6.66% of had diabetes mellitus, 16.66 of had hypertension, 83.33% of had edema. The discomfort of episiotomy is an added concern in the already overstressed situation. Episiotomy, despite evidence that it is an unnecessary intervention, is one of the most common surgical procedures performed during the second stage of labour especially in Primigravida women. Perineal trauma due to episiotomy causes a number of distressing conditions in the postnatal period. It causes pain, discomfort, disturbed normal activities; it gives the mother a feeling of inadequacy, increased the risk of infection, prolongs postnatal recovery and increased the cost of healthcare. After the detailed analysis, this study the study shows various risk factors affects the health status of postnatal mother and need to focus on that to improve health status of PNC mother after delivery.

KEY WORDS: ASSESS, EPISIOTOMY, POSTNATAL MOTHERS AND WOUND HEALING.

INTRODUCTION

In a dynamic society where values, rules and practices concerning childbearing and rearing are changing rapidly, women and their families seek guidance from many sources. However, women rely on maternity nurses to provide specific, accurate and appropriate information

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about what they should expect and request from the health care system, and about what choices they have regarding their own care. For some years now, there has been increasing pressure on midwifery and other allied health care professions to make clinical practice more firmly grounded on research evidence rather than on time – honored ritual, on the basis that patient care and the profession's status can only be enhanced through the development and implementation of relevant, scientifically derived findings. (Hicks et al., 1994).The report of the committee on nursing encouraged the pursuit of research and Research Mindedness'. Individual accountability requires maternity nurses to examine the care they provide, It is therefore, important that maternity nurses have access to reliable research based



knowledge. Since 1975, there has been an increase in the number of studies, in investigation midwifery practice, (Haris 1992).

A complex series of events occur with child-birth. One such event is the practice of episiotomy, which has undergone changes in popularity, with rationale for clinical practice not always based upon available scientific evidence. Perineal injury, including episiotomy, has long been accepted as a standard outcome of vaginal delivery. Episiotomy defined as an incision of the perineum during delivery to enlarge the vaginal orifice, has been, in practice since 1742, when a perineal incision was used to facilitate difficult deliveries. However, episiotomy did not become common until the early 1900s when the shift from home to hospital delivery occurred. The popularity of episiotomy among obstetricians continued to grow with the introduction of local anaesthetic and suture material and as a result of advocacy for its performance by two obstetricians, DeLee and Pomeroy (Maier 1997). It was claimed that an episiotomy should be performed for every women delivering her first child to avoid perineal lacerations and damage to the pelvic floor. The prevention of perineal trauma is very much at the forefront of midwifery care. It gives many midwives a sense of pride to complete a birth with no perineal trauma. However, this should not be at the expense of trauma to the vaginal mucosa. Episiotomy rates up to 100% have been reported and vary among countries and institutions.

Episiotomy is one of the most widely practiced obstetric procedures and refers to a surgical incision on the perineum during the second stage of labor to enlarge the diameter of the vulval outlet to facilitate passage of the fetal head and prevent an uncontrolled tear of the perineal tissue. Indications such as a prolonged second stage, macrosomia, non-reassuring fetal heart rate, instrumental delivery, occiput posterior position, and shoulder dystocia have been questioned. The incision substantially increases maternal blood loss, the average depth of posterior perineal injury, risk of anal sphincter damage, improper wound healing and increased amount of pain in the immediate postpartum period. Episiotomy at the first vaginal birth significantly and independently increases the risk of repeated episiotomy and spontaneous tears in subsequent delivery. Routine episiotomy is now considered to be a form of obstetric violence when a woman is automatically transformed into a patient and when routine medical procedures are carried out without giving the woman the right to make her own decisions concerning her own body (Borruto 2016).

Objectives:

- 1. To assess the factors responsible for episiotomy wound healing among postnatal mother.
- 2. To associate the assessment level of healing of episiotomy wound among postnatal mothers with selected demographic variables.

Assumption:

1. The risk factors of episiotomy may be responsible for

delayed healing of episiotomy wound in most of the postnatal mothers.

Research Hypothesis:

H1- There will be significant association in the risk factors responsible for episiotomy wound healing among postnatal mother with their selected demographic variable.

MATERIAL AND METHODS

Present quasi experimental quantitative study was conducted to assess the factors responsible for episiotomy wound healing among postnatal mothers. 60 subjects were selected based on the inclusion and exclusion criteria and non-probability convenience sampling technique. Structured observational checklists were used as tools to collect the data.

Criteria for sample selection: Inclusion:-1.Postnatal mothers who have normal vaginal delivery with left medio-lateral and Right medio-lateral episiotomy.2. Postnatal mothers within 8 hours of delivery.3. Postnatal mothers who were willing to participate in the study. Exclusion:-1. Postnatal mothers who were having immediate postnatal complications like primary postpartum hemorrhage, shock, amniotic fluid embolism.2. Postnatal mothers who underwent instrumental procedures like forceps or vacuum delivery (Amorim et al., 2014).

RESULTS

Descriptive and inferential statistics were used to analyse the collected data. The data finding have been organized and analysed according to the plan for data analysis and are presented under the following sections.

Section-A:- Percentage wise distribution of postnatal mothers according to demoghraphic characteristics.

Section-B:- Assessment of the risk factors responsible for episiotomy wound healing.

Section-C: Association of episiotomy wound healing score among postnatal mothers with their selected demographic variables.

Section A: Percentage Wise Distribution Of Postnatal Mothers According To Their Demographic Characteristics.

This section deals with percentage wise distribution postnatal mothers with regards to their demographic characteristics. A convenient sample of 60 subjects was drawn from the study population, who were from AVRRH, Sawangi (M), Wardha. The data obtained to describe the sample characteristics including age of the mother, education, area of residence, number of parity, type of delivery, occupation, nutritional pattern, monthly income, type of episiotomy incision, respectively. The above table shows the distribution of samples according to their age. It shows that in frequency for 37of the samples belongs to the 18-25age group (the percentage score of 61.66%); in the frequency 21 of the samples belong to the 26-30 age group (the percentage

score of 35%); in the frequency 2 of the samples belong to the 30-35 age group (the percentage score of 3.33%);. Hence it was interpreted that most of the samples under study were between the age group of 18-25 year.

Table 1. Percentage wise distribution of postnatal mothers according to demographic variables. n=60				
Demoghraphic variables	Frequency	Percentage (%)		
1. Age (in year)				
18-25 yrs	37	61.66		
26-30 yrs	21	35		
30-35 yrs	2	3.33		
35-40 yrs	0	0		
40 & above	0	0		
2. Education				
Primary	13	21.66		
Secondary	29	48.33		
Higher secondary	8	13.33		
Graduate	7	11.66		
Post – graduate & above	3	5		
3. Area of residence				
Urban	18	30		
Rural	42	70		
4. Occupation				
Housewife	49	81.66		
Private service	1	1.66		
Others	10	16.66		
5. Monthly income				
5000-10000	31	51.66		
10001-15000	15	25		
15001-20000	6	10		
20001-25000	3	5		
30000 & above	5	8.33		
6. Number of parity				
Primipara	37	61.66		
Multipara	23	38.33		
7. Type of delivery				
Spontaneous labour	44	73.33		
Induced labour	16	26.66		
8. Type of episiotomy incision				
Mediolateral	59	98.33		
Median	1	1.66		
9. Nutritional pattern				
Vegetarian	43	71.66		
Mixed(Veg+Nonveg)	17	28.33		

The above table shows the distribution of the samples according to their education. It shows that in frequency for 13 of the samples belong to the primary group (the percentage score of 21.66%); in frequency for 29 of the samples belong to the secondary group (the percentage score of 48.33%); in frequency for 8 of the samples belong to the higher secondary (the percentage score of 13.33%); in frequency for 7 of the samples belong to the graduate (the percentage score of 11.66%); in frequency for 3 of the samples belong to the post-graduate & above

(the percentage score of 5%); hence it was interpreted that most of the samples under study were secondary. The above table shows the distribution samples according to their area of residence. It shows that in frequency for 18 of the samples belongs to the urban area (the percentage score of 30%); in the frequency for 42 of the samples belongs to the rural area (the percentage score of 70%); Hence it was interpreted that most of the samples under study were between area of residence of rural area. The above table shows the distribution samples according to their occupation. It shows that in frequency for 49 of the samples belongs to the housewife (the percentage score of 81.66%); in the frequency for 1 of the samples belongs to the private service (the percentage score of 1.66%); the frequency for 10 of the samples belongs to the others (the percentage score of 16.66%); in government service are no representative samples. Hence it was interpreted that most of the samples under study were between occupations of housewife

The above table shows the distribution samples according to their monthly income. It shows that in frequency for 31 of the samples belongs to the 5000-10000 (the percentage score of 51.66%); in the frequency for 15 of the samples belongs to the 10001-15000 (the percentage score of 25%); the frequency for 6 of the samples belongs to the

15001-20000 (the percentage score of 10%); in frequency for 3 of the samples belongs to the 20001-25000 (the percentage score of 5%); in the frequency for 5 of the samples belongs to the 30000 & above (the percentage score of 8.33%); Hence it was interpreted that most of the samples under study were between monthly income of 5000-10000 (Chaithra 2012).

The above table shows the distribution samples according to their number of parity. It shows that in frequency for 37 of the samples belongs to the primipara (the percentage score of 61.66%); in the frequency for 23 of the samples belongs to the multipara (the percentage score of 38.33%); in grandpara are no representative samples; Hence it was interpreted that most of the samples under study were between number of parity of primipara (Chochrane 2009).

Table 2. Level of assessment of episiotomy wound healing among postnatal mothers						
Sr.No	Factors Responsible For Episiotomy Wound Healing	Yes	No			
1.	Poor Nutrition:					
	• Anaemia	43(71.66%)	17(28.33%)			
2.	Infection:					
	 Vulvovaginitis 	6(10%)	54(90%)			
	• Urinary Tract Infection	14(23.33%)	46(76.66%)			
	 Surgical site infection 	1(1.66%)	59(98.33%)			
3.	Perineal Injury:					
	Perineal Tear	5(8.33%)	55(91.66%)			
4.	Medications: Antibiotic Prophylaxis					
	 Before episiotomy 	4(6.66%)	56(93.33%)			
	 After episiotomy 	60(100%)	0(0%)			
5.	Obesity	1(1.66%)	59(98.33%)			
6.	Hypothyroidism	7(11.66%)	53(88.33%)			
7.	Diabetes Mellitus	4(6.66%)	56(93.33%)			
8.	Hypertension	10(16.66%)	50(83.33%)			
9.	Edema	50(83.33%)	10(16.66%)			
*Anemia assessed by Hb % estimation						

The above table shows the distribution samples according to their type of delivery. It shows that in frequency for 44 of the samples belongs to the spontaneous labour (the percentage score of 73.33%); in the frequency for 16 of the samples belongs to the induced labour (the percentage score of 26.66%); Hence it was interpreted that most of the samples under study were between type of delivery of spontaneous labour (D'Gregorio 2010).

The above table shows the distribution samples according to their type of episiotomy incision. It shows that in frequency for 59 of the samples belongs to the mediolateral (the percentage score of 98.33%); in the frequency for 1 of the samples belongs to the median (the percentage score of 1.66%). Hence it was interpreted

that most of the samples under study were between type of episiotomy incision of mediolateral. The above table shows the distribution samples according to their nutritional pattern. It shows that in frequency for 43of the samples belongs to the vegetarian (the percentage score of 71.66%); in the frequency for 17 of the samples belongs to the mixed (the percentage score of 28.33%). Hence it was interpreted that most of the samples under study were vegetarian in type of nutritional pattern.

Section B: Level Of Assessment Of Episiotomy Wound Healing Among Postnatal Mothers From A.V.B.R.H.

This section deals with level of assessment of episiotomy wound healing among postnatal mothers from AVBRH. The above table shows 71.66% of the postnatal mothers of anemia, 10% of the have vulvovaginitis, 23.33% of had uninary tract infection, 1.66% of had surgical site infection, 8.33% of had perineal tear, 6.66% of had before

episiotomy, 100% of had after episiotomy, 1.66% of had obesity, 11.66% of had hypothyrodium, 6.66% of had diabetes mellitus, 16.66 of had hypertension, 83.33% of had edema (Swati 2018).

Table 3. Association of episiotomy wound healing score among postnatal mothersin relation to their age n=60				
Age (yrs)	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
18-25 yrs	37	4.13±0.88	0.53	0.58
26-30 yrs	21	4.42 <u>+</u> 1.39		N3,p>0.05
30-35 yrs	2	4.50±0.70		
35-40 yrs	0	0±0		
40 & above	0	0±0		

Table 4. Association of episiotomy wound healing score among postnatal mothers in relation to their educational status n=60

Educational Status	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
Primary	13	4.07 <u>+</u> 0.95		
Secondary	29	4.34±1.04		0.54
Higher secondary	8	4.50±1.05	0.77	
Graduate	7	3.71 <u>+</u> 1.49		NS,p>0.05
Post – graduate	3	4.66±1.15		
& above				

Table 5. Association of episiotomy wound healing score among postnatal mothers in relation to area of residence n=60				
Area of residence	No. of postnatal mothers	Mean episiotomy wound healing score	t-value	p-value

	postnatal mothers	wound healing score		1
Urban	18	4.38±1.14	0.54	0.52 NS,p>0.05
Rural	42	4.19±1.06		

Section C: Association Of Level Of Episiotomy Wound Healing Score Among Postnatal Mothers In Relation To Demographic Variables.

This table shows the association of episiotomy wound healing score with age in years of postnatal mothers. The tabulated 'F' values was 3.15(df=2,57) which is much higher than the calculated 'F' i.e. 0.53 at 5% level of significance. Also the calculated 'p'=0.58 which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that age in years of postnatal mothers is statistically not associated with their episiotomy wound healing score.

This table shows the association of episiotomy wound healing score with educational level of postnatal mothers. The tabulated 'F' values was 2.52(df=4,55) which is much higher than the calculated 'F' i.e. 0.77 at 5% level of significance. Also the calculated 'p'=0.54 which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that educational level of postnatal mothers is statistically not associated with their episiotomy wound healing score.

This table shows the association of episiotomy wound healing score with area of residence of postnatal mothers. The tabulated 't' values was 2.00(df=58) which is much higher than the calculated 't' i.e. 0.54 at 5% level of significance. Also the calculated 'p'=0.52 which was much higher than the acceptable level of significance i.e.

'p'=0.05. Hence it is interpreted that area of residence of postnatal mothers is statistically not associated with their episiotomy wound healing score (El-Nagger 2012).

Table 6. Association of episiotomy wound healing score among postnatal mothers in relation to occupation $n=60$				
Occupation	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
Housewife	49	4.34±1.01	2 77	0.071
Government service	0	0±0	2.11	NS,p>0.05
Others	10	4±1.24		

Table 7. Association of episiotomy wound healing score among postnatal mothers in relation to monthly income (Rs) n=60

Monthly income(Rs)	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
5000-10000	31	4±1.12		
10001-15000	15	4.73±0.96		0.026
15001-20000	6	4.83±0.75	2.96	
20001-25000	3	3±1		S,p<0.05
30000 Et	5	4.40 <u>+</u> 0.54		
above				

This table shows the association of episiotomy wound healing score with occupation of postnatal mothers. The tabulated 'F' values was 3.15(df=2,57) which is much higher than the calculated 'F' i.e. 2.77 at 5% level of significance. Also the calculated 'p'=0.071 which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that occupation of postnatal mothers is statistically not associated with their episiotomy wound healing score (Graham 2005).

This table shows the association of episiotomy wound healing score with monthly family income(Rs) of postnatal mothers. The tabulated 'F' values was 2.52(df=4,55) which is less than the calculated 'F' i.e. 2.96 at 5% level of significance. Also the calculated 'p'=0.026 which was less than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that monthly family income(Rs) of postnatal mothers is statistically associated with their episiotomy wound healing score (Jacob 2005).

This table shows the association of episiotomy wound healing score with parity of postnatal mothers. The tabulated't' values was 2.00(df=58) which is much higher than the calculated't' i.e. 1.04 at 5% level of significance. Also the calculated 'p'=0.30 which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that parity of postnatal mothers is statistically associated with their episiotomy wound healing score (Michel 2006).

This table shows the association of episiotomy wound healing score with type of delivery of postnatal mothers. The tabulated't' values was 2.00(df=58) which is less than the calculated 't' i.e. 2.22 at 5% level of significance. Also the calculated 'p'=0.030 which was less than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that type of delivery of postnatal mothers is statistically associated with their episiotomy wound healing score (Mohamed 2012).

This table shows the association of episiotomy wound healing score with type of episiotomy incision of postnatal mothers. The tabulated't' values was 2.00(df=58) which is much higher than the calculated't' i.e. 1.16 at 5% level of significance. Also the calculated 'p'=0.24 which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that type of episiotomy incision of postnatal mothers is statistically not associated with their episiotomy wound healing score (Pankaj 2005).

This table shows the association of episiotomy wound healing score with nutritional pattern of postnatal mothers. The tabulated't' values was 2.00(df=58) which is less than the calculated 't' i.e. 2.71 at 5% level of significance. Also the calculated 'p'=0.009 which was less than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that nutritional pattern

of postnatal mothers is statistically associated with their episiotomy wound healing score (Perineum 2012).

Table 8. Association of episiotomy wound healing score among postnatal mothers in relation to parity $n=60$				
Parity	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
Primipara	37	4.13±0.91		0.30
Multipara	23	4.43±1.30	1.04	
Grandpara	0	0±0		NS,p>0.05

Table 9. Association of episiotomy wound healing score among postnatal mothers in relation to type of delivery n=60

Type of Delivery	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
Spontaneous labour	44	4.05±0.99		0.030
Induced labour	16	4.75±1.18	2.22	
Instrumental			1	S,p<0.05
delivery	0	0±0		

Table 10. Association of episiotomy wound healing score among postnatal mothers in relation to type of episiotomy incision. n=60

Episiotomy incision	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
Medio lateral	59	4.27±1.08		0.24
Median	1	3±0	1.16	
Lateral	0	0±0		NS,p [>0.05
'J' type	0	0±0		

Table 11. Association of episiotomy wound healing score among postnatal mothers in relation to nutritional pattern n=60

Nutritional Pattern	No. of postnatal mothers	Mean episiotomy wound healing score	F-value	p-value
SVegetarian	43	4.02±1.01		0.009
Non- vegetarian	0	0±0	2.71	
Mixed	17	4.82±1.07		S,p<0.05

DISCUSSION

A non probability convenient sample of 60 subjects was drawn from the study population, who were from selected AVBRH Sawangi (Meghe) Wardha. The data obtained to describe the sample characteristics including age, education, Area of residence, number of parity, type of delivery, occupation, nutritional pattern, monthly income, type of episiotomy incision. The association of episiotomy wound healing score with age, educational level, area of residence, occupation and type of episiotomy incision of postnatal mothers is statistically not associated with their episiotomy wound healing score (Usha 2016).

Moon et al.,

The association of episiotomy wound healing score with monthly family income (Rs), parity, type of delivery and nutritional pattern of postnatal mothers is statistically associated with their episiotomy wound healing score. Uygur, Yesildalar, Kis & Sisphi (2004) conducted a study on early repair of episiotomy dehiscence on 37 patients in Hanim maternity hospital, Turkey. Out of 37 patients,12 patients were allowed to heal by secondary intention and 25 patients underwent early repair. All the episiotomies were medio-lateral. Infection was the obvious cause of dehiscence in 25 women. Among the patients treated by early repair, 3 patients had superficial separation of skin edges. The study concluded that with adequate pre- operative care, primarily wound cleansing and intravenous antibiotics, early repair of episiotomy dehiscence was safe and effective.

Demitrov, Tsenov (2000) conducted a prospective study on causes for healing complications in episiotomy on 33 puerperal women. The cases were divided into two groups: the first group were 12 women with normal healing of episiotomy and second group consists of 21 cases with wound healing complications, divided into 3 sub -groups:13 with edematous and erythematous edges; 5 with superficial dehiscence in the area of introitus vaginae and 3 with entirely open episiotomies. The study high lightened that episiotomy wound healing was influenced by age of the women, parity, duration of labour, and duration of rupture of membranes. Gracy, Limanowski, Wydukam (1998) conducted a comparative study on healing and patient comfort parameters between interrupted and subcutis polyglycolic acid suture used for episiotomy repair after delivery. Follow up was done during hospital stay, and two months after delivery. The data collection tool was self-administered questionnaire, enquiring about perineal pain, resumption of sexual intercourse and cosmetics of suture time. The study highlighted that at the 3rd day postpartum examination patients with sub cut is sutures had significantly better healing.14

Hirsch (1997) article on episiotomy and its complications stated that median episiotomy, has a higher risk of third degree laceration. Medio-lateral episiotomy was followed by postpartum pain and impaired wound healing. For good healing of an episiotomy or a perineal laceration, suturing with non-reactive suture material is mandatory.A randomized controlled trial study was conducted to assess the effect of suture materials used in perineal repair undertaken by midwives with a sample of 391 women. The subjects were randomly allocated for repair with either polyglycolic acid (194) or chromic catgut (197). The study concluded that primiparity was a statistically significant predictor of pain, compared with multiparty at day 1 (82.1% versus 65.3%) and day 3 (70.2% versus 56.2%). There was no statically significant difference in perineal pain between the two suture materials at any time point, with and without parity adjustment.

Implication: The findings of the study have several

implications for nursing practice, nursing administration, nursing education and nursing research.

Nursing Practice: The nurse plays a vital and major role in the healthcare delivery system. Nurse midwives have an important role to play in the care of perineal trauma due to episiotomy. She is the one who works in the immediate environment with the patients and hence she has all the opportunity to identify the needs and problems. Each nurse midwife should provide one to one comprehensive care to clients to prevent long term puerperal complications. There is a need for the nurses to teach the clients about perineal hygiene and the factors responsible of episiotomy wound healing. If women are given a clear explanation of the self-care, they tend to do it well. Perineal care is an easy procedure to learn and the mother can be instructed to carry it out herself as soon as she is ambulatory.

Nursing Administration: Nursing administration improves economic and social standards. It contributes to the healthy economy of a hospital or institution by making effective utilization of its resources and bringing fair returns on investment. The nursing administration should look into the need for organizing in-service and continuing nursing education programs for staff nurses in order to update their knowledge regarding episiotomy care. Nursing administration must awaken to the fact that patient education is a necessity and should provide resources in terms of manpower, money and material.

Nursing Education: The nurses will need assessment skills, technical competence and the ability to deal with the rapid changes in the environment. The knowledge base and technology used in providing nursing care will continue to increase as well as the nurse's need for skill and ability. Nursing curriculum should be equipped with knowledge and skills to prepare efficient and skillful nurses to provide quality nursing care. Nursing students should be given updated knowledge on recent practices and trends of episiotomy care. Nurses will be required to provide more in-depth education on self-care practices to patients. Educator will help students, colleagues and junior staff to be trained using the awareness about the episiotomy wound healing (Thacker 1983).

Nursing Research: Use of research findings should become a part of the quality assurance evaluation to evaluate individual performance as a whole. The study will motivate initial researchers to conduct the study on large scale selected care measures to protect the perineum may reduce the maternal morbidity. It is a topic that requires further evaluation through well designed and implemented research.

Recommendations:

- 1. The same study could be undertaken with larger samples to show strong statistical associations.
- 2. The similar study can be conducted on Selective episiotomy vs. implementation of a non-episiotomy protocol: a randomized clinical trial

- 3. Pattern of episiotomy use & its immediate complications among vaginal deliveries in tertiary care hospitals and or various setting.
- 4. Episiotomy Practice: Changes and Evidence-based Practice
- 5. Comparison: Policy of selective/restrictive compared with routine or liberal use of episiotomy.

CONCLUSION

After normal vaginal delivery the mother has to adjust to physical changes in her own body due to involution and lactation. She also has to come up with the new demands on her time and emotions made by the new born baby. The discomfort of episiotomy is an added concern in the already overstressed situation. Episiotomy, despite evidence that it is an unnecessary intervention, is one of the most common surgical procedures performed during the second stage of labour especially in Primigravide women. Perineal trauma due to episiotomy causes a number of distressing conditions in the postnatal period. It causes pain, discomfort, disturbed normal activities; it gives the mother a feeling of inadequacy, increased the risk of infection, prolongs postnatal recovery and increased the cost of healthcare. After the detailed analysis, this study leads to following conclusion. It empowers a mother with the ability to do her normal activities earlier than normal. It also decreases the risk of infection by increasing vascularity, enhances quick recovery and shortens the hospitalization period and thereby minimizing the healthcare cost.

Ethical Approval: Approved by Institutional Ethical committee on 12/10/2019.the reference No. is DMIMS (DU)/IEC/Sept-2019/8497.

Patient inform Consent: Informed consent has been taken at the time of data collection.

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Suspension Model of Fluid Particle for Blood Flow Through Balloon Catheterized Elliptic Shaped Stenosed Artery

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ABSTRACT

This current work is concerned with the realization of fluid flow through arterial catheterization (inserting of balloon inside the arteries to fracture the stenosis). The blood is considered as two-phase fluid, in which first one is the particle phase which consists the red blood cells (erythrocyte) and the second is fluid phase, consists the plasma. It is found that blood, which is mixture of red cells in plasma, and behaves as non-Newtonian at a low shear rate. Solutions for fluid velocity (uf), shear stress at wall (τ_w) and the shearing stress on the wall at throat of the stenosis (τ_s) are obtained analytically. The insertion of balloon with catheter into diseased i.e. Stenosed artery leads to adequate change in the magnitudes of fluid flow characteristics. It is noticed that the WSS (τ_w) decreases with increasing values of the displacement in axial direction of the balloon, while the WSS (τ_w) increases with the increasing volume fraction density of the particles, the radius of the inner tube, which keeps the balloon in position k and the maximum height attained by the balloon.

KEY WORDS: STENOSIS, HEMATOCRIT, SUSPENSION MODEL, SHEAR STRESS, CATHETERIZED ARTERY.

INTRODUCTION

The circulatory system of blood in mammals due to its complicated nature is always the subject of research that leads to the diagnosis of a number of cardiovascular diseases like angina myocardial infarction. Various theoretical and experimental efforts are carried out just to find out the blood flow behavior when it flows in artery and veins of living beings. Stenosis is the unusual and non-natural growth in the arterial wall thicknes in cardiovascular system under unhealthy condition. In Biology, the meaning of stenosis is narrowing of any body passage, tube or orifice or in simple form it can say that stenosis is the accumulation of cholesterol and other substances on the endothelium and by the proliferation of connective tissues in an arterial wall. The stenosis blocks the supply of blood to the brain and heart and causes, heart attack and various cardiovascular diseases. Researchers Fry, Dintenfass explained that the fluid



dynamics properties play a significant role in circulation of fluid (Maiti 2016).

To understand the role of stenosis in blood flow through an artery, several works have been carried out by Young Shukla et al., Most of the work is based on the assumption that blood is considered as Newtonian fluid. But in practical nature, blood shows non-Newtonian behaviour under some conditions. It is practically found that blood, being a suspension of red cells (erythrocyte) in plasma, blood behaves like non-Newtonian fluid at a low shear rate (Han and Barnett, Whitemore). The studies relating variation of the resistance to flow and the shear stress at wall with the axial distance and the depth of the stenosis has explained by many authors. Fung analyzed that an accurate description of the blood in small vessels requires the consideration of red cells as discrete particles.

The length of artery is taken large enough as compared to radius of artery so that the onset point, end point and special wall effects can be neglected. Young observed that blood can be assumed as Newtonian fluid when it passes through narrow arteries at low shear rate particularly in diseased state, while blood being suspension of corpuscles in plasma acts as a non-Newtonian fluid, when it flows inside larger arteries at high shear rate. An effort has been made to analyze the influence of arterial catheterization (widening of arteries by a balloon in the existance of mild stenosis) on the flow characteristics of fluid flowing in



arteries explained by a two-fluid model of particle-fluid suspension. The arterial wall has been considered hard and elastic. The wall of the artery is assumed relatively rigid, when stenoses develop in circulatory system. In the present time, the use of catheters has become an important tool for diagnosis and treatment in medical Science (Han & Barnett 1973).

It is a polyester based thermoplastic polyurethane, medical grade polyvinyl chloride. Catheter is moved to the location of stenosis sincerely in the arteries and balloon is then inflated to break the fatty deposit substances and widen the narrowed portion. An inserted catheter modifies the pressure distribution and changes the flow of fluid with the assumption of slip velocity or zero slip at the vessel wall as explained by Haynes and Cokelet et al. . Blood flow model for flow of blood through catheterized stenosed artery has been prepared by Mekheimer and Kothari. During the blood flow red blood cells act as discrete particles i.e. blood is considered as two-phase fluid in which the particle phase consist the red blood cells (erythrocyte) and the fluid phase consists the plasma. The equations in the case of mild stenosis and the boundary conditions has solved analytically for the axial velocity. By considering the blood vessels to be cylindrical in shape, Prakash has studied the flow of blood in stenosed artery for blood as the Casson fluid. Maiti studied the role of arterial stenosis on blood as Herschel-Bulkley fluid under slip velocity. Wu et al. prepared a fluid suspension model for blood flow. Therefore, it is perhaps more appropriate to treat the blood like a double -phase fluid, that is, a suspension of red blood cells and plasma (Young 1968).

In this research paper, generalized equations for fluid in motion and particle phases has been solved and expressions for blood flow characteristics basically, the shear stress at wall (τ_w), and shearing stress at the maximum height (τ_s) of the stenosis have formulated and has discussed qualitatively (Young & Tsai 1973).

Mathematical formulation

Consider the axisymmetric flow of blood, through the gap between an artery of circular cross section with elliptic shaped stenosis as depicted in figure -1 and the inner tube have a balloon. Mathematically, the geometry of artery with elliptic shaped mild stenosis and balloon model is defined by functions R(z) and $R_{\rm b}(z)$ respectively

$$\frac{R(z)}{R_0} = \begin{cases} 1 - \frac{\delta}{R_0} \sin\left[\frac{\pi(z-d)}{l_0}\right] & d \le z \le d + l_0 \ , \\ 1 & \text{otherwise,} \end{cases}$$
(1)

$$\frac{R_b}{R_0} = \begin{cases} k + \delta_1 \exp\left[-\pi^2 \left\{z - z_d - \left(\frac{1}{2}\right)\right\}^2\right] & d \le z \le d + l_0, \\ k & \text{otherwise.} \end{cases}$$
(2)

where

R(z) Radius of stenotic portion of the artery . R0 Radius of non- stenotic artery.

l length of the arterial segment.

 l_0 length of the stenotic portion of the artery.

d: stenosis location

Blood is assumed as suspension of all erythrocytes i.e.

red cell and plasma mixture. Equations representing two layered suspension blood flow in case of mild stenosis $\frac{\delta}{R_0} \ll 1$, are given as.

$$\frac{1}{r}\frac{\partial}{\sigma_{t}}\left(r\frac{\partial u_{f}}{\partial r}\right) = \frac{1}{(1-c)\mu_{s}}\frac{dp}{dz},$$
(3)

$$\frac{\partial p}{\partial x} = 0,$$
 (4)

$$C_{a_{p}}^{d_{p}} = CS(u_{f} - u_{p}).$$
(5)

Where

u_f= axial velocity component of fluid,

u_n = axial velocity component of particle,

C = Volume fraction density of the particle which is constant also called haematocrit,

S= drag coefficient of interaction.

 $\rho_{\rm f}$ = Fluid density,

 $\rho_{\rm p}$ = Particle density,

 μ_s = suspension viscosity of fluid,

 kR_0 = Inner radius of artery which keep balloon in position k<<1,

 Z_d = Displacement in axial direction of the balloon.

The boundary condition are

$u_f = 0, u_p = 0$	at $r = R(z)$	(6)
$u_f = 0, u_p = 0$	at $r = R_b(z)$	(0)
$\mu_{s}(c) = \frac{\mu_{0}}{1-mc},$		(7)
m = 0.070 exp[2.49C +	(1107/T)exp(-1.69c)],	(8)

$$S = \frac{9}{2} \frac{\mu_0}{b^2} \frac{4+3[6-3c^2]^{3/2}+3c}{(2-3c)^2}.$$
 (9)

 $\label{eq:model} \begin{array}{l} \mu_0 = \mbox{fluid} \mbox{(suspending medium) viscosity,} \\ b_0 = \mbox{radius of erythrocytes,} \\ T = \mbox{temperature.} \\ \mbox{Solution of problem} \end{array}$

Solving equations (3), (4) and (5) with boundary conditions equation (6) yields the following expression for the fluid veocity uf and particle velocity up as given below

$$u_{f} = -\frac{\frac{R_{0}^{2}\frac{dp}{dx}}{4(1-C)\mu_{g}}}{4(1-C)\mu_{g}} \left\{ \left(\frac{R}{R_{0}}\right)^{2} - \left(\frac{r}{R_{0}}\right)^{2} - \frac{\left[\left(\frac{R}{R_{0}}\right)^{2} - \left(\frac{R_{0}}{R_{0}}\right)^{2}\right] \log\left(\frac{r}{R_{0}}\right)}{\log\left(\frac{R_{0}}{R}\right)} \right\},$$
(10)

$$u_{p} = \left[-\frac{R_{0}^{2} \frac{dp}{d\pi}}{4(1-C)\mu_{a}} \left\{ \left(\frac{R}{R_{0}} \right)^{2} - \left(\frac{r}{R_{0}} \right)^{2} - \frac{\left[\left(\frac{R}{R_{0}} \right)^{2} - \left(\frac{R}{R_{0}} \right)^{2} \right] \log \left(\frac{r}{R_{0}} \right)}{\log \left(\frac{R}{R_{0}} \right)} + \frac{4(1-C)\mu_{a}}{8R_{0}^{2}} \right\} \right].$$
(11)

The volumetric flow rate given as

$$Q = 2(1 - C) \int_{R_b}^{R} ru_{f} dr + 2C \int_{R_b}^{R} ru_{p} dr,$$

Using equations (10) and (11) and then solving, it

 $Q = -\frac{\left(\frac{dp}{dg}\right)R_{0}^{4}}{8(1-c)\mu_{g}}\left\{\left(\frac{R}{R_{0}}\right)^{2} - \beta^{2}\right\}\left\{\left(\frac{R}{R_{0}}\right)^{2} + \beta^{2} - \frac{\left\{\left(\frac{R}{R_{0}}\right)^{2} - \beta^{2}\right\}}{\left[\log\left(\frac{R}{R_{0}}\right)^{2}\right]} + \alpha\right\}.$ (12)

Where $\alpha = \frac{8C(1-C)\mu_s}{sR_z^2}$ is suspension parameter.

344

$$\begin{split} & \beta = \frac{R_{h}}{R_{h}}, \\ Q = -\frac{(dp/dz)}{\pi(1-c)\mu_{h}} \left[\frac{1}{4(z)} \right], \\ & \text{Where } \varphi(z) = \frac{1}{\left[\left(\frac{R}{2z} \right)^{2} - \beta^{2} \right] \left[\left(\frac{R}{2z} \right)^{2} + \beta^{2} - \frac{\left(\frac{R}{2z} \right)^{2} - \beta^{2} \right]}{\log \left[\frac{R}{2z} \right]} \right]}, \end{split}$$
(13)

$$\Rightarrow \frac{dp}{dz} = -\theta(1-c)\mu_{y}Q\varphi(z).$$
(14)
Shear stress at wall (WSS) is given by

$$\overline{\tau}_{R} = -\frac{R}{2} \frac{dp}{dz}, \\ \overline{\tau}_{R} = -\frac{R}{2} \frac{dp}{dz}, \\ \overline{\tau}_{R} = -\frac{R}{2} \frac{dp}{dz}, \\ \overline{\tau}_{R} = \frac{4(1-c)\left(\frac{R}{2z} \right)^{2}q_{\mu}\varphi(z)}{\pi R^{2}}, \\ \overline{\tau}_{R} = -\frac{R}{2} \frac{dp}{dz}, \\ \overline{\tau}_{R} = \frac{4(1-c)\left(\frac{R}{2z} \right)^{2}q_{\mu}\varphi(z)}{\pi R^{2}}, \\ \overline{\tau}_{R} = \frac{\pi}{\tau_{0}}, \\ \overline{\tau}_{R} = \frac{\pi}{\tau_{0}},$$

Shear stress at the stenosis throat (τ_s) is given as $\tau_s = [\tau_R]_{\frac{R}{R_0} = \left(1 - \frac{\delta}{R_0}\right)}.$

RESULTS AND DISCUSSION

To evaluate analytic results, obtained for axial velocity profile of fluid (u) the shear stress at wall (τ_{ij}) and shearing stress at stenosis computer codes are developed. In order to estimate the quantative effects of the various parameters at the temprature of 25°C.

(16)





The values of parameters using following data; δ/RO $(\text{stenosis height}) = 0,0.05, 0.10, 0.15, 0.2; \delta 1/R0$ (balooon height) = 0, 0.1,0.2,0.3; zd = 0.75,0.95,1.15; d = 0.75; k = 0.01, 0.05, 0.10 and presented graphically.

Figures 2-4 indicate, how the axial velocity (uf) of fluid is influenced by the radius of catheter by fixing the other parameters. The nature of the axial velocity (uf) is seen parabolic in the annular space between the artery wall and the balloon wall. It is observed from figures that the axial velocity (uf) attains its maximum value at r = 0.5then decreases gradually. Graphs 2 and 3 demonstrate that axial velocity (uf) decreases with increasing values of $\delta 1$, k while graph 4 revels that axial velocity increases with increasing values of zd (Mishra 1993).





Shear stress at wall is very important flow characteristic to understand the development of stenosed arterial disease. The variations of wall shear stress (WSS) (τ_{w}) and shear stress at stenosis throat (τ_{c}) with different parameters have been shown in figures 5 -11. The magnitude of shear stress at wall (τ_w) in the stenosis constriction region ($0.75 \le z \le 1.75$) starts increasing at the

Lal & Jha

begining of the stenosis at (z = 0.75) upto its maximum constriction (z = 1.25) at the throat of the stenosis then the curve is decreasing gradually to reach end point (z = 1.75) of the constriction.







The nature of variations in wall shear stress distribution, (τ_w) and its value at the stenosis throat, with respect to the parameters C, δ 1, k and zd are shown in figures 5-7. Figure 5 describes the distribution of shear stress at wall, (τ_w) in the stenosis constriction region for different values of the volume fraction density C. It increases with

increasing value of C for fixed value of $\delta/R0$, $\delta1$ and k. The wall shear stress distribution, (τ_w) increases with increasing value of $\delta1$ for some fixed values of $\delta/R0$, C and k in the stenotic region (Figure 6), while it decreases with increasing value of zd in the same region for fixed $\delta/R0$, C, $\delta1$ and k (Figure 7). Also (τ_w) increases with increasing value of k in the stenotic region for fixed $\delta/$ R0, C and $\delta1$ (Figure 8) (Mekheimer 2010).



The variations of shearing stress at the stenosis throat, (τ_s) with the stenosis size, $\delta/R0$ are shown in figures 9-11. Figure-9 describes, (τ_w) increases with increasing values of k and C {(k,C) = (0.01,0.2), (0.05,0.2), (0.1,0.2), (0.03,0.1), (0.03,0.2), (0.03,0.2) } for fixed z, $\delta1$, zd. Figure 10 shows (τ_s) decreases with increasing of zd and fixed value $\delta1(0.1)$ i.e. {(zd, $\delta1$) = (0.75,0.1), (0.95,0.1) , (1.15,0.1)} and increases with increasing values of $\delta1$ i.e {(zd, $\delta1$) = (0.75,0.15), (0.75,0.20), (0.75,0.25)} for fixed values of z, C and k.

In figure 11, the variations of shearing stress at stenosis throat (τ_s) with the volume fraction density C have been demonstrate for different values of δ /R0 and δ 1. It is seen that shearing stress at the stenosis throat, τ_s increases with {(δ /R0, δ 1) = (0,0.1), (0,0.2), (0,0.2), (0.1,0), (0.2,0), (0.3,0) } increasing values of stenosis size, δ /R0, δ 1. Also

 (τ_s) increases with increasing values of C, because of the apparent viscosity of fluid increases with increasing erythrocytes concentration in blood.



CONCLUSION

A mathematical model has been developed, for the flow of blood through axi-symmetric coaxial tubes such that the outer tube consist an axially symmetric mild elliptic shaped stenosis and the inner tube consist a balloon which is also axi-symmetric in nature. Graphical results are dipicted for the fluid velocity profile in axial direction, distributions of WSS, shear stress at stenosed throat. The main finding in brief are given as follows:

- Axial velocity decreases corresponding with raising values of δ1, k while it shows reverse nature for balloon displacement i.e. zd.
- It is seen that the flow characteristics WSS consider higher magnitude in particle fluid suspension than that in particle free flow (i.e. C = 0). WSS attains its highest value at maximum heights of stenosis (throat) and lowest at the ending of the stenosis and at the onset of the normal region of the artery.
- Shearing stress at throat of stenosis (τ_s) with the volume fraction density C have been studied for different values of δ/R0 and δ1. It is seen that, (τ_s) increases corresponding with, raising values of stenosis size, δ/R0, C and δ1. Also it shows same nature in variation of k and C.

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Ligaplants: A New Era in Dental Engineering

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ABSTRACT

In today's era, replacement of teeth by a more advanced and fixed therapeutic modality has gained popularity in the field of dentistry. Natural tooth consists of periodontal ligament which acts as a shock absorber providing tooth movement in the socket and also delivers the progenitor cells for alveolar bone formation and remodelling. Dental implants serve as the prosthesis with lacking this ligament tissue further laying out a direct attachment of the implant with the bone. This reduces the biological performance. Currently osseointegrated implants are agreed to be highly acceptable implants based on high clinical long term survival rate. Tissue engineering has laid the foundation of implants with periodontal ligament which has provided a breakthrough in the surgical field of dentistry. This quantum leap is termed as Ligaplants serving as a perfect replica of tooth in the socket. It can be described to be a combination of implants with ligament. They are considered to be an innovative treatment modality for teeth replacement, several trials being done in invivo and invitro. Ligaplants are being studied to prolong the life of prosthesis duplicating the natural tooth. This review paper provides an insight of the various procedures for obtaining Ligaplants, the risk factors involved and the merits and demerits of this development. Also, the clinical importance will be given an emphasis during the placement of ligaplants.

KEY WORDS: LIGAPLANTS, TISSUE ENGINEERING, DENTAL IMPLANTS, PERIODONTAL LIGAMENT.

INTRODUCTION

Ligaplants: A New Era in Dental Engineering: Implant dentistry has become a called for branch of conventional dental field in this generation of dental practice. Fixed and partial dentures are restored by implants which further improves the quality of life. The reverberation of this speciality is a combination of various reasons such as failures linked to fixed partial denture and removable partial dentures and also prolonging the life span of ageing population.

The high predictability and long term success rate can be attributed to the attachment of implant with bone post cellular and molecular activities taking place at the implant bone interface. Branemark's work contributed to the osseointegrated dental implants which shows the

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direct contact between bone and implant. This direct attachment is termed as "Osseointegration". There have been various complications pertaining to implants which can be operator and patient factors or surgical procedure related. The success rate of implants depends on factors such as sufficient jaw bone height and width, operator's experience, patient case selection and the type of dental implant chosen (Aeran 2021).

Periodontal ligament is a highly vascular connective tissue which acts like a shock absorber allowing tooth movement in its socket. Various vital cells such as osteoblasts, cementoblasts, osteoclasts, cementoclasts and fibroblasts resides in this ligament. The undifferentiated mesenchymal cells which also are accomodated in this tissue shows the amount of regeneration and reestablish the strength of biomechanical tissue. With the extraction of natural teeth, the bony socket is just an empty socket without periodontal ligament attachment fibres. These fibres are lost with the tooth. Due to the absence of these fibres and the periodontal ligament cells there is no regeneration of the ligament possible. Therefore, when implant is placed, the process of healing results in direct bone implant attachment without any intervening ligament for attachment. Due to lack of this periodontal


ligament in implants, there is ankylosis and no mobility as in natural tooth. Many treatment modalities have been planned to improve this property which include alteration of implant surface by surface treatment and growth factors introduced into implant surface.

There was a study conducted by Buser et al1, in which they concluded that when Titanium implants come in proximity to retained root tips, the periodontal ligament houses the cells which envelopes the implant surface during healing. However, a new prospect called" Tissue Engineering" have paved the way in the field of periodontal regeneration. Tissue engineering is known to be a new promising therapeutic approach utilising the dental stem cells for regeneration of new tissues. Tissue engineering involves the three key elements namely scaffold, signaling molecules and cells. The difficulties arousing in the present dental implants can be resolved by development of periodontal ligament cells around by the bioengineering involving the periodontal ligament cell regeneration around the implants. The fusion of the periodontal ligament cells with implants have been termed as "Ligaplants" which is yet again a boon in implant dentistry (Bathla 2021).

Footing of Ligaplants: The interdisciplinary field of tissue engineering shows the principle of engineering and life sciences for evolution of biological substitutes which upgrades and preserves tissue function. This was pioneered by "Langer And Vacanti"2. The study conducted by Lin et al derieved the autologous rat periodontal ligament cells from molar root surface3. A 3 dimensional matrix scaffold called"matrigel" was introduced to organise rat periodontal ligament regeneration at the Titanium implant bone interface. Also, it was observed that periodontal ligament fibroblasts could be harvested from teeth with hopeless prognosis and the cells when further cultured in bioreactors, preserves the differentiation state4. The study carried out showed the extraction of donor tooth, 14days before transplantation and then the same tooth was instantly reimplanted in the actual alveolus. The process of cell proliferation and differentiation occurs during the healing of periodontal ligament which starts as soon as this intentional injury occurs. Post 14 days, the invivo cellular activity enhances and is at its highest activity rate. At this period, the process of transplantation of tooth is done as there are many cells with peak activity attached to its root by the new Sharpey's fibres5,6. Based on this clinical and biological representation, a similar cell culture is conducted around artifical root using engineering process (Buser 1990).

The laboratory steps involved for the invention of this new device is as follows:

Culture Dishes Preparation: The Polystyrene culture dishes were taken and were treated with N isopropylacylamide monomer along with 2-propanaol solution. These dishes were irradiated with electron beam. Thorough rinsing of the polymer grafted dishes with cold water is done to remove engrafted monomer. These dishes were then sterilized with ethylene oxide **7**,8 (Deepa 2018).

Culturing of the cell: The periodontal ligament cells are obtained from the extracted tooth. The periodontal tissue is scraped with the help of scalpel blade from the middle third portion of the root. Dulbecco's modified eagle's minimal essential medium, supplemented with 10% fetal bovine serum and 100units/ml of penicillin-streptomycin is used as the culture medium. The cells obtained from the extracted tooth are now placed on the culture dishes which are kept in a humidified atmosphere of 5%CO₂ at 37 °C. this is supplemented with 50mr/ml ascorbic acid 2-phosphate ,10nm dexamethasone and 10nM β - glycerophosphate. These all substances together will provide an osteodifferentiation medium9.

Bioreactor: Hydroxyapatite coated titanium pins are placed inside a hollow plastic cylinder. These pins are placed in such a manner that at a gap of 3 mm is left around the pin. Culture medium is continuously pumped through the gap. These titanium pins are kept under the growth medium for a time period of 18 days10,11.

Merits

a. Replica of natural tooth root in the alveolar bone socket.

b. The gingival recession and alveolar bone defects of missing tooth can be decreased.Therefore, second surgical option such as bone grafting not required by the patient. The ligaplant induces new bone formation even at large periodontal defect sites eliminating the surgical requirement of bone grafting 11.

c. The periodontal ligament offsets lateral and vertical tooth wear throughout the individual's life span. Thus, there is an adequate movement of the implant inside the bony socket.

Demerits

a. The culturing process is highly technique sensitiveb. The factors taken into consideration is the culture cells, temperature and duration of culture. It can also cause failure in development of periodontal ligament cells.c. Acceptance by the host is highly unpredictable.d. Cost of Ligaplant is because of deficient facilities.

DISCUSSION

In a study done by Gomez Flares M et al in 200812, a multi-layered periodontal ligament cell sheet was found to have regenerative capacity of periodontal ligament and therefore concluded that this strategy can be used for periodontal ligament cell regeneration. Nunez et al in 201213, showed the regenerative potential of periodontal ligament derieved mesenchymal cells. Invivo experiments demonstrated the migration of cementoblast and periodontal ligament fibroblast precursor cells towards dental implant when the implant was in closer proximity to these cells. In a review done by Gulati et al in 201214, many research from Pubmed, Elseiver and Blackwell were extracted and showed succesful studies on Ligaplants and concluded that these implants are a boon to implant dentistry. Kiong and Arjunkumar stated that the surgery of ligaplants are considered to be comparatively easy as the implant is not fitted tightly

to its site due to the periodontal ligament regeneration in between the implant and bone (Gault 2010).

Parlar et al demonstrated that all the tissues of periodontium occupied the implant and bone interface in dog models for periodontal regeneration15. Results of the study done by Byung-Ho Choi in 2000 revealed that once Titanium screw-type implant was placed and the periodontal ligament cells from mid root surface was utilised, there was a perio-integration at the implant and bone interface16. The regenerative potential of periodontal ligament depends on an array of signaling molecules. These molecules consist of their own anatomic code and homeogene-coded transcription factors. The synthesis of cell surface is forced by the homeoproteins. The signals from the cellular surface send a feedback to alter homeogene expression, whereby cell identities are formed based on tissue type and anatomical site. If the mineral formation has to be inhibited, an SLRP protein called asporin is established. However, this has lead to a thought over the risk of Ligaplants and its success rate (Giuseppe 2000).

CONCLUSION

Majority of the literature is done in animals and have showed the generation potential of periodontal ligament like tissue arounfd the implants. Further studies are required in humans as well to understand the function, survival rate and successes of Ligaplants. Therefore, validity of these implants are essential in each research. This revolutionary approach of developing periodontiointegrated implants; has opened up the current implant scenario which have taken implant dentistry to yet another level.

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Graphics in History: An Examination of Visuals in Counter-Reformation Art

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ABSTRACT

The concept of patronage has stayed in society in every era, and great artists were able to make spectacular creations because they had patronage. These sponsorships by kings, popes, and the wealthy people played a multi-dimensional role in society. It did promote art, but it also promoted something 'else'. Because Visual art is something which has an impact on people, even those who are illiterate, that's why it is 'used' for by certain people. The paper examines the concept of patronage in different periods, and focuses on who were patronizing, and most importantly, why they were giving the support.

KEY WORDS: COUNTER-REFORMATION, PATRONAGE, RENAISSANCE, ART.

INTRODUCTION

'Patronage' has always played an essential role in society. It has the power to set the course of any form of art. In visual art, both the style and content of an era was largely determined by the way commissions are given. In Italian, patronage of the arts is called mecenatismo. It is also known as clientelismo, as it refers to the relationship between a patron and his client. Although these 'Patronage' are full of political, religious economic and social motives, still it is only because of 'Patronage' that the great Artist and their art flourished. William Roscoe believes that patronage plays two impotent roles 'encouragement' and 'protection'; but it is also a fact that it is used as a political and religious tool. The question of artistic freedom also comes with patronage. Its effect on mankind is immense, as scholars believes that visual art affects the emotional and subconscious mind.

The Baroque art and Counter-Reformation: The baroque art is the perfect period to understand how the patronage works. There were many motives hidden in



the commissioning of art work. During the course of time, churches became corrupt and the centre of political power. In reaction, reformers like Martin Luther raised their voice and wrote against the Catholic Corruption and Catholic ideology, especially by writing pamphlets, like Martin Luther's Ninety-Five Theses. It is a movement known as Protestantism. They tried to fill the gap that Catholic churches had made between God and people. Catholic churches tried their best to stop, and they became inhuman (Rubinstein 1988). People were killed in the most barbaric way, like burning alive that too in public. A major figure in the Protestant movement, William Tyndale, who translated the Bible into English, was burnt alive. An account of such inhuman events was published by John Day in 1563. The Actes and Monuments (Book of Martyrs) is a book by John Foxe that shows the people's lives, sufferings by Church and brutal deaths.

Such event helped to raise the consciousness in common public, and people in Catholic churches started to have reform in them, which is known as the Counter Reformation. It was a Catholic's answer to the Protestant movement. They tried to fill the gap between God and people in a way in which Catholic churches do not lose their power, that is through art. Art is a powerful medium, and Catholic churches know that art is something that gives more impact than writing. Also, people of that era were not educated, so art was something that could even be understood by illiterate. So a Council of Trent was established in 1545, which took decisions regarding



visual arts. Baroque realistic art became a mean of propaganda for the Roman Catholic church because they were sponsoring it.

This shows the power of patronage that could change the style of an era. There were still religious Madonna, nativities, and crucifixions, but they are quite different from those of the previous Ages. Now they do not look divine or heavenly with a golden aura but look just like one of us. (Rookmaaker 1985) writes that "The artists of the Reformation painted life and the world realistically, without idealizing or glorifying the creature but, instead, showing things as they really were and are, not glossing over sin but not exalting it either" (Francis Schaeffer 1986) states,"At its core, therefore, the Reformation was the removing of the humanistic distortions which had entered the church" For example; Caravaggio's Crucifixion of St. Peter, (1601) or The Supper at Emmaus, (1600) (Figure 1 and 2 respectively).



Figure 2



The Barogue art in Protestant countries: The Protestant art was largely destroyed during the movement. It later survived in the Protestant countries. Protestant artists and their patrons were looking towards art differently. Patrons were wealthy individuals who gave money for, landscapes scenes, portraits of life. For example, the famous picture of Protestant Bishop John Hooper's execution. Many critics believe that Vermeer's The Milkmaid (1658-60) shows the Protestant virtue and pious living. (figure 3) There is an interesting area of patronage which is related to non-religious art works. It sounds strange to many if we study the taste of the middle class of Holland. They sponsor for such art work which they can use to decorate their homes, painting with their own pictures. Moreover, picture of thing they wanted to do in their life or have done. The Northern Europe including Dutch was free and wealthy middle class. Here art was not controlled by Popes or monarchs. So, with the use of amazing light effects and latest technologies like camera obscora, Artists like Vermeer were able to create art work without religious influence. For example, Officer and a Laughing Girl by Vermeer. Another example of individual patronage is when Captain Frans Banninck Cocq commissioned Rembrandt to make his Militia Company's group portrait.

Figure 3



Royal patronage is an exciting area to explore. Kings and rulers have always been the most prominent and most influential patronage in every era. Even in the period of before Christ, Horace wrote about the importance of the patronage. In France, King Louis XIV established French Royal Academy of Fine Arts. With this, he tried to control the art work in France. He started sponsoring the painting through his Royal Academy. It was another type of propaganda, not of God but of a King. All art work sponsored by the academy, would be known as Academic painting. For Example; Rigaud's painting of Louis XIV, 1701.

High renaissance is one of the best eras to be examined in terms of patronage. It widely accepted that the three significant figures of High renaissance are Da Vinci Michelangelo and Raphael. Michelangelo is a legend who is known for his extraordinary art work. However, more interestingly the stories of commissions are as fascinating as his artwork. His every art work has an exciting story of patronage. Michelangelo was quite young (only 26 years) and he had to convince the Opera that he can make it so he should be given the commission. Michelangelo got the commission on 16 August 1501. The commission of David had a political intention (Baggaley 1990). The city of Florence was going through a bad time; it was weak and lost the wars. Ordinary citizens were under pressure of taxes. Political power wanted to revive the spirit of the city by making a symbol of pride. It is another kind of Political Patronage which is different from Royal Patronage, which was discussed earlier.

Julius is known for his religious patronage. Many of the famous art work that we know as High Renaissance art was commissioned by him, that's why is known as "the Renaissance Pope". He commissioned a lot of art works to various people. He commissioned Michelangelo for the painting of the Sistine Chapel ceiling. He commissioned Raphael for making the four wall of his library, where Raphael painted the four branches of human knowledge, including The school of Atens. Raphael also painted his Portrait. He gave extensive commissions of paintings, sculpture, and architecture with a common theme of Christianity. After death of Julius, Michelangelo again commissioned and had to return to the same chapel where he had once painted the ceiling with high spirits of optimism, but now, he was old and filled with pessimism. He made the alter wall. This was the era when patronage was at its peak.

To put in nutshell, patronage has always played a critical role in visual culture. It, on the one hand, provides an opportunity to create a remarkable art which centuries would remember, but on the other hand, it influenced the art. The paper examines different kind of patronages and its role and impact. The paper argues that patronage is a critical element in the understanding of art, and it is an area of study, which should be focused more along with the study of art.

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Intelligent Number Plate Detection System

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ABSTRACT

In this paper, the automatic detection of the number plate using INTEL EDISON to diminish the time taken by the police to discover the criminal for the violations that are going on utilizing vehicles has described. Open CV& Numpy are libraries display in python utilized as a part of extraction of the characters and numbers which are available in the number plate of the vehicle. The input to the libraries would be a picture caught utilizing the camera. The intention of this system is to build an application that may help the police in discovering the culprits inside no time. The character models are prepared initially. The characters on the number plate would be of government given characters. We would prepare it i.e., train it with the goal that the characters show in the tag will be distinguished.

KEY WORDS: INTEL EDISON, IMAGE SENSOR, YOCTO LINUX, AMAZON WEB SERVICES (AWS), OPEN CV, NUMPY.

INTRODUCTION

The fast advancement in people in general transportation framework, has brought out automatic identification of vehicles which has been assuming a critical part in a major part of the applications all through the previous two decades. For illustrations, the identification might use for dealing with the parking facilities, entering of unapproved vehicles into the private zones can be checked, recognition of stolen vehicles, traffic volume can be controlled, ticketing fast vehicles, etc. A standout amongst the best and valuable recognizable proof techniques utilized as a part of numerous applications in visual image processing. Three handling modules are created in the Automatic License Plate Recognition (ALPR) framework; they are, number plate discovery, character division, and character recognition. Among them, the assignment "number plate identification" is most significant stage in the entire ALPR framework. Hues, vertical edges, symmetry, corners, so forth, are the significant highlights utilized for number plate recognition technique.



2. Design Of System: In this application a camera for catching the pictures of the vehicles continuously is utilized. Camera is associated with Intel Edison which acts as edge device which implies that it can perform mathematical calculations by utilizing Open CV functions with a foundation support of Numpy Matrix operations and sends the information to cloud. The input to Intel Edison is the picture caught by a camera. Now picture will be processed by the Edison. The processing includes recognition of the number plate of the vehicle. It is the most essential criteria since we need to know whether there is a vehicle or not in that picture. Recognition of number plate will be the hardest activity in this.

2.1 Number Plate Detection: Number plate is an example made out of a few characters which have high characteristic intensities in their background. The key element to recognize the desired number plate is the high contrast part in the image (Agarwal & Goswami 2016).

3. System Hardware And Software:

3.1 Intel Edison: Intel Edison was developed by Intel, It is a computer-on-module, It can be used as a development system for IoT Application devices. Initially the system was declared to be an indistinguishable shape and size from that of a SD card. It Consists a Intel dual-core Quark x86CPU at 400 MHz communicating via Wi-Fi & Bluetooth. Then after the CPU was changed to a 22 nm Silvermont Intel dual-core Atom CPU, and a moment form of Edison was appeared at IDF in September 2014, the size of which greater and thicker than a standard SD card.



Nakerikanti et al.,

The way of looking at the embedded electronics can be changed using this platform of ultra-small computing. While providing the strong quality of go-to single board computer, every Edison stuff with a gigantic measure of tech goodies into a small bundle. To append a veritable slew of shield-like "blocks" which can stack over each other, a BLE, Wi-Fi, and a 70-pin connector include in the system powered by Intel Atom on Chip Dual-core CPU. The Add-on for Intel Edison can be the base block which permits to append distinctive peripherals like a keyboard, mouse, or thumb drive. Anything which connects to a USB can be presently associated with the Edison which is equipped with a micro AB USB supported by USB OTG and FT231X respectively and we should guarantee that there are no issues in joining outer equipment to Edison.





3.2 Image sensor: A webcam could be a camera that streams its image increasingly through or to a computer to a computer network. The video stream can be viewed after it was caught by the computer and it has shared or sent to different systems completely based on that of

another frameworks. For example, web and assigned as a connection. If the video stream sent to a remote area, it may be viewed, saved, or sent to others. By using a comparable cable or a USB cable or embedded with PC equipment like laptops, a webcam is connected not like an IP camera which associates based on Wi-Fi or Ethernet (Hatim 2017).



3.3 Yocto Linux: The project of Yocto is a collaborative open source project of Linux Foundation that focuses on delivering devices and procedures that aides in empowering the linux disseminations making for embedded programming. These are free of the inserted hardware's hidden engineering. In 2010, the Linux foundation was announced the project in 2010 in collaborative effort with 22 associations involving Open Embedded and it was propelled in March 2011. The primary focal point of the Yocto Project's is to enhance the product advancement process for embedded Linux distributions. The repeatable and fast advancement of Linux-based implanted frameworks empower the metadata, interoperable tools, and procedures that are given by the Yocto Project ,in which each part of the improvement procedure can be tweaked.

3.4 PuTTY: PuTTY is a free terminal and an open-source emulator, system record exchange and serial comfort application. Different types of network protocols have supported such as Raw Socket Association, Telnet, SSH, Rlogin, and SCP. It will consider as the interface using a port. The porting of PuTTY has performed for different alternative frameworks but composed initially for Microsoft Windows. For a few Unix-like phases, official ports can be accessible with work-in advance ports to MacOS and Classic mac OS. Informal ports have superimposed into the stages. For example, Windows Mobile, Symbian, and Windows Phone.

3.5 OpenCV and Numpy: Open CV or Open source Computer Vision focuses on real-time computer vision which could be a library of programming functions. Intel was developed this and Willow Garage had supported the OpenCV, and Itseez is preserved it. Under the BSD license of open-source, the library is liberal and is a cross-platform (Nandan & Tidke 2015).

3.5.1 Applications: The application zones of OpenCV involving:

- Mobile AI
- Human-computer Interaction (HCI)
- Gestures recognition
- System for face recognition
- Egomotion estimation
- 2D&3D feature toolkits
- Understanding of motion
- Objects detection
- Segmentation and recognition A measurable machine learning library is included in Open CV to assist a little of the higher than zones and it includes:
- Support vector machine (SVM)
- Random Forest
- Artificial Neural Networks
- Naïve Bayes Classifier
- K-Nearest Neighbor Algorithm
- Expectation-Maximization algorithm
- Gradient Boosting Trees
- Decision Tree Learning
- Boosting
- Deep Neural Networks (DNN)

The important interface in C⁺⁺ is included in the OpenCV and composed it conjointly in C++. A broad, and additional seasoned C interface is there without regarding the holding a less and much reaching. However, the bindings are available in Python, Java, and Matlab/ Octave. Within the on-line documentation, the API is found for these interfaces. To foster the adoption of wrappers extensively, they develop in various languages like Ruby, CH Haskell, Perl, and C#. In C++ interface of OpenCv, the bigger a part of the new enhancements and calculations are presently created. NumPy could be considered as a library for the programming language of Python in addition to the support of multi-dimensional and immense matrices, and arrays and accumulating the high-level numerical functions largely for figuring out these arrays. With commitments from a couple of totally different engineers, the ancestor of NumPy, Numeric, was originally made by Jim Hugunin. In 2005, NumPy was created by Travis Oliphant by consolidating highlights of the competitive Numarray into Numeric, with broad changes. NumPy has various benefactors because it is open-source programming.

3.6 Amazon web Services (AWS): Amazon.com has an auxiliary part as Amazon Web Services (AWS) that provides the stages of on-request cloud computing for governments, organizations, and people. Based on a complementary setup selection, it is available to accessible for a year on a paid membership. The PCs with a simple virtual cluster can access perpetually on the online are allowed in the innovation. Virtual computers with AWS's version have played a key role in the real computer qualities together with instrumentality (GPU(s) and CPU(s) for hard-plate stockpiling, RAM memory, and making ready); pre-stacked application programming; organizing; and a call of operating frameworks. For example, databases, web servers, CRM, etc. The facultative AWS subscribers and console I/O (mouse, show, and console) virtualize by every AWS system with the AWS system using a contemporary browser. Here, this browser can display as a window to log into the virtual computer, allow the subscribers to sign up, prepare, and use the virtual systems as a true physical laptop. Based on the administrations for their clients and own advantages, AWS systems will send for granting net initially (Nauman 2016).

Implementation: This paper is implemented in an effective way by classifying the procedure into two categories. First thing is the working of the hardware used. In this paper the hardware used includes Intel Edison module and an image sensor. The implementation of hardware is described in the Fig.4.1 shown below. The pictures of vehicles are caught by the image sensor and the caught pictures are sent to the edge device to process the image and extract the text from that image. For the processing of the image for extracting the number plate from the image, we use Open CV and Numpy libraries. Processing includes gray scale imaging i.e., image is converted from RGB to gray scale image. Then, through machine learning techniques like KNearest Neighbors algorithm (KNN) we would get to know the number plate of the vehicle and through crop function in Open CV the image is cropped. This is observed in Fig.4.2.Thresholding function is applied, characters are extracted from the threshold image by Optical Character Recognition(OCR). It can be seen in Fig.4.4.In OCR there would be aloha, numeric are predefined and by comparing with these the characters will be assigned. After processing the obtained number plate is checked. If the obtained number is valid then the data is sent to the cloud (Nguwi 2015).

Here the Fig 4.3 describes about the implementation of the user interface. Webpage is utilized as a UI (user interface). (http://13.126.21.59/SmartSpy/V.html). The client enters the required vehicle number in the field given in the webpage. The different fields are likewise accessible with the end goal of confirmation. After submitting the details in the webpage the data already stored will be checked and if the required number is valid the available area of the vehicle will be displayed. (http://13.126.21.59/SmartSpy/data_display.php)

5. Experimental Study: This system uses image sensor to capture the images and Intel Edison to process and send the data to store it in the server. The Fig 5.1 shows the hardware used. Here is the Fig. 5.2 is the webpage to manually enter the culprit number plate . This IP is global IP. The below fields are mentioned for future scope so that there ought not be any misuse. If they want to misuse it, they would be caught because they are providing mobile number to which the verification code i.e., One Time Password is sent. After submission of the vehicle number it gives an acknowledgment that number is entered successfully. Now if cops need to know the vehicle area, it will be visible if it is detected. Area of the vehicle detected will be shown along with date and time. If a vehicle number is invalid or not been detected, at that point it would show as appeared in Fig.5.5.

Nakerikanti et al.,







CONCLUSION

We can ensure that crimes can be resolved within less time and the victim can trust that they can get back their valuable things which are lost. It is a financially savvy system which requires less hardware. In future, cops would still find hard time in finding criminals by knowing their vehicle number and location so when we detect number plate of required vehicle it would also detect the face and send it to the cops so that it would be easy enough to get them.



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Brain Mri Image Segmentation Using Simple Linear Iterative Clustering (SLIC) Segmentation With Superpixel Fusion

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ABSTRACT

Brain MRI image segmentation is a challenging task owing to the complex texture of the various parts of the brain. The goal of the segmentation is to divide the image into parts so that the classification algorithm can recognize the tumour present in the image. This paper presents a modified Simple Linear Iterative Clustering (SLIC) segmentation algorithm to segment the brain MRI image. The SLIC segmentation divides the brain MRI image into many superpixels. This algorithm uses both spatial intensity value and the pixel positions to form the superpixels. These superpixels are then fused with the neighbouring superpixels to form bigger regions in order to merge similar regions. The fusion operation algorithms to perform better. The proposed segmentation method is compared with existing techniques to analyse the performance. The existing algorithms are compared in terms of execution time, average deviation from and entropy. The experimental results prove that the proposed method segmented the brain MRI image better than the existing algorithms.

KEY WORDS: BRAIN MRI, SEGMENTATION, TUMOUR, SIMPLE LINEAR ITERATIVE CLUSTERING (SLIC).

INTRODUCTION

In the body, the most important part is brain which has included the most complex structure. The study of operations and the increment of diagnosis of diseases complexity are hindered by the presence of skull around the brain. Any specific diseases couldn't be liable to the brain like the other remaining parts of the body. But, the growth of cells abnormally can be triggered where a change in its structure and behaviour is made possible. This abnormality feature is indicated the Brain Tumor usually. To detect such type of tumors, MRI is utilized. By including the technology improvements, a researched area has considered the brain tumor and tissue segmentation (Al-Kafri 2019).

For discriminating and predicting the better points of interest in the body structure, MRI is used specifically on behalf of a biomedical system. The differences in the



tissues that have a much better technique in contrary to the estimated tomography can be distinguished by exploiting this system fundamentally. To identify the brain tumor and growth imaging, this procedure is made an extraordinary and exceptional type. As a part of various examinations, MRI is exploited widely in the medical field. For making the image of a body, MRI techniques are used as radio waves and powerful magnet as it is a non-invasive method. To probe the soft tissues of the human body, this technique is suitable. For example, brain tumors, spinal cord injury, Ligament and tendon damage, etc. Several MRI image segmentations have been proposed by researcher. Some of such categories are clustering based techniques, region growing and merging and semantic segmentation. This paper presents a SLIC super pixel segmentation with superpixel fusion. The input data is first given to the SLIC algorithm. Superpixel fusion takes place on the resultant superpixels with similar textural features (Arunkumar et al., 2019).

Proposed Method: In the proposed method, the brain MRI image is given to the SLIC superpixel algorithm first. The formed superpixels are then fused with the neighbouring superpixels which possess similar structure. Figure 1. Shows the block diagram representation of the proposed model. The implementation of the two modules, namely SLIC superpixel segmentation and fusion of superpixels are presented in the following subsections.





SLIC segmentation: The SLIC algorithm generates super pixels with a simple iterative algorithm. The use of super pixels instead of pixels offers on the one hand the advantage that the computing time is significantly reduced during classification. In addition, the super pixels have an additional smoothing effect. Misclassification of isolated pixels are avoided because all pixels assigned within a superpixel have the class. Two nodes are considered to be adjacent within a level if the edge polygons of the associated image have a common edge. The statistical dependencies between different parts of the tumour effect the segmentation accuracy.



Let k be the number of cluster centres in an image. The size of each superpixel is calculated from k and the number of pixels N of the image. In the first step, k cluster centres are regularly distributed over the image. This happens at a distanceS = N/k. Each cluster receives a search area with the size 2Sx2S, which is shown in Fig 2. This limitation of the search area means that the number of required distance calculations are severely limited and the complexity of the algorithm is linear. The distance calculation for each pixel, the distances to the cluster centres are calculated, in whose search area range the pixel lies. The pixel then becomes the cluster with the closest spacing assigned (Bernard et al., 2018).

For the distance calculation, a 5-dimensional vector is used for each pixel|dl da db dx dy|^T set up. The vector|dl da db|^T stands for the pixel color in the CIELAB colour space. This three-dimensional colour space divides colours based on their hue and brightness ability (blackand-white scale). In this way, colour differences can be described as distance. The vector dx dy represents the spatial distance on the picture. The distance between the colour values is limited to the size of the CIELAB colour space and the spatial distance in the picture to the picture size. Therefore the spatial distance must be normalized, so that both distances have the same influence on the result.

$$d_{lab} = \sqrt{(dl_k - dl_i)^2 + (da_k - da_i)^2 + (db_k - db_i)^2}$$
(1)

$$d_{xy} = \sqrt{(dx_k - dx_i)^2 + (dy_k - dy_i)^2}$$
(2)

$$D_s = d_{lab} + \frac{m}{s} d_{xy}$$
(3)

Where,

dlab is the distance between intensity values.

 d_{xy} is the spatial pixel distance.

m is compactness.

s is cluster distance.

 D_s is the spatial distance being normalized with the aid of the cluster distance s.

In the next step, the cluster centres of all super pixels are recalculated. To do this, the mean value for each entry of the distance vector is formed from all the pixels in the cluster. The distances to all cluster centres in whose search areas the respective pixel is calculated and the algorithm will run again. Figure 3 represents the Brain tumour MRI image and superpixel segmentation image. This is done iteratively until the cluster centres barely move. Overall, the SLIC algorithm requires the following input parameters:

- Color Channel 1-3: Here three primary channels R, G and B that will later be transferred to the CIELAB Color space which have an influence on the limits of the superpixels.
- Minimum and maximum size of the superpixels: Minimum and maximum size that the superpixels should have.
- Compactness m of the super pixels: This parameter indicates how compact the individual pixels should be. The larger the value for m, the more influence on the spatial distance and has the less the super pixels adapt to color jumps in the image.

Algorithm 1: SLIC superpixel algorithm			
1.	Initialize the cluster centres $C_k = dl da db dx dy ^T$		
2.	For every cluster centre C_k ,		
3.	Find the pixels similar to the cluster centre in the neighbourhood of 2S x 2S using the eq. (3).		
1	If the nivel is similar to the cluster centre, group it with the same cluster centre		

- 5.
- If the D_s value is more, merge it with the cluster with the least D_s .
- 6. Repeat the steps 2 to 5 till the entire image is segmented.

Figure 3: (a) Brain tumour MRI image and (b) superpixel segmentation image



2.2 Fusion of super pixels: Density-related fusion methods recognize areas with similar characteristics as clusters. First, the density of a particular superpixel has to be measured. In the case of the center-based approach, the density for the superpixel p is estimated by the number of superpixels in an ε region. The ε - neighborhood of p consists of all superpixels which are at most the distance ε from p (Bernard et al., 2018).

If the radius ε is very large, then all data superpixels have the density m (= number of data superpixels), since then for each superpixel p all superpixels lie in the ε - neighborhood of p. If ε is chosen too small, each superpixel has the density 1. Therefore, the determination of ε in the run-up to the analysis is of central importance. Another parameter that is considered is MinPixCnt. This specifies how many superpixels must lie in the ε neighborhood of a superpixel p so that p belongs to a cluster (Despotovic 2015).

The segmented image superpixels are divided into three different categories. A data superpixel lies either inside a dense region (core superpixel), on the edge of such a region (edge superpixel) or in a sparsely occupied area (noise superpixel) more precisely:

- Core superpixel:The number of data superpixels in the ε neighbourhood of the core superpixel is at least MinPixCnt.
- Edge superpixel:An edge superpixel is not a core superpixel, but lies in the ε- neighbourhood of a core superpixel.
- Intoxication superpixel:An intoxication superpixel is neither a core nor an edge superpixel.
- Informally described, two core superpixels whose distance is at most ε land in the same cluster, edge superpixels are assigned to the cluster of a corresponding core superpixel and noise superpixel are neglected.

Algorithm 2: Superpixel fusion			
12	Name the superpixels as core, edge, or noise superpixels.		
2.	Delete all intoxication superpixels.		
3,	Connect core superpixels that lie within an ε -ball with an edge.		
4.	Assign each edge superpixel to the cluster of an adjacent core superpixel.		

In order for superpixel fusion to provide good clustering, the values of the parameters ε and MinPixCnt must be chosen carefully. The usual approach to determining these values is to consider the distance between a superpixel p and its k -nearest neighbor, i.e., the superpixel that has the k distance from p. For superpixels within a cluster, k - dist is usually small,

Experimental Results: The proposed method is tested on different types of MRI images described here:

- **Susceptibility weighted imaging (SWI):** SWIis a recently popular MRI technique primarily used when neurologic disorders needs to be diagnosed. The MRI highlights the differences in the magnetic susceptibility of the brain components like blood, iron, deoxygenated blood and calcium, thereby increasing the contrast in the MRI.
- **Apparent diffusion coefficient (ADC):** ADC is an MRI image which is a modified version of a DWI without the T2 component.
- **T1 weighted:** T1 weighted image is the most commonly used MRI image sequence. The image clearly depicts the appearances of tissues macroscopically.
- **T2 weighted:** The T2 weighted image is also a very widely used MRI image which retains the dominant signal intensities. The MRI depicts fluid, muscle, fat, grey and white matter.
- **DWI:** The DWI image is an isotropic T2 weighted map which is formed by the T2 signal and the diffusion values. The MRI image presents the grey matter, white matter, CSF, Fat and other soft tissues.
- Fluid attenuated inversion recovery (FLAIR): FLAIR MRI removed the signal form the cerebrospinal fluid thereby resulting in a special inversion recovery sequence.
- **T2*weighted:** T2* imaging is an MRI sequence to quantify observable or effective T2 (T2* or "T2-star"). In this sequence, haemorrhages and hemosiderin deposits become hypo intense.
- **PD weighted:** Given that nuclear magnetic resonance of protons (hydrogen ions) forms the major basis of MRI, it is not surprising that signal can be weighted to reflect the actual density of protons; an intermediate sequence sharing some features of both T1 and T2. The components depicted in the MRI include fluid, muscle, fat, hyaline cartilage and fibrocartilage. The following table 1 shows the segmentation results of the proposed method on different MRI sequences stated above.

The proposed method is compared with existing techniques k-means and mean shift segmentation in terms of elapsed time, mean value, average deviation from mean and entropy (Gordillo 2013).

Elapsed time: Time taken by the algorithm to segment the image.

Mean value: The mean pixel value of the segment.

Average Deviation: This value represents the deviation of the pixels values in a cluster from its mean. Lesser the deviation, better the segmentation.

Entropy: Entropy measures the randomness of the pixel values present in the segment. Lesser the entropy, better the segmentation by an algorithm.

Snehalatha & R Patil

In the tables 2 to 5, the elapsed time, mean, average deviation from mean and the entropy are all observed as minimum in the proposed method. This proves that the

proposed method has performed better when compared to the exiting segmentation algorithms (Kalaiselvi & Nagaraja 2015).



Table 2. Elapsed time				
Image	K-means [16]	Mean shift [17]	Proposed algorithm	
adc	2.238980	0.714511	0.078972	
conv dw1	2.734809	0.647594	0.038209	
multiple-sclerosis-35	1.522309	0.071121	0.037827	
mripediatric brain pd axial				
image 3	10.782455	0.791066	0.158915	
sus wat	10.769653	6.676479	0.190005	
t1	9.208027	4.213025	0.145144	
brain_mri_				
transversal_t2_002	4.458631	0.981096	0.109113	
t2(star)	2.419330	0.649109	0.042103	

Table 3. Mean value				
Image	K-means [16]	Mean shift [17]	Proposed algorithm	
adc	151.136835	141.430345	129.321684	
conv dw1	100.040041	136.072562	64.179059	
multiple-sclerosis-35	76.571196	121.491920	43.597124	
mripediatric brain pd axial				
image 3	83.442380	97.833810	71.764321	
sus wat	80.566957	137.691116	69.965320	
t1	107.174528	143.401308	105.321873	
brain_mri_				
transversal_t2_002	76.429280	136.600206	63.440623	
t2(star)	82.341560	130.319726	57.921296	

Table 4. Average Deviation from Mean				
Image	K-means [16]	Mean shift [17]	Proposed algorithm	
adc	35877.410923	17290.578828,	26997.993388	
conv dw1	33298.972565	13610.956284	19017.557552	
multiple-sclerosis-35	1447.251152	3303.840799	9116.401200	
mripediatric brain pd axial				
image 3	35744.226387	729967.238157	25188.935943	
sus wat	75063.640345	21717.469726	47222.462397	
t1	103673.064028	33373.045462	80759.569904	
brain_mri_				
transversal_t2_002	81015.446730	90530.931883	37284.545856	
t2(star)	25938.206637	1696.789390	22474.284669	

Table 5. Entropy				
Image	K-means [16]	Mean shift [17]	Superpixel segmentation	
adc	35877.410923	17290.578828,	26997.993388	
conv dw1	33298.972565	13610.956284	19017.557552	
multiple-sclerosis-35	1447.251152	3303.840799	9116.401200	
mripediatric brain pd axial				
image 3	35744.226387	729967.238157	25188.935943	
sus wat	75063.640345	21717.469726	47222.462397	
t1	103673.064028	33373.045462	80759.569904	
brain_mri_				
transversal_t2_002	81015.446730	90530.931883	37284.545856	
t2(star)	25938.206637	1696.789390	22474.284669	

CONCLUSION

This paper presents a SLIC superpixel segmentation algorithm with superpixel fusion from brain MRI image segmentation. SLIC superpixel segmentation is generally used for satellite image segmentation where the images are very complex. As the brain MRI image has complex textures, the SLIC segmentation algorithm can provide better results when compared to the existing techniques. The proposed method used SLIC superpixel segmentation along with superpixel fusion which combines similar superpixels facilitating the classification process. The proposed algorithm is implemented over different kinds of MRI images namely, Susceptibility weighted imaging (SWI), Apparent diffusion coefficient (ADC), T1 weighted, T2 weighted, DWI, Fluid attenuated inversion recovery (FLAIR), T2*weighted and PD weighted. The segmentation algorithm performed better on all types of MRI image. The minimum values of elapsed time, mean, average deviation from mean and the entropy prove that the proposed method performed a better segmentation of the image.

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Low Probability of Intercept (LPI) Radar Signal Identification Techniques

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ABSTRACT

A structure which a makes use of both Radar and Electronic Support tools is known as Low Probability of Intercept. Evading identification by ES receiver is the main aim behind the LPI radar. Features like frequency variability, low power, and wide bandwidth lend the property of Low probability of Intercept to the emitter making it undetectable by passive intercept devices like electronic intelligence receivers, radar warning, and electronic support. Novel signal processing methods are needed for identifying LPI radar waveforms. To retrieve meaningful information from the fed signal, Higher Order Spectral Analysis algorithms are utilized. Bispectrum, Bicoherence and Trispectrum techniques comprise the methodologies. For every LPI signal, the images generated by the algorithms are distinct and mean to be identifiers.

KEY WORDS: LOW PROBABILITY OF INTERCEPT (LPI), RADAR WARNING, FREQUENCY VARIABILITY.

INTRODUCTION

Low Probability of Intercept is recommended as a prudent strategy by several radar customers nowadays. Features like frequency variability, low power, and wide bandwidth lend the property of Low probability of Intercept to the emitter making it undetectable by passive intercept devices like electronic intelligence receivers, radar warning, and electronic support. Long-range detection is the goal behind LPI radars instead of shorter ranges. The viability of an LPI radar is directly proportional to the difficulty of receiver identifying the radar emitter's traits (Abdullah et al.,210).

In the wake of progressively advanced intercept receivers which identify radar emitters, an LPI criteria is being preferred. The interception of radar transmission could instantly result in electronic attack in implementations like surveillance, altimeters, and navigation. In addition, the possible chance of attack by ARMs and military weapons makes it necessary for an LPI emitter. This



property of pre-empting interception safeguards these emitters against almost all threats. Intercepting receivers face problems when making use of just power spectral analysis while attempting to detect and/or intercept LPI radars which generally utilize wideband CW signals thereby making it impossible to intercept and/or detect. This leaves them with no choice but to utilize advanced methods and signal processing systems required to make the appropriate electronic attack (Agrawal et al., 2013).

The differentiation of four intercept receiver signal processing methods to identify LPI wave metrics is performed in this work. Several kinds of LPI CW waves were produced with S/N ratios of 0 and -6dB for evaluating the four methods. FMCW, P1 through P4, Frank code, Costas hopping and combined PSK/FSK are LPI waveforms which were produced. Filter bank processing with higher order statistics, Wigner distribution, Quadrature mirror filter banks, and Cyclostationary processing are the signal processing methods upon which the comparison was performed (Båth 2012).

In implementations like underwater acoustics, communications, and seismic surveillance, the requirement to identify transient signals crops up. The optimal detector comprises a matching filter and a threshold circuit whose threshold is set to best perform a function when the arrival time and waveform of the signal is given. Many subpar methods for identification exist. For only a known set of signals and high SNR assumptions, techniques having



basis in short-time Gabor transform, Fourier transform, wavelet transform and non-linear methods work fine.

Although it is not feasible in practice, the matched filter technique makes it necessary that the waveshape and arrival time are provided. A match filter cannot be developed in applications without the knowledge of arrival time and waveshape of transient signal. A transient sound like a knock sound or a hydro sound wave is a case in point, which don't have a clear waveform. A transient sound like the sound of a knock or hydroacoustic pulse lacking a pronounced waveshape would be an instance of such a case. Moreover, from the same origin, the waveshape can change depending on the event. It is therefore difficult for these transient signals to develop a matched filter (Kishore et al., 2017).

2. Signal Processing Techniques: Following are the signal processing methods for identifying LPI radar properties (Kocamis 2016).

2.1 Filter Bank and Higher Order Statistics: As demonstrated in the figure below, the Filter Bank and Higher Order Statistics method has basis in the utilization of a parallel array of filters and higher order statistics. The main objective behind the filter bank is to segment the input signal in small frequency bands, giving an entire time frequency overview. Following this, every band is performed on separately and is then fed to a third-order estimator which reduces noise. After identifying LPI radar properties, they can be utilized to make an attack on the LPI radar (Punchihewa 2010).

Identifying a transient signal s(n) in an individual noisy signal x(n) is the primary goal. For the received signal, the signal including the noise is taken into account i.e.

$$x(n) = s(n) + v(n) \tag{1}$$

Figure 1: The filter bank and higher order statistic technique



Signal s(n) is a transient sign of unfamiliar waveform and time of arrival; v(n) is a non-familiar symmetrical probability distribution color noise additive. Let us take into account the hypothesis test given below.

$$H0: x(n) = v(n)$$
(2)

$$H1: x(n) = s(n) + v(n)$$
(3)

The hypothesis H1proves the existence of signal and noise compared to the hypothesis H0, which only has noise.

Wigner Distribution: The Wigner distribution [9] is a relatively productive method for the analysis of time-frequency for LPI waveform property. The Wigner W x (t,w) distribution is shown.

$$W_{x}(t,w) = x\left(t+\frac{T}{2}\right)x^{*}\left(t-\frac{T}{2}\right)e^{-jwT} dT \qquad (4)$$

In this case t is a time variable, w is a frequency variable, and * is a complex combination. A two-dimensional function which is in terms of frequency content of signal with respect to time, and has several attributes like: 1) Real nature.

2) It contains marginal distributions:

$$\int_{-\infty}^{+\infty} W_x(t,w) = |X(w)|^2$$
(5)
$$\frac{1}{2\pi} \int_{-\infty}^{+\infty} W_c(t,w) dw = |x(t)|^2$$
(6)

Here X (U) be the Fourier transform of (t);

3) Two important functions – the instantaneous frequency and group delay – are provided by their first time in relation to t and w.

4) Lack of intermingling of time and frequency resolutions. It is demonstrated that the windowed Wigner distribution [10] can be expressed as

$$W(t,w) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} W_x(t,\epsilon) W_w(0,w-\epsilon) d\epsilon \quad (7)$$





Here W (t,w) is the pseudo-Wigner distribution, and W_x (t,w) and W_w (t,w) are the Wigner distributions of the

signal x (t) and the window w (t) correspondingly. The convolution of two Wigner distributions in the frequency domain is W (t, U) shown by the final equation. Hence, the time resolution is constant, while the frequency resolution is impacted by windowing. Requiring only some amount of processing to derive the kernel function, the Wigner Distribution can effectively obtain the waveform parameters (Shevgunov 2018).

Quadrature mirror filter bank: A discrete-time signal x[n] is segmented into a number of sub-band signals with the help of an analysis filter bank in several applications. After this, the sub-band signals are processed. Consequently, an output signal y[n] is obtained by merging the processed sub-band signals with the help of a synthesis filter bank. They can be downsampled before processing if the sub band signals are band confined to frequency ranges significantly lesser than those of the actual input signal x[n]. The sub-band signals could be down-sampled before processing if they are confined to frequency rangers lesser than the initial input signal x[n]. The handling of the downsampled signals is performed more productively due to the low sampling rate. . Following this, before being merged together as a signal by the synthesis filter bank, the signals are up-sampled. These signals are later upsampled and then merged with the help of synthesis filter bank together as a signal. The merged arrangement is known as quadrature-mirror filter (QMF) bank.

By selecting the relevant filters, the output y[n] could possess some or all properties of the input signal x[n]if the down-sampling and up-sampling factors are the same or exceed the number of bands of the filter bank. The arrangement is called a critically sampled filter bank if the up-sampling and down-sampling factors are same as the number of bands. This arrangement is widely used in coding of a signal x[n]. Following illustration shows the basic two-channel QMF bank-based sub band codec (coder/decoder) (Stamenkovic 2014).

Cyclo-stationary spectral analysis: Digitally modulated signals are cyclostationary. By definition, the probabilistic parameters like correlation or mean value, change with respect to time with single or multiple periodicity. In addition, this property is also the fact that the signal is linked to frequency shifts in frequency shifts. Benefit in the examination of LPI waveforms making use of cyclostationary modeling, is that non-zero correlation is observed between certain frequency components when their frequency gap is in reference to the periodicity of interest. The magnitude of that frequency gap is called the cycle frequency. In an illustration of the Spectral Correlation Density (SCD) function the spectral correlation properties of a signal are clear.

3.1 Graphical User Interface (GUI): The 10U (5000 samples) LPI signals produced with software for examining purposes (at IF level of 160 MHz, Sampled at 500 MHz), a GUI has been designed. The following signals are considered

- Barker
- Polyphase codes
- Frank
- Signal with no modulation

3.1.1 Bispectrum: Within the field of data analysis, the bispectrum is a piece of data for locating nonlinear interactions. conventional power spectrum. The Fourier transform of $C3(t_1,t_2)$ is the bispectrum or bispectral density (third-order cumulant-generating function). Implementing the convolution theorem permits rapid computation of bispectrum (Shi et al., 2016).

$$B(f_1, f_2) = X^*(f_1 + f_2) \cdot X(f_1) \cdot X(f_2)$$
(8)

They belong to the group of higher-order spectra or polyspectra and provide the power spectrum with additional information. The polyspectrum of the 3rd order is more commonly known in calculations. Statistics of the second order relate to the mean m value and variance. They are expressed as the operation of the expected value and X is the result of the altered method:

$$m_X = E\{X\}$$
 (9)
 $\sigma_X^2 = E\{(X - m_X)^2\}$ (10)

If x is a discrete time signal, then the second order moment, or ACF, is shown as.

$$m_X^2(i) = E\{X(n), X(n+i)\}.$$
(11)

Besides these, statistics from a higher order provide more orderly moments (m3,m4, ...) and nonlinear, so-called cumulative, higher order combinations (c1, c2, c3, ...).

3.1.2 Bicoherence: A squared, normalized form of the bispectrum is Bicoherence. The bicoherence obtains values in the range of 0 and 1, thereby an easy metric for measuring the amount of phase coupling in a signal. Also referred to as bispectral coherency. The prefix bi- in bispectrum and bicoherence means two frequencies of an individual signal and not two time series xt, yt. It is different when calculating coherence, since the input and output values are necessary when two auto spectra and one cross-spectrum are approximated. Bicoherence, meaning it can be derived from an individual signal, is an auto quantity. The coherence function offers a measurement of variations by linearity in the system between the input and output devices. The bicoherence calculates the signal energy in quantity at only the quadratically combined bifrequencies. Non-linear process

Devi et al.,

are not covered properly by second order statistics. The quadratic phase coupling problem is a known issue. The supposition that a signal x/n is filtered through a system with quadratic characteristics has two harmonics at frequencies f1 and f2;

e.g. y(n) = [x(n)]2, y(n) has harmonics at the frequencies f1, f2, f1 + f2 and f1 -f2 (Wang 2012).

3.1.3 Tri spectrum: The trispectrum is a data piece for finding non-linear interactions. The traditional power spectrum is the Fourier transformation of the cumulative secondary order, which is also known as autocorrelation function. The Fourier transform of C4(t1, t2, t3) is the trispectrum or trispectral density (fourth-order cumulant-generating function). The trispectrum T(f1,f2,f3) belongs to the higher order spectrum group and provides further power spectrum data. It's a 3D system. The scope of the maximum kurtosis phase estimate used for deconvolution of seismic data to determine the layer structure has been determined.



A GUI has been developed to analyze the LPI signals (at IF level of 160 MHz, Sampled at 500 MHz) of 10uS duration

(5000 samples) generated from the Signal Source / samples generated through software. The following signals are considered Barker, Polyphase codes, Frank and Signal with no modulation. These signals are analyzed with three algorithms such as Bispectrum, Bicoherence and Trispectrum in the presence of noise (Zou 2013).









0.0

0.1 0.2

0

signal before adding noise__b5_10us.dat

2000

300



figures 9 to 15 shows the analysis of bakers 5 signal with three different algorithms in the presence guassian noise with 3Dband -3db.from the above figures we observe that the Trispectrum computation is more complex than others.

0.4

P1 Signal(Poly phase code):

Figures 21 to25 shows the analysis of polyphase codes with three different algorithms in the presence of Gaussian noise 3db and -3db.from the figures it is observed that non-linear interactions can be observed clearly in Trispectrum in the presence of noise.



£¥ 0.1

-0.2

-0.3

-0.5

40

20

-40

50

Figure 12: Barker 5 - 3dB Noise







Figure 19: P1 Trispectrum





















Figures 26 to29 shows the analsis of no modulation signal with three different algorithms in the presence of Gaussian noise 3db and -3db.from the figures it is observed that the three methods can differentiate the signals. Frank Signal:





Figure 29: No-mod Signal Trispectrum













Figures 30 to 33 shows the analsis of frank signal with three different algorithms in the presence of Gaussian noise 3db and -3db.from the figures it is observed The graphs produced and given above are unique and are of help in detecting and distinguishing signals at certain noise levels.

CONCLUSION

With the help of higher order spectral analysis, the signals can be distinguished from one another. Trispectrum calculation is relatively difficult. In spite of calculated Gaussian noises of order upto -6db, Bispectrum, bicoherence and trispectrum can differentiate the signals. All three techniques are applied while classifying signals impacted by Gaussian noise. That can be very helpful in identifying and distinguishing LPI radar signals. The graphs produced and given above are unique and are of help in detecting and distinguishing signals at certain noise levels. Some existing and potential academic topics in the field of the higher-order spectrum are non-stationary and cyclostationary signal analysis with HOS-based time-frequency representatives, HOS-based wavelet representations and higher-order statistics used to examine chaotic signals.

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