SPECIAL ISSUE VOL 12 NUMBER-1 FEBRUARY (2019)
Print ISSN: 0974-6455
Online ISSN: 2321-4007
CODEN: BBRCBA
www.bbrc.in
University Grants Commission (UGC)
New Delhi, India Approved Journal

BBRC

Bioscience Biotechnology Research Communications

Special Issue in Communication and Information Technology

The Role of ICT in our Daily Life Applications: Obstacles and Challenges

An International Peer Reviewed Open Access Journal For Rapid Publication

Published By:
Society for Science & Nature (SSN)
Bhopal India
Indexed by Thomson Reuters, Now Clarivate Analytics USA
ISI ESCI SJIF 2018=4.186
Online Content Available: Every 3 Months at www.bbrc.in

SOCIETY
FOR SCIENCE AND NATURE
SCIENCE FOR LIFE

Registered with the Registrar of Newspapers for India under Reg. No. 498/2007
Bioscience Biotechnology Research Communications
SPECIAL ISSUE VOL 12 NUMBER-1 FEBRUARY (2019)

Continued Inside Cover

Published By:
Society For Science and Nature
Bhopal, Post Box 78, GPO,
462001 India

ISSN 0974-6455

Registered with the Registrar of Newspapers for India under Reg. No. 498/2007
Bioscience Biotechnology Research Communications
SPECIAL ISSUE VOL 12 NUMBER-1 FEBRUARY (2019)

Bioscience Biotechnology Research Communications
SPECIAL ISSUE VOL 12 NUMBER-1 FEBRUARY (2019)
Print ISSN: 0974-6455 Online ISSN: 2321-4007 CODEN: BBRCBA

Special Issue in Communication and Information Technology

The Role of ICT in our Daily Life Applications: Obstacles and Challenges

Published By:
Society for Science & Nature (SSN)
Bhopal India
Indexed by Thomson Reuters, Now Clarivate Analytics USA
ISI ESCI SJIF 2018=4.186
Online Content Available: Every 3 Months at www.bbrc.in

SOCIETY
FOR SCIENCE AND NATURE
SCIENCE FOR LIFE

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in Our Daily Life Applications: Obstacles and Challenges

Editorial

It gives me immense pleasure to go through the superb collection of this special issue selected manuscripts on the Role of ICT in our daily life applications: Obstacles and Challenges and write the coveted editorial for the painstakingly written each and every article.

In this age of information that has invaded and penetrated the technology of our present world until it has become an essential part of our daily lives, the emergence of electronic commerce has surfaced, even though it is late in the ladder of historical development of IT growth. There are many technical difficulties which have met the major challenges, notably information security, electronic payment methods, intellectual property, electronic contracting, technical authority, standards, etc., to impose digital life itself on everyone, with all its electronic features now becoming part of our fast life.

The computer is only one of a series of ICT products from the telephone onwards that has been accompanied by a whole range of technical and non-technical problems. Many of those interviewed experienced problems adopting, using or owning ICTs. The type of problem is highly dependent on the type of technology: the PC and Internet connections giving considerable technical, learning, service, and upgrade as well as compatibility problems. Mobile phones on the other hand, while occasionally having poor infrastructure difficulties, gave problems of usage, service quality (customer care) and personal identity. It is not only technical issues that cause problems; there are various other equally important practical and social problems. Even for technical systems that are largely stable, where the technical problems have mostly disappeared from view, there remains a host of other issues.

Nearly all the technologies mentioned involved some conflict between people over usage and meanings, as the domestication literature has shown to be the case with media that are more traditional and communications technologies. Then there are problems with content, and dislike or disapproval of media products, and in the use of tools: how to get over a particular obstacle in a video game, putting up with disliked TV shows, or design problems in multimedia or graphics. These are nothing to do with faults in the technology, but have to be overcome, avoided or put up with just the same zeal. One application of ICT that is used widely in our daily life is the social networking which can help policy makers to prioritize decisions, choose between opportunities, and encourage the public to accept new programs, plans and policies. This can certainly make a great difference to mankind.

The present special issue of *Bioscience Biotechnology Research Communications* envisages a volume of excellent papers written on the various applications of ICT being in use for a better understanding of our fast running technology.

Happy Reading!

Editor in Chief
Sharique A. Ali PhD., FLS, FRSB (UK)
Bioscience Biotechnology Research Communications

CONTENTS

BBRC
Bioscience Biotechnology Research Communications

SPECIAL ISSUE • VOL 12 NO 1 • FEBRUARY 2019

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

A Systematic Approach for Evaluating ERP Project Proposals

Wajdi H. Al Jedaibi*[1], Victor R. Basili[2], Ibrahim Albidewi[3] and Abdullah Almalise[4]

[1]*Department of Computer Science, Faculty of Computing & Information Technology, King Abdulaziz University, Jeddah, Saudi Arabia*
[2]*Department of Computer Science, University of Maryland, College Park, USA*
[3,4]*Department of Information Systems, Faculty of Computing & Information Technology, King Abdulaziz University, Jeddah, Saudi Arabia*

ABSTRACT

Implementing an ERP system is a complex transformational project. Many organizations struggle with this type of transformation as it involves rethinking their business processes so that the organization can improve their business system. The transformation has to be carefully negotiated, taking into account the as-is processes, the to-be processes, and the new requirements for such things as automation and integration of the to-be process, anticipating and designing these new requirements. This paper discusses the experiences at a Saudi Arabian university in their attempt to transform the organization's business model so it automates and integrates what is required and to achieve a level of capability that was not available before. It offers an analysis of the problems encountered, a set of lessons learned from their unsuccessful implementation experience, and a suggested set of steps that can improve ERP project proposal evaluation by putting more effort into the upfront analysis, limiting the impact of the typical changes accompanying ERP projects.

KEY WORDS: ENTERPRISE RESOURCE PLANNING (ERP), EXPERIENCE ANALYSIS, EXPERIENCE-BASED ERP CONTRACTING IMPROVEMENT APPROACH; RELATIVE CHANGE EFFORT, METRICS

ARTICLE INFORMATION:

**Corresponding Author: waljedaibi@kau.edu.sa*
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/1

INTRODUCTION

In 2010, King Abdulaziz University (KAU) in Jeddah, Saudi Arabia decided that there was a need to improve, integrate and automate its administrative and finance business processes. It was decided that acquiring an ERP system would create the basis for the future evolution of KAU's transition to an efficient, productive and fully integrated business environment, and it would keep pace with the evolution of the e-government system by providing an automated platform that can be integrated with other public sectors. It went through an RFP and bidding process, chose an implementer and developed an ERP System. The implementation which was anticipated to take 18 months, took 36 months and cost about 25% more than was expected from the original bid and the system was not fully implemented, i.e., only the Finance and Control were run in parallel with the existing system. At the time, the system was partially developed but not deployed. This presented an opportunity to analyze the problems involved and pose a solution based upon this analysis. It is important that we understand what went wrong and how we could have done a better job in the next implementation of an ERP.

This paper focuses on KAU's experience with contracting out the ERP system, i.e., the writing the RFP and selecting the bidder. Our approach has been to 'learn by application' [14], where we use observation of what happened to evolve the method we used. We began by characterizing the approach that was used and the consequences of various decisions that were made. We then identified the problems encountered based upon analysis of the available data and interviews with members of the KAU project management team. To assure a broad view of problems, we identified documented problems from the literature that were similar to the ones we experienced and supplemented that set with problems specific to the local environment. This analysis provided input for the development of several techniques that we believe would minimize the number of surprises and challenges that arose and contributed to a more successful ERP deployment. We packaged these techniques into a new method that allows us to compare and evaluate ERP proposals. We then applied the method to a subset of the organization's business process as a pilot to check the feasibility and usability of the method.

The method aims at providing sufficient information before the implementation begins that would help an organization write a better RFP and do a better job of assessing the relative effort of the submitted bids. We believe our experience was not unique; many organizations have struggled with implementing an ERP [7, 8, 9, 10,11]. In fact, many organizations, who have achieved a successful ERP implementation, were successful on the second try [1].

BACKGROUND FOR THE STUDY

King Abdulaziz University (KAU) was established in 1967 as a national university aimed at spreading higher education in the western area of Saudi Arabia. It offers university education to both female and male students [2]. The university has witnessed much improvement in quality and quantity since it was first established, becoming one of the more distinguished universities in terms of the number of students, the number of scientific and theoretical fields of study, and the quality of its programs. It is also the only university in Saudi Arabia that offers certain specializations such as Sea Sciences, Geology, Nuclear Engineering, Medical Engineering, Meteorology, Aviation, and Mineralogy.

The main administrative business departments of the University are Human Resources, Finance and Account-

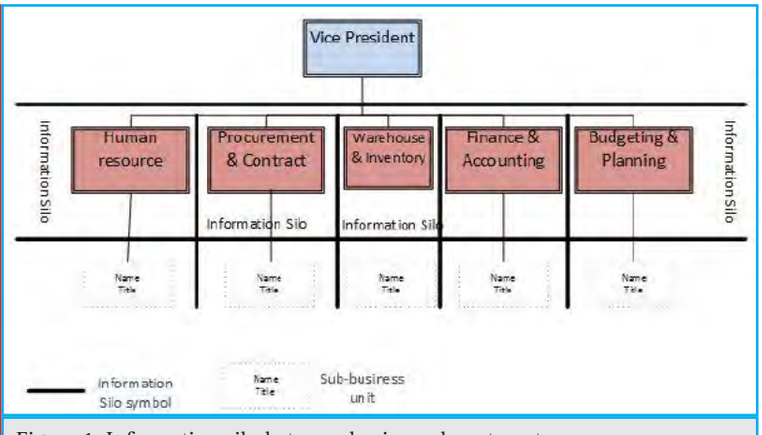


Figure 1. Information silo between business departments

ing, Budgeting and Planning, Procurement and Contract, and Warehouse and Inventory. These business departments report to KAU's vice president for approval of major decisions. TABLE I lists the main business processes in the Procurement and Contract department. It shows the status of automation of the business processes in the current KAU legacy system. We will refer to this table later when we map KAU business processes into the selected ERP system. It will help us identify the gap between current KAU business processes and the selected ERP system, as well as giving us an indication of how many of these processes are covered in the new system compared to the KAU legacy system.

The University developed its legacy based administrative system over a 17 year period. It was developed using COBOL-CICS and the IBM DB2 database on an IBM mainframe machine. The system was composed of human resource business functionalities which had evolved to an effective level. The Accounting and Finance system was also developed to include most business functionalities. The least developed systems were the procurement and contract modules and the warehouse and inventory modules. Each of these business modules evolved separately.

During the implementation of the ERP system we selected at KAU we faced some challenges and they can be categorized as follows:

1. Functional issues
    a. Insufficient business functionalities
    b. Lack of integration between business modules
    c. Data inconsistency, inaccuracy and incompleteness
    d. Incomplete Business Process automation
2. Technical issues
    a. Un-normalized Database tables
    b. Lack of support for Web-based applications
    c. Lack of documentation
    d. Unstructured applications landscape

A major issue with the current legacy system is the lack of integration of the various business modules. Each department is functioning as a silo, independent of the other business departments (see figure 1). This creates a collection of information silos within the legacy system where information is not shared between modules [3]. Every module has its own database tables with different fields and different encoded names for each business unit. This created a huge set of data inconsistency and redundancy problems in the system and information flow between those systems was severely limited. Another issue with the legacy system is that it lacks support for web technologies to port the modules to a new web-based system. Due to these complexities, most business processes were not automated; most of the work was done manually where the end-user fed the final data into a form on the screen so that a formatted report could be printed on official paper. Also, legacy applications were not well documented so it was difficult for developers to maintain the system and database tables were not normalized causing a lot of data problems.

So, it was very clear that KAU had to enhance its administrative business processes through the acquisition of an ERP system. We decided to conduct an ERP readiness report [4, 5]. The readiness exercise was conducted over 10 weeks. We hired International consultants who had experience in ERP project implementation and management. The scope of the readiness assessment was to evaluate KAU business processes (a sample of these business processes are shown in table I with their status in the legacy system), organization maturity and IT readiness. The findings encouraged KAU to proceed with acquiring an ERP system. We prepared the RFP as described in [6, 13] where we discuss the RFP preparation process in details.

ERP implementations pose several common challenges to enterprises [7, 8, 9]. Although the lack of proper communications between the parties involved in the project was reported as the overriding problem [7], there were other interesting challenges encountered. For example, the resistance to change in updating existing business processes, the lack of training on the new system and technologies, and the existence of fewer experts than needed by the project. A crucial piece of advice by others is not to treat an ERP project as "just another IT project" but rather a transformational project for the whole enterprise [10]. In almost all cases, enterprises should look at an ERP project from a different point of view in the sense that they provide a window of opportunity for re-evaluation of the business processes and may possibly lead to improving them.

Success of ERP projects is deeply affected by how change is managed throughout all related activities. In particular, rigorous controls must be placed on the number of desired customizations applied to the eventual system [11]. A customization is a new or additional functionalities applied to the system as required by process owners (POs), a full definition of customization is provided later (section IV.B. Details of the Method) in step 3 of our method. Continually changing and inconsistent requirements are viewed as impediments to success as they waste project resources and raise frustration amongst team members [9].

Additional challenges arise based upon certain environmental constraints and in our case we witnessed a couple of these. First, there was a critical issue with language and system localization in which it was required

Table 1. Some Business Processes Status in the Legacy System

Modules/Business Processes	Status in Legacy System
1. Purchasing	
1.1 Purchase Requisition	Not implemented
1.2 Purchase Requisition Approval	Not implemented
1.3 Quotation Process	Not implemented
1.4 Purchase Order	Partially implemented
2. Inventory and Warehouse Business Processes	
2.1 Goods Receipt with Gov. Serial Number & Warehouse Books Interval Number	Implemented
2.2 Request (Reserve) Stock from Warehouse with approval workflow	Not implemented
2.3 Goods Issue Stock from Warehouse with Gov. Serial Number & Interval Number	Implemented
2.4 Goods Receipt or Goods Issue Cancellation	Not implemented
2.5 Return Asset to Warehouse	Partially implemented
3. Logistic Invoice Processes	
3.1 Enter Invoice	Partially Implemented
3.2 Advance Payment	Not implemented
4. Vendor Registration	
4.1 Register new vendor by KAU	Partially Implemented
4.2 Maintain/Update Vendor Data By KAU	Not implemented
4.3 Register/Maintain/Update Vendor Data By Vendor using online services	Not implemented

to implement a code change in the core of the system. For example, in the ERP system we used, the database imposed a 40 character limit in name fields which was insufficient for the use of the Arabic language [6, 13]. We also encountered a suite of challenges with data due to the organizational changes in the enterprise that were going on at the same time. There was not a problem in mapping the organizational structure and financial organizational structure (i.e. Budget allocation structure and related accounting activities) to the ERP system. However, there were mismatches between data of the two structures that yielded slightly different sets of views such as different field tag names and different data type for the same field in different views. As a result, we were faced with problems that required data to be cleansed and mapped correctly. Negotiations on any data related issues required a complicated process of reviews followed by a lengthy administrative approval process.

Being a government agency requires strict adherence to all government policies and procedures. The rules say

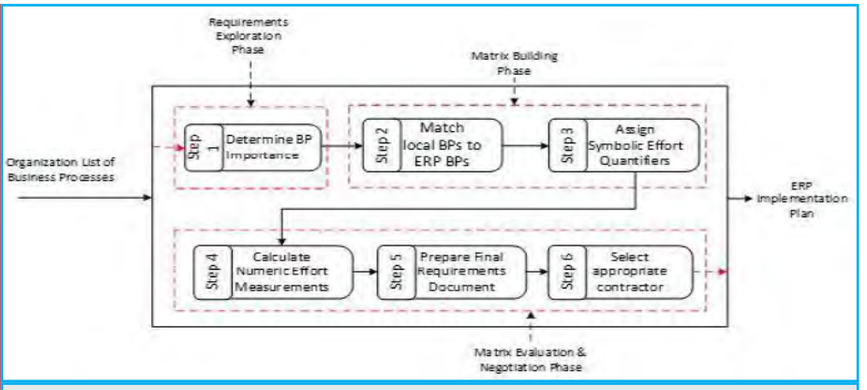


Figure 2. Evaluation method phases and steps

what must be done, not how to do it, so there are several ways a rule could be implemented and still be correct. So having different implementations should not have created a problem. However, we encountered problems in mapping the local implementations of business processes to the ERP system as in some situations a local valid interpretation of a business rule was not easy to map into the ERP implementation of the rule.

By default ERP systems are shipped with a set of best practice business processes characterized in workflows and a set of tools to design and/or extend them. However, KAU business process owners expected that all current business processes would be mapped to the new system as is. This represented a major source of customizations to the ERP standard workflows and hence additional costs on the project that was not accounted for in the original project RFP. It should be noted here that it is not uncommon to customize some workflows to reflect essential local business processes which must stay as-is. In our experience, the reluctance to compromise on changes and accept more effective business process implementations can be attributed to a lack of understanding that (1) the new system was supposed to improve their processes and (2) the new process was actually an improvement, e.g., it allowed integration, but had the same effect as the as-is process. We also encountered cases where the business owners resisted changing the as-is business processes due to personal views and/or simply intransigence. In other cases, change was perceived as creating more work in the future workload and rejecting it seemed like an easy out.

Translation from Arabic to the English language was another challenge we faced; especially since there was no consensus on the meaning of certain terms in the Arabic language to start with. Different departments sometimes had a different understanding of the meaning of the same term. In some cases this was acceptable since it reflected terms that were only used internally within the particular department. Reaching agreements to unify terminology, however, was not an easy venture for either the KAU management team or the ERP implementation team.

Validation of entry fields in all screens posed another key challenge. Although there was a minimal set of validations checks in the legacy system, as the implementation progressed, users felt the new system should be more vigilant by providing an extensive range of validation rules and checks for all types of data entry fields, e.g. direct fields and derived values. For example, users requested that based on values entered in field date_of_birth a validation check must be executed to apply the rule: "Employee age must be LESS THAN 60 years old at the time of appointment".

While validation checks are an integral part of modern software systems and are included as default in normal application, extensive checks attached to derived values resulted in a plethora of customization requests for almost all ERP screens. Two issues that characterize this challenge are:

1. New validation schemes needed to be designed and developed to satisfy evolving user requests.
2. We needed to integrate them with validation techniques already defined in the ERP system.

Validation is not a trivial process [12]. Some validation schemes were designed and developed to satisfy business process owner's and user's requests. However, it was not always possible to design and develop validation rules that would satisfy their requests as there was not sufficient related data to do so. For example, if some data is entered at a specific entry field, and the user require a validation rule to be applied to it, then that might affect or restrict another field in the same form or another screen. So, validation on field has to be thoroughly investigated and negotiated with the users before applying them.

In general, it was clear that users had imprudently high expectations of the ERP project implementation. Initial ERP project goals were to achieve higher levels of efficiency, transparency, and improved budget utilization. User and business owners, nevertheless, felt it was an opportunity to automate every administrative aspect of the organization as they were already doing it; a clear deviation from the original project plan. There was a lack of project vision especially since ERP projects are of a transformational nature when compared to automation projects. Enterprise organizations should expect a gradual growth in organizational maturity level after an initial ERP implementation; and if it is placed within a phased-development track, it will certainly yield in more improvements in the future.

We define our terminology for the sake of consistency. We will use the terms organization and client interchangeably to mean the purchaser of the ERP system. We will use the term vendor to mean the ERP system provider which is being used as the base for the client's transformed system. We will use the terms contractor and bidder for the responder to the RFP, using the vendor's ERP system as the base for their proposal.

AN EXPERIENCE-BASED APPROACH

As stated above, ERP projects are complex transformational projects and, in almost all cases, span several departments of the enterprise. Challenges will always occur while progressing towards a successful deployment of the final system. They will most likely continue to appear as the enterprise organization evolves and implementation environments keep changing. As a

result, challenges are an essential part of the game and we believe they should be handled positively; any plans to eliminate them are not practical and can waste valuable project resources. Instead, an ERP project management team should put forth plans to manage and limit their impact. A first step is to gain early knowledge of their existence and develop a clear vision of what lays ahead in the project path. Analysis of each challenge and its associated difficulties is needed so that remedies can be discussed with the involved parties. As can be expected, challenges within a single department are easier to manage than those hovering over the territories of two or more departments. The latter requires a lengthier process of reviews, discussion of possible remedies, and negotiations.

Based upon the lessons learned from our unsuccessful first experience we present a method for exposing challenges early to gain insights into their nature and to assess their relative impact on the implementation. The approach suggests a major juxtaposition of effort, up-front, which allows an organization to learn before making a commitment, to better understand what they really need. It allows for the opportunity to bring business owners on board early, allowing them to prioritize their needs and shows them the cost of not compromising the implementation of some of their current as-is business processes. The degree of the impact of not compromising is reflected in the amount of customization needed in the sense that unsolved challenges will result in business owners requiring major customizations to the implementation. Our method devises an early evaluation process for ERP project bids from which we can learn the expected number of changes required to the system's implementation. The goal is to discover, expose, and treat sources of ERP changes in the best way possible.

Overview of the Evaluation Method

The method we present here is based on early assessment of organizational needs, evaluating them against what is offered by more than one potential ERP solution. The evaluation is fine grained at the level of the specific enterprise business processes, exploring the degree of change required by the different ERP system solutions proposed. Applying the method must precede any effort towards setting up and/or executing an ERP implementation plan; and it will enable enterprise organizations to:

1. Explore their business processes in details,
2. Classify their business process needs,
3. Match organizational business processes to what each ERP offers, and
4. Develop a clear understanding of what level of change each ERP solution requires.

In more detail, here are the three major processes and documents developed by the method as shown in figure 2:

Phase 1 – Requirements Exploration:

Step1: Preliminary Requirements involves building a preliminary requirements document which documents all the current, as-is business processes in a consistent organized form and provides an indication of how much flexibility is available for the contractor. Abstractions of these two pieces of information are represented in the first two columns of the evaluation matrix as presented in TABLE II. Each row of the evaluation matrix represents information about a particular business process. The first column contains the name of the process as it exists in the legacy system. The next column represents the flexibility with respect to each of the business processes as will be explained in Step 1 below. This represents the version of the requirements that goes into the RFP for the bidders. It is the initial step for the bidding process.

Phase 2 – Contractor Requirements Analysis:

The matrix set up by the client is filled in by the contractor, with the vendor's support. It is characterized by steps 2 and 3, in which the interested contractors create a mapping of the client's needs to the vendor's system and the contractors' estimate of what will be required to implement the client's business process relative to the vendor system. Each row of the evaluation matrix represents information about a particular business process.

Step 2: Process Mapping: Identify the closest processes in the vendor's ERP system to the listed set of processes in the legacy system.

Step 3: Change Identification: Characterize the changes to the ERP system that are needed

Phase 3 – Matrix Evaluation and Negotiation:

Step 4: Relative Effort Analysis: The client analyzes the relative effort required to make the changes for each business process

Step 5: Process Modification: The project management team negotiates with the business process owners, armed with the relative effort data to make the modification to the implementation of each specific process, so they can understand what the ERP system offers and the cost of not adapting to the new processes. Based upon the outputs of this discussion, a final requirements document is created.

Step 6: Contractor Selection: Using the final requirements document, the client evaluates the proposals by estimating the relative effort and time involved based upon the amount and type of change needed to the ven-

dor's system and picks the contractor with the best relative offer. Note that if two of more contractors bid the same vendor system, it would be possible to compare implementations in detail to help with the selection.

Details of the Method

The steps of the method are explained as follows:

Step 1: Define an as-is document of the business processes (BPs) with the support of the processes owners. A business process consists of mainly 4 parts:

a. A template,
b. Input data,
c. Business rule(s), and
d. Workflow and approval cycle.

For each business process, process owners (POs) are all encouraged to recommend potential improvements to the process and are made aware of the necessity of integrations with other business processes. The business processes are defined as the set of steps needed to be performed, the business rules followed, the forms needed for the process, the approvals required, and the outputs expected, such as reports that need to be generated. A by-product of this step should be the creation of a relationship with the POs, preparing for change and making them aware of the need for integrating their processes with other POs. The result is an exploratory requirements document that describes each as-is process and the level of importance and flexibility specified by the POs. An example set of classifications for a sample set of business processes are provided in TABLE II. Classifications are:

1. M: Mandatory

A mandatory process is a must have; it must be part of any ERP implementation.

2. GTH: Good to Have

A good-to-have process does not necessarily have to be part of the ERP implementation, but it is good to have if possible.

3. NU: Not Urgent

A not-urgent process is a one that is not needed right away in the upcoming ERP implementation. Flagging a BP as NU does not exclude it from future ERP implementation upgrades, but business owners at this early stage are okay to continue using it as is.

A set of questions can be sent by the bidders to the client; identifying such things as can a business process be changed in some way to minimize effort. These questions will be answered with the advice and consent of the POs. The exploratory requirements document and responses to the bidder's question are used by the bidders to select the most appropriate vendor for the enterprise.

Table 2. A Snapshot of KAU BPs classified according to organization needs

KAU Business Processes	KAU Needs
Invoice	
Enter Invoice	M
E-Invoice	GTH
Advance Payment	M
Vendor Registration	
Register and Maintain Vendor Data by KAU	M
Online Registration by Vendor	NU
Material Master	
Create/Change Material Master (General Data)	M
Batch Management	NU
Login (Technical Requirement)	
Single Sign-In	NU

Step 2: The contractor matches the organization BP's to those offered by their selected ERP system. TABLE III shows an example snapshot of KAU business processes and their match in the ERP they selected, i.e. SAP. Matching processes does not signify full equivalence between two processes but rather the ERP process that is the best match to the organization's process. For instance, SAP standard BP "Create purchase requisition (PR)" does not necessarily embodied the exact internal steps and logic required by its matched KAU BP, but it is the one the bidder will customize to achieve the specified process.

Step 3: The client provides a matrix for the bidders to fill in where they propose their chosen vendor's system and whether that process is standard, needs additional configuration, needs some level of customization, requires a third party integration, or requires the writing of extra code. They also suggest how they can provide certain customizations to minimize the effort by certain reasonable modifications to the business processes in accord with the client's statements of flexibility. By the end of this process, the client will have the ability to estimate the relative effort required to implement each of the bidder's proposals and what opportunities are available to make changes to the business processes that would lower effort. TABLE IV shows an example analysis of KAU/SAP processes as was analyzed by a contractor. The analysis is based on vendor's and contractor's response and reviewed by subject matter experts (SMEs) from the within the organization. The organization is expected to have their own product and functional consultant and/or a third party BP consulting firm. Vendor

Table 3. A Snapshot of KAU BPs matched with SAP Business Processes

KAU Business Processes	SAP Standard Business Processes
1. Procurement Business Processes	
1.1. Purchase Requistion	
Create Purchase Requisition (PR)	Create Purchase Requsition (PR)
Budget & Planning Dept. Approval or Self Finance Approval	Define approval strategy/wprkflow
Dept. Manager or Dean approval	Define approval strategy/wprkflow
1.2. Quotation Process	
Create Request for Quotation (RFQ)	Create Request for Quotation (RFQ)
Get response from supplier	Supplier can respond by email or through the system (Maintain Quotation)
Quotation Selection Process	Online selection
Get approval from committee	Get approval from manager (Can define more than approval)
1.3. Purchase Order Process	
Cretae Purchase Order	Cretae Purchase Order
Get approval	Define approval strategy/wprkflow
1.4. Bid Process	
Create Bid	Create Bid
Supplier Repsonce	Supplier Participation
Bid Opening Process	Techniocal Envelop Evaluation
Technical Evaluation for Bid	Commecial Envelop Evaluation
Bid slection process	Bid selection/rejection

and contractor response should mark matched organization/ERP business processes with symbolic qualifiers for expected change as follows:

Standard (S) meaning the required business process exists as a standard in the vendor's system and it can be used as is or with minimum configuration, i.e., no major effort is needed to make it usable.

Configuration (CF) meaning the process is supported by the vendor system but requires a setting or adjustment of the parameters or adding a new field or adding a new approval cycle. These types of adjustments are supported by the vendor's system. The benefit of configuration is to provide flexibility within the system to allow the alignment of the ERP functions with the PO requirement by using standard functionalities exist in ERP product.

Customization (CZ) meaning the PO requirement cannot fulfilled using standard functionalities provided by vendor/ERP, to incorporate these requirements it might require enhancing the system by developing new or additional functionalities e.g. describing new screens, changing field positions on forms, integrating processes, or introducing new forms. You still have to integrate these changes with the system but without changing the existing vendor source code. This form of customization has the long term problem that the extension might not be compatible with future updates and releases of the system.

Third Party Integration (TPI) meaning that the ERP system cannot provide a major functionality required by PO, without the contractor adopting some other system to fulfill this requirement, but it requires the integration of this system with ERP. For example, if you want to implement a smart card or finger print recognition capability in the system, then you need to use a party integration. This involves customization and the added negotiation and interaction with the third party code which might include its own non-compatibility evolution. It may also involve source code change if the third party system is not set up to be integrated with the vendor's standards of integration.

Change Source Code (CSC) meaning the vendor code must be changed. This has the short term problem of extending the functionality of the existing system and also has that long term problem that this new code might not be compatible with future updates and releases of

Table 4. Analysis of KAU/SAP processes to reflect expected change per BP		
KAU Business Processes	Contract Response	
	SAP Standard	Work Requirement
3. Invoice		
Enter Invoice	Create and Post Invoice	S
E-Invoice	E-Invoice	CF
4. Vendor Registration		
Register new vendor by KAU	Suplier Registration	CZ
Maintain/Update Vendor Data By KAU	Maintain Suuplier	CZ
Register/Maintain/Update Vendor Data By Vendor using online services	Online Registration	CZ
5. Material Master		
Create/Change Material Matser	Create/Change Material Matser	CZ
Create/Change Material Matser	Create/Change Material Matser (Material Type)	CF
6. Login (Technical Requirement)		
Singlr Sign-In	N/A	TPI

the system. An example of the need for changing source code is if an algorithm within the ERP system is not fulfilling the process owner requirement and the algorithm needs to be modified. Needless to say, CSCs rarely occur.

Step 4: After reviewing and approving contractors' responses, numerical weights are assigned on each process to note how much change is expected when choosing a specific ERP solution. Figure 3 depicts numerical weights to be given to symbolic qualifiers and TABLE V shows the actual worksheet. For example, if a business process is rated as standard, there is minimal cost associated with the implementation, let's say we assign that a value of 1. If the business process is rated as requiring a configuration, we assign a value of 2, as it is a least twice the work of a standard. For customization, we assign a value of 4 to 6 as we consider it two to three times as complicated as a configuration. Performing third party integration is most likely at least twice the effort as a customization, so we assign it an 8 to 12. A source code customization can be anywhere from a 12 to 16 due to it both short term and long term effects.

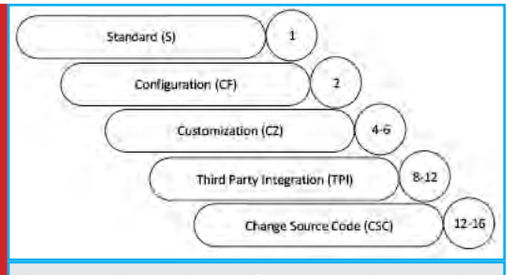


Figure 3. Symbolic qualifiers and their nurmerical weight values

These values are provided based upon the experience from our own KAU implementation where the standard processes have been implemented by the contractor with minimal effort such as Enter Invoice (TABLE V: 3rd row), whilst some other business processes associated with customization and it required considerable effort such as Online Registration (TABLE V: 6th row). On other hand, some of the business processes did not match ERP standard functionalities, thus the customization was not pebble, to incorporate such type of processes the contractor must integrate a functionality provided by a third party into the system and it required more effort of a customization, for example a single sign-on subsystem was added as a TPI (TABLE V: last row).

The categories selected here were based upon our experience with the KAU implementation. But another client might want to select different categories and different rating values. Based on TABLE IV in step 3, numerical weights are assigned to each symbolic quantifier.

TABLE V shows a partial list of real KAU BPs assigned numerical weights by a potential contractor reflecting the amount of changes they expected to apply during implementation. Numbers of interest to the client are the

Table 5. Weight assignment to symbolic qualifiers

KAU Business Processes	Contract Response		Weight
	SAP Standard	Work Requirement	
3. Invoice			
Enter Invoice	Create and Post Invoice	S	1
E-Invoice	E-Invoice	CF	2
4. Vendor Registration			
Register new vendor by KAU	New Vendor Master	CZ	6
Maintain/Update Vendor Data By KAU	Update Vendor Master	CZ	4
Register/Maintain/Update Vendor Data By Vendor using online services	Supplier Online Registration	CZ	6
5. Material Master			
Create/Change Material Matser	Create/Change Material Matser	CF	2
Block Material	Block Material Matser	S	1
Delete Material	Delete Material Matser	S	1
6. Login (Technical Requirement)			
Singlr Sign-In	N/A	TPI	10

summation of weights per category of change expected (figure 4.) We suggest the following metrics:

- TS: Total Standards
- TCF: Total Configurations
- TCZ: Total Customizations
- TTPI: Total Third Party Integrations
- TCSC: Total Change Source Code

In the example given above the final estimated relative effort of the change is: TS = 3, TCF = 4, TCZ = 16, TTPI = 10, and TCSC = 0. Hence, it is expected that major change effort will be dedicated to customizing the implementation, while no code change will be required. TTPI value indicates that this slice of the project needs a moderate effort to adapt parts of the system during implementation to integrate with a functionality provided via a third party. Values for TSs and TCFs show the numbers for expected effort of change required, and this example they represent a minor concern.

$$TS = \sum_{i=0}^{n} Si$$

$$TCF = \sum_{i=0}^{n} CFi$$

$$TCZ = \sum_{i=0}^{n} CZi$$

$$TTPI = \sum_{i=0}^{n} TPIi$$

$$TCSC = \sum_{i=0}^{n} TCSCi$$

Figure 4. Metrics for total expected change per category

Step 5: The matrix analysis provides an insight into the relative amount of work each bidder's proposal will take. So it is easy to see which proposals are better as each ERP BP is analyzed to understand how much it requires change to comply with the organization's BP. This provides a sense of how much work will be involved implementing each business process. A discussion should ensue as to what requirements expectations might be changed based upon the amount of work for each requires. For example, if a process can be modified so it is a configuration rather than a change source code, there would be a great saving. This discussion will be carried out in collaboration with the process owners (POs) and they are able to see the cost of sticking to a particular as-is process. This might convince them to be more flexible in their requirements.

Step 6: Based upon the analysis, the bidder requiring the minimum amount of effort would most likely be selected as the winner. However, how the bidder selected and characterized the particular changes should be considered in terms of what it says about the quality of the bidder.

CONSLUSION

The proposed approach aims at addressing the challenges of contracting out for an ERP system. It focusses

on the need to begin learning about what is needed by the client and what is available from the ERP vendor and the contractor before choosing a contractor and beginning the implementation. The requirements document provides information about the as-is business processes and insights about the perceived flexibility for change and saves this information in the evaluation matrix. The matrix as filled in by the contractor offers insights into the level of effort required to implement each process, paving the way for negotiation before the contract is let. It gives the option to the client of motivating minor and even major changes in business processes by recognizing the value/cost relationship for implementing various processes as-is or modified. Early preparation helps the client understand what As-Is business processes are important to re-evaluate or reengineer to minimize the customization.

It provides a basis for comparison of the various proposals with respect to relative effort estimation and an understanding of how the effort is distributed. It minimizes the risks that might show up during implementation and provides a way to understand what trade-offs are possible.

The weaknesses are that the client has to be willing to spend the effort up-front and do a great deal of learning about themselves, the vendor, and the contractor. It requires the early commitment of top level management to take responsibility for understanding the effect of the change on the organization as a whole, getting involved with process owner to help make the compromise when there is a need for change, and empowering the project manager to make the changes when they are beneficial. For example, top level management is needed when a process owner is unwilling to accept a change that lessens the cost or improves the overall integration process.

This method has been derived based upon the analysis of experience with the implementation of an ERP system. We have applied it to a subset of the organization business process as a pilot to check the feasibility and usability of the method. We plan to extend this method so that it covers other factors that we view as important to the success of ERP implementation projects. For example, enterprise data readiness, team competency, alignment of ERP enterprise goals, and change management requirements.

ACKNOWLEDGMENTS

This project was funded by the Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah, Saudi Arabia. The authors acknowledge and extend their gratitude towards DSR for its technical and financial support.

REFERENCES

[1] K. M. Lui and K. C. C. Chan, “Rescuing troubled software projects by team transformation: A case study with an ERP project,” IEEE Trans. Eng. Manage., vol. 55, no. 1, pp. 171–184, Feb. 2008.

[2] http://www.kau.edu.sa/Pages-Our-History.aspx

[3] Jun Xu and Mohammed Quaddus, “Using Information Systems for Enhancing Internal Operation: Enterprise Resource Planning Systems”, Chapter 7, DOI: 10.2991/978-94-91216-89-3_7. Atlantis Press 2013

[4] De Soysa, S., and J. Nanayakkara. “Readiness for ERP Implementation in an Organization: Development of an Assessment Model.” Information and Automation, 2006. ICIA 2006. International Conference on. IEEE, 2006.

[5] Sammon, David. “Towards a model for evaluating organisational readiness for ERP and data warehousing projects.” (2004).

[6] Adnan Al Bar, Victor Basili, Wajdi Al Jedaibi, Abdul Jawad Chaudhry, An Analysis of the Contracting Process for an ERP system, SEAS-2013, Computer Science Conference Proceedings in Computer Science & Information Technology (CS & IT) series, Dubai, UAE, November 2-3, 2013.

[7] Tanya Bondarouk & Maarten van Riemsdijk, “Successes and failures of SAP Implementation: A learning Perspective”, International Journal of Technology and Human Interaction, Volume 3, Issue 4, 2007.

[8] Derek S. Dieringer, “ERP Implementation at Nestlé”, [online] available at: *http://www.uwosh.edu/faculty_staff/wresch/ERPNestlé.htm* June 24, 2004.

[9] Kristi I. Wenrich & Norita Ahmad,” Lessons Learned During a Decade of ERP Experience: A Case Study” International Journal of Enterprise Information Systems, Volume 5, Issue 1, 2009.

[10] Lykkegaard & Jsozef Gemela, “SAP In The Mid - Sized Enterprise: Lessons Learned In Europe and Africa”, International Data Corporation (IDC), January 2009.

[11] Bob Lewis, “Six lessons from a lightning ERP rollout”, InfoWorld, November 2011.

[12] Hong, Kyung-Kwon, and Young-Gul Kim. “The critical success factors for ERP implementation: an organizational fit perspective” *Information & Management* 40.1 (2002): 25-40.

[13] Adnan Al Bar, Victor Basili, Wajdi Al Jedaibi, Abdul Jawad Chaudhry, An Experience-Based Evaluation Process for ERP Bids, Advanced Computing International Journal (ACIJ), Vol. 5, No. 1, January 2014.

[14] V. R. Basili,, “Learning through Applications: The Maturing of the QIP in the SEL”, in Making Software, Andy Oram and Greg Wilson, eds., O’Reilly, 2011.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Performance Analysis of 4QAM for AF Relays over Rayleigh Fading Channel

Huda A. AL-Khafaji[1], Haider M. Al Sabbagh[1], Alauddin Al-Omary[2]* and Hussain Al-Rizzo[3]

[1]*Department of Electrical Engineering, College of Engineering, University of Basra, Iraq*
[2]*Department of Computer Engineering, College of IT, University of Bahrain, Bahrain*
[3]*Department of Systems Engineering, College of Engineering and Information Technology, University of Arkansas at Little Rock, USA*

ABSTRACT

Cooperative relay has been recently employed to resolve the problem arises from fading and multipath propagation. Bit Error Rate (BER) is one of key metrics used for system performance assessment. This paper provides analytical formulation for the BER as a function of distance employing 4Quadrature Amplitude Modulation (4QAM). Impact location of the relays and effects of different propagation environment is considered. Also, impact of AF relay in reducing the required SNR in case using 4QAM is presented. Results show that the best location of relays is in the center between the source and destination. Also, using relays reduce the SNR, which reduces the power of the transmitted signal.

KEY WORDS: AMPLIFY AND FORWARD (AF) RELAYING; 4QAM; RAYLEIGH CHANNEL; BER; COOPERATIVE RELAYING

INTRODUCTION

Many enhanced technologies of wireless networks have been investigated and contributed by academia and industry over the past few decades, relay is one of the most attractive technologies [1]. Transmitting independent copies of signal generates diversity may be generated by transmitting signals from different locations, thus allowing independently faded versions of the signal at the receiver. Cooperative communication enables this type of cooperative diversity [2]. In [3] authors derive closed-form expressions of the exact bit error rate computation for cooperative communication systems for 4/16 QAM modulation over additive white Gaussian noise (AWGN) channels and Rayleigh fading channels. Suraweera et al., [4] derived closed-form expressions for the outage probability in Nakagami/Generalized-K and Generalized-K/Nakagami fading environments. Based on

ARTICLE INFORMATION:

**Corresponding Author: aalomary@uob.edu.bh*
Received 12th Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/2

the obtained formulas, new expressions for the average bit error probability of rectangular QAM modulations were also derived. Trigui et al. [5] have investigated the outage probability of a single relay transmitting over different channel condition. Also, investigated the perfeormance of the system in term of BER for 4 and 16 QAM.

This paper provides analytical formulation for the BER in terms of distances between source, relay and destination with existence of direct path. The BER simulated for a different relay locations with a specific propagation environment. Also, compare the performance of the system with and without employing relays and show how the relay enhance reduing the SNR with using 4QAM modulation. Finally, investigating effect of different propagation environments on the BER of multiple AF relay.

The rest of the paper is organized as follows. In Section 2, the system model of the considered AF system is described. In Section 3, results and discussion are presented. Finally, Section 4 concludes the paper.

System Model

Large-scale fading in wireless system occurs when the transmitted signal passes through large distances compared to the wavelength and obstacles causing shadowing and path loss. Influence of the propagation environment in addition to the loss of signal power as a function to the propagation distance cause path loss, while shadowing is the variation of signal power as it is impeded by obstacles [6]. Path of the signal travels between the source and destination fluctuates from Line of Sight (LoS) to that harshly obstructed by objects with Non Line of Sight (NLoS) [7]. The path loss exponent, α, used to capture the effect of path loss with the distance is d^{α} [6]. The characteristic of different prorogation environments is referred to as path loss exponent value [8]. Lower value of α means availability of LoS, while larger values of α implies the existence of NLOS due to obstructions [7]. For example, LoS environment is represented by α = 3 and 4 while NLoS environment given by α = 5 [9]. Considering a system in which the signal transmitted from the source s to the destination d is supported by N relays. The system works in a half-duplex transmission mode. The transmission protocol requires two phases. In phase 1, the source broadcasts information to the destination, and the information at the same time naturally received by the relay. The received signal at the i-th relay node, y_{sri}, and the destination, y_{sd}, are given by [10]:

$$y_{sri}=\sqrt{P_t}\, h_{sri}x+ n_{sri},\ i = 1, 2, 3..., N \quad (1)$$

$$y_{sd}=\sqrt{P_t}\, h_{sd}x+ n_{sd}, \quad (2)$$

In phase 2, N relay nodes assist in amplifying the received signal and then retransmit the signal to the destination node. The received signal at the destination due to the i-th relay transmission is:

$$y_{rid}= G_{ri}\, h_{rid}y_{sri}+ n_{rid} \quad (3)$$

where P_t is the transmit power, x is the transmitted signal and G_{ri} the amplification factor for i-th relay. The n_{sri}, $n_{sd}$and n_{rid} are the additive white Gaussian noise (AWGN) of the source to destination link, the source to i-th relay link and i-th relay to the destination link, respectively with variance N_0. The h_{sd}, h_{sri} and h_{rid} are the channel coefficients modeled as a circularly symmetric complex Gaussian random variable with variances $\sigma_{sd}^2 = d_{sd}{}^{-\alpha}$,$\sigma_{sri}^2 = d_{sri}{}^{-\alpha}$ and $\sigma_{rid}^2 = d_{rid}{}^{-\alpha}$, respectively [11]. d_{sd}, d_{sri} and d_{rid} are distances between the source and the destination nodes, source to i-th relay nodes and i-th relay to the destination nodes, respectively. In the simulations, the distance between the source and the destination is normalized as d_{sd} =1 km. Three cases are employed to simulate location of the relays: close to the source, close to the destination and in the center between the source and the destination. These three cases are investigated for availability of existing single and multi-relays. The values represent the location of the relay are assigned according to:

$$d_{sd} = d_{sri}+ d_{rid} \quad (4)$$

the transmission gains are:

$$h_{sri} = \left(\frac{1}{d_{sri}}\right)^{\frac{\alpha}{2}},\ h_{rid} = \left(\frac{1}{d_{rid}}\right)^{\frac{\alpha}{2}} \text{ and } h_{sd} = \left(\frac{1}{d_{sd}}\right)^{\frac{\alpha}{2}} \quad (5)$$

and the amplification factor of i-th relay G_{ri} is [12]:

$$G_{ri} = \sqrt{\frac{P_{ri}}{P_t d_{sri}{}^{-\alpha}+N_0}} \quad (6)$$

where P_{ri} is the power at the i-th relay. Let $P_t = P_s = P_{ri}$ and assume that the SNR of the source to destination link, the SNR of source to i-th relay link, γ_{sri}, and SNR of the i-th relay to the destination link, γ_{rid}, written in term of distances, as:

$$\gamma_{sri} = \frac{P_t d_{sri}{}^{-\alpha}}{N0},\ \gamma_{rid} = \frac{P_t d_{rid}{}^{-\alpha}}{N0} \text{ and } \gamma_{sd} = \frac{P_t d_{sd}{}^{-\alpha}}{N0} \quad (7)$$

The *total* SNR at the destination when a direct path link exists, between source and destination, is:

$$\gamma_d = \sum_{i=1}^{N} \frac{\gamma_{sri}\gamma_{rid}}{\gamma_{sri}+ \gamma_{rid}+1} + \gamma_{sd} \quad (8)$$

For simplicity, assume $SNR=\frac{P_t}{N_0}$, the total SNR at the destination in Eq. 8 may be rewritten as:

$$\gamma_d = \sum_{i=1}^{N} \frac{SNR^2 d_{sri}{}^{-\alpha} d_{rid}{}^{-\alpha}}{SNR\, d_{sri}{}^{-\alpha}+ SNR\, d_{rid}{}^{-\alpha}+1} + SNR\, d_{sd}{}^{-\alpha} \quad (9)$$

The BER *for* 4QAM modulationis [13]:

$$P_b \approx \frac{2}{\log_2 M}\left(1-\frac{1}{\sqrt{M}}\right) erfc\left(\sqrt{\frac{3}{2(M-1)}\gamma_d}\right) \quad (10)$$

where *erfc (x)* is the complementary error function and M is the modulation order. In this work M = 4.

RESULTS AND DISCUSSION

Figure 1 illustrates influence location of relay on BER for multiple AF relays in sub-urban environment, α = 4, and 4QAM modulation and all relays are located at the center of the link between the source and the destination. It is obvious that increasing number of relays reduces the BER, compare with direct transmission, without using a relay, for SNR = 10 dB the BER is reduced to 7.7×10^{-5} with two relays in the center, from the corresponding value 8×10^{-2} which obtained without employing any relays. Also, type of the modulation (4QAM modulation) is known of its requirement for high SNR to achieve small BER in direct transmission, without relays. Using relay in the system amount of the SNR is reduced, hence the power of the transmitting signal will be lessened. For example, SNR is 20 dB to achieve BER = 10^{-2} in direct transmission will reduce to 2 dB in case using two relays to achieve the same BER.

Fig.2 and Fig. 3 illustrate the BER for three relays when all located close to the source and close to the destination with α = 4, respectively. Using 4QAM modulation with AF relay will require an extra SNR to maintain the same BER but in all cases using relays always better than direct transmission. For instance, BER = 10^{-3} can be achieved at SNR ≈ 12 dB when single relay close to the source and SNR = 15 dB when single relay close to the destination. On the other hand, increasing number of relays will reduce the required SNR, for example, the same BER (10^{-3}) can be geten at SNR ≈ 7 dB when two relays close to the source and SNR = 8 dB when two relays close to the destination.

However, comparing the results in Figs.2 and 3 with that in Fig.1 reveals that the best location is at the center of the link between the source to the destination. The worst performance is when the place of the relay close to the destination with using 4QAM modulation.

To study effect of different propagation environment on BER, path loss exponent with different values will considered as a function of distance. Table 1 presents the results for three relays when the first, second and third relay are placed at the center with different SNR. Increasing the number of relays generally decreases the BER and further it decreases more when the relay is located at the center. The reason behind the reduction in BER is that path loss is function to distance and since placing relays will split the distance between source and the destination (d_{sd}) into smaller distances. The BER in Eq.10 is function tofrom will associate with inverse relationships with α.

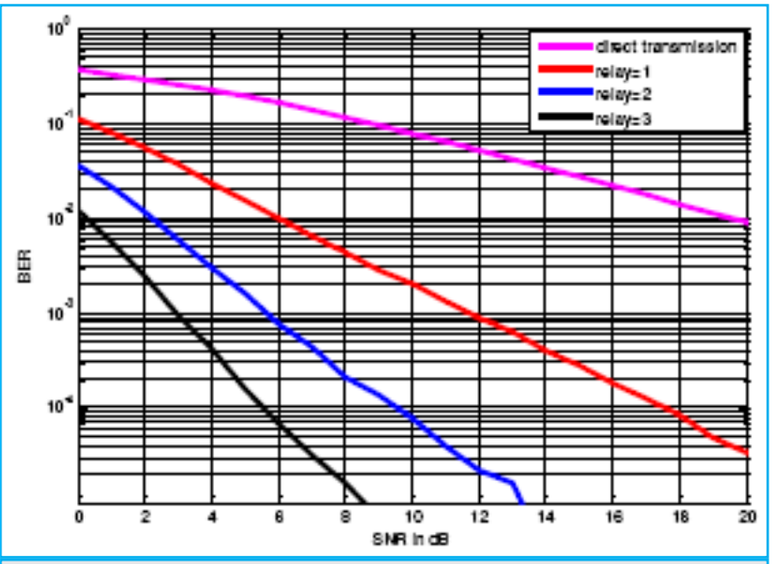


Figure 1. BER versus the SNR for three cases with direct link: using a single relay in red, using two relays in blue, and using three relays in black when all are located at the center.

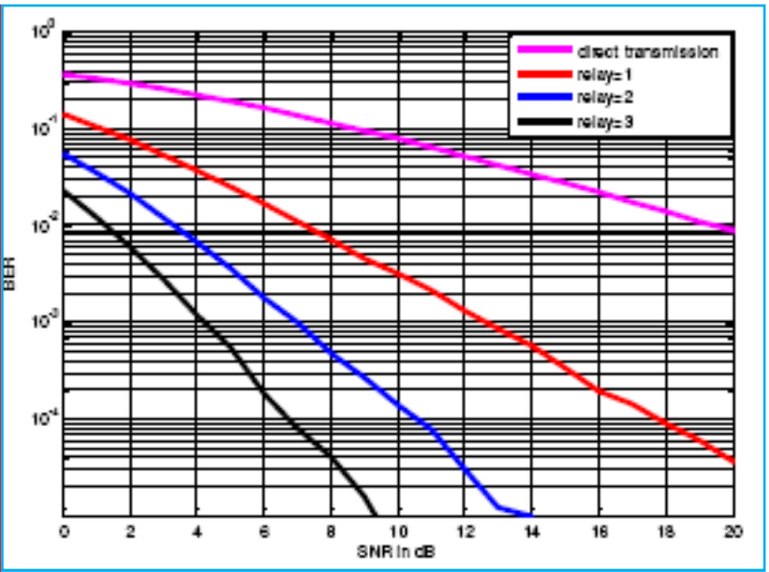


Figure 2. BER versus the SNR for three cases with direct link: using a single relay in red, using two relays in blue, and using three relays in black when all are located close to the source.

CONCLUSION

In this paper, BER of 4QAM for multiple AF relays in term of location between the source -destination with the direct link is investigated. Comparison between direct transmission and with using multiple relays in different

Table 1. The BER for three relays when d_{sr2} = 0.5 at different SNR

α	SNR=2dB	SNR=4dB	SNR=6dB
3	9×10^{-3}	2×10^{-3}	4×10^{-4}
4	2×10^{-3}	3×10^{-4}	7×10^{-5}
5	6×10^{-4}	6×10^{-5}	1×10^{-5}

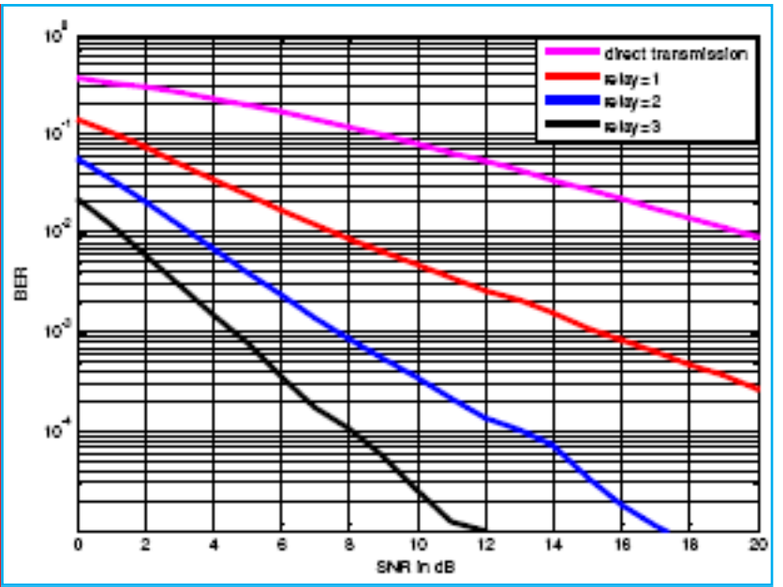


Figure 3. BER versus the SNR for three cases with direct link: using a single relay in red, using two relays in blue, and using three relays in black when all are located close to the destination.

locations the simulation results show that the best performance with lowest BER value may be obtained when relays are placed at the center of the link between the source and the destination. It also studies effects of the path loss for different propagation environment with three relays. The results show that the propagation environment has an effect on BER in which higher path loss exponent (i.e., harsh propagation environment) results in low BER if the relay exist in the system. When the signals propagate in NLOS environment with α is 5 and number of relays in the system are three, the lowest BER is 1×10^{-6} and decreasing more with increasing SNR.

REFERENCES

[1] K. Loa, C. C. Wu, S.-T. Sheu, Y. Yuan, M. Chion, D. Huo, et al., IMT-advanced relay standards [WiMAX/LTE Update], IEEE Communications Magazine, 48(8), 2010, 40-48, DOI: 10.1109/MCOM.2010.5534586.

[2] A. Sendonaris, E. Erkip, and B. Aazhang, User cooperation diversity. Part I. System description, IEEE Transactions on communications, 51(11), 2003, 1927-1938,DOI: 10.1109/TCOMM.2003.818096

[3] M.-k. Chang and S.-y. Lee, Performance analysis of cooperative communication system with hierarchical modulation over Rayleigh fading channel, IEEE Transactions on Wireless Communications, 8(6), 2009, 2848 – 2852, DOI: 10.1109/TWC.2009.081077.

[4] H. A. Suraweera, G. K. Karagiannidis, and P. J. Smith, Performance analysis of the dual-hop asymmetric fading channel, IEEE Transactions on Wireless Communications, 8(6), 2009, 2783 -2788 ,DOI: 10.1109/TWC.2009.080420.

[5] I. Trigui, S. Affes, and A. Stephenne, On the performance of dual-hop fixed gain relaying systems over composite multipath/shadowing channels, in Vehicular Technology Conference Fall (VTC 2010-Fall), 2010 IEEE 72nd, 2010,1-5, DOI: 10.1109/VETECF.2010.5594177.

[6] A. Goldsmith, Wireless communications: Cambridge university press, 2005.

[7] T. S. Rappaport, Wireless communications: principles and practice vol. 2: Prentice Hall PTR New Jersey, 1996.

[8] K. R. Liu, Cooperative communications and networking: Cambridge university press, 2009.

[9] J. R. Hampton, Introduction to MIMO communications: Cambridge university press, 2013.

[10] K. G. Seddik, A. K. Sadek, W. Su, and K. R. Liu, Outage analysis of multi-node amplify-and-forward relay networks, in Wireless Communications and Networking Conference, 2006. WCNC 2006. IEEE, 2006, 1184-1188.

[11] P. Herhold, W. Rave, and G. Fettweis, Relaying in cdma networks: Pathloss reduction and transmit power savings, in Vehicular Technology Conference, 2003. VTC 2003-Spring. The 57th IEEE Semiannual, 2003, 2047-2051, DOI: 10.1109/VETECS.2003.1207185.

[12] M. Wu, D. Wübben, and A. Dekorsy, BER-based power allocation for amplify-and-forward and decode-and-forward relaying systems, in Smart Antennas (WSA), 2011 International ITG Workshop on, 2011, 1-8, DOI: 10.1109/WSA.2011.5741925.

[13] M. Wu, D. Wübben, and A. Dekorsy, BER-based power allocation for decode-and-forwardrelayingwithm-qam constellations, in 7th International Wireless Communications and Mobile ComputingConference (IWCMC), 2011, 888-893, DOI: 10.1109/IWCMC.2011.5982664

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

A Comparative Study of NoSQL Databases

Musbah J. Aqel[2], Aya Al-Sakran[1] and Mohammad Hunaity[3]

[1]*Faculty of Information Technology, Applied Science Private University, Amman, Jordan*
[2]*Department of Management Information Systems, School of Applied Sciences Cyprus International University, Lefkosa, North Cyprus*
[3]*Faculty of Information Technology, AlBalqa'a Applied University, Jordan*

ABSTRACT

A lot of traditional relational databases are still used so far in a very large number of applications. Recently, new data bases technologies have been developed in the need to deal with the increasing amount of complex data. Millions of users would do their updates and reads on web applications, in contrast to traditional DBMSs and data warehouses which have no ability to scale horizontally on these applications. Choosing the most appropriate NoSQL database would be sometimes tricky so it is important to know the features of the NoSQL database. In this survey, most popular NoSQL databases: Cassandra MongoDB, CouchDB, Hbase and SimpleDB are compared. This comparison allows the user to choose the most appropriate database, basing on application's needs. Also, the focus is on the NoSQL models and their descriptions, and when they are best used. Lastly, the compared advantages and disadvantages of these data stores are listed to discuss selecting appropriate NoSQL database which processes huge volumes of data; and provides global overview of these non-relational NoSQL databases.

KEY WORDS: NOSQL DATABASE, RELATIONAL DATABASE MANAGEMENT SYSTEM, STRUCTURED QUERY LANGUAGE.

INTRODUCTION

Big data is a term for data sets that are very large and complex which traditional data processing applications would not handle with them. It is related to the huge development of the Internet, mobile devices and cloud computing. Increasingly, organizations today are facing more and more big data challenges, including analyzing, capturing, searching, sharing, storing, transferring, visualizing, and querying, updating and information privacy. They have access to all the information, but they do not know how to get value out of it because it is in a semi structured or unstructured format. As a result, they do not even know whether to keep or there is a capability to keep it or not [1].

ARTICLE INFORMATION:

**Corresponding Author: musbahaqel@yahoo.com*
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/3

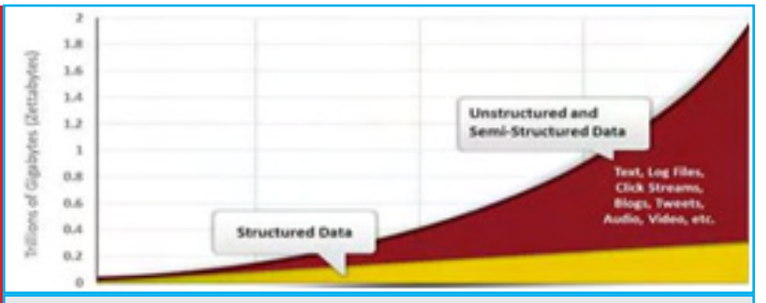


Figure 1. Growing of Big Data

Big data has the ability to help companies to improve their operations and make faster decisions. This data, when captured, formatted, manipulated, stored, and analyzed would help a company to obtain helpful idea to increase revenues, customers, and improve operations [2].

Nowadays the widely accepted interpretation defines big data as 3 V's. The first one is called Variety. Today data is presented in different formats which are called unstructured data such as texts, videos, images, sound and much more. The second one is Velocity that can be defined as the rate at which data is generated, such as around 100 terabytes of data is uploaded daily on Facebook, YouTube users upload 48 hours of video every minute. And the last one is the Volume of data: terabytes of data being processed daily requires very efficient techniques to store and process data [3].

Figure1. below shows the big data about 80% of the data generated now is unstructured or semi-structured. The total amount of data is growing very fast [4]

Types of NoSQL Databases

Recently NoSQL database are generated by the huge growth of data mostly in web and mobile applications. If it is to be considered that social media web pages such as Facebook, LinkedIn and Twitter, which are dealing with thousands of terabytes of data, then it must be noticed that besides handling huge data volume, those systems still have to maintain latency, meaning that reading and writing are supposed to be responded immediately [3]. As previously mentioned there are many NoSQL types which recently have appeared with different performances; therefore, they are compared in terms of performance and verified how the performance are related to the database types [5]. In this Section thefollowing NoSQL databases: Cassandra MongoDB, CouchDB, Hbase and SimpleDB are compared in details.

2.1 Cassandra

Facebook continues to be the most popular and the largest social media site that contains thousands of users of the system simultaneously using tens of millions of servers that are distributed in many data centers around the whole world. There is always a probability any server and any of network components may fail at any given time as any software system needs to be constructed in a way that to deal with failures immediately and efficiency. To meet those Requirements reliability and scalability, Facebook Company has developed new NoSQL Database in 2007 that called Cassandra. Cassandra is the leading NoSQL database that has been developed by Facebook to solve the problem with slow Inbox search across millions messages, in which they had to deal with very large volumes of data in such a way that was impossible to scale with traditional method and to handle Facebook's millions of users searching hits per day. It is an open source non-relational, column oriented distributed system for handling very large amounts of massive structured data distributed over many servers around the whole world [6], while providing highly available services to all users at any given time with no single point of failure. Also, it is used in data-heavy apps like Instagram, Snapchat which daily handle with an average of 100 million photos uploaded, and iCloud which stores over 40 million songs in its database [7, 8].

Cassandra is mainly consists of two systems: Google's BigTable and Amazon's Dynamo. Both systems meet the challenge of scaling, but they do it in different methods: BigTable uses the distributed file system Google already had, while Dynamo is based on a distributed hash table. Cassandra combines the data structure of Big Table, and the high availability of Dynamo [9].

Cassandra uses the eventual consistency model which is used for writing operations and has no central node. Data would be read from or written to any node in a cluster and that provides us with continuous horizontal scalability and has no single point of failure. Because Cassandra uses peer-to-peer fault-tolerance technology, no master/slave setup, failover. This means any node in the cluster would perform users query in the case of any failure happen, the figure1 below shows peer to peer structure [10].

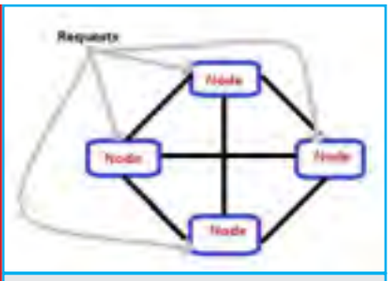


Figure 2. Peer-to-peer Structure

As shown in the figure 2 a peer-to-peer structure means each node is corresponding to the others, and there are replications in the ring. If one node fails, the service will continue of performance. Data on the failed node would still be accessed. The peer-to-peer design also makes it easy to scale by adding new nodes. Because the behavior of each node is separated, in order to add a new server, it is simply need to add it to the cluster [8].

2.1.1 Cassandra API

Cassandra API consists of the following three simple methods:

Inser(table,key,rowMutation)
Get (table,key,columnName)
Delete(table,key,columnName)

The column Name can refer to a specific column within a column family, a column family, a super column family, or a column within a super column [11].

2.1.2 Facebook Inbox Search

One of the popular applications of Cassandra is Facebook Inbox Search problem, the inbox search system needs to handle a very high speed writing, billions of writings per day and is also required to scale to a very large amount of users. To keep search, data has to be replicated to all data centers which are used by different users distributed at different geographic areas. It is noticed that there are very powerful and restricted operational requirements on Facebook's platform in terms of performance, reliability and efficiency, and to keep up the continuous infinite growth the platform used needs to be highly scalable that dealing with failures in an very efficient way[11].

Table 1. Describe some production measured numbers are showed for their performance.

Latency	State Search	Term Search
	Interactions	
Min	7.69ms	7.78ms
Median	15.69ms	18.27ms
Max	26.13ms	44.41ms

For each of these super columns the individuals are the columns. In order to make the searches, fast Cassandra provides certain hits for intelligent caching of data; for instance, when a user clicks into the search bar an asynchronous message is sent to the Cassandra cluster to prime the buffer cache with that user's index. This way when the actual search query is executed, the search results are likely to already be in memory. The system currently stores about 50+TB of data on a 150 node cluster, which is spread out between on different data centers [12].

As shown the table1 above Cassandra can support a very high update throughput while delivering low latency [12].

2.1.3 Cassandra Characteristics

The schema of Cassandra is very flexible and does not require any database schema design as well as adding and deleting fields are very convenient. And it is Supports range queries and the scalability is very high such that a single point of failure does not affect the all cluster and it supports linear expansion [13].

Table 2. below shows how Cassandra Differ from a Relational Database

Relational Database	Cassandra
Handles moderate incoming data velocity	Handles high incoming data velocity
Data arriving from one/few locations	Data arriving from many locations
Manages primarily structured data	Manages all types of data
Supports complex/nested transactions	Supports simple transactions
Single points of failure with failover	No single points of failure; constant uptime
Supports moderate data volumes	Supports very high data volumes
Centralized deployments	Decentralized deployments
Data written in mostly one location	Data written in many locations
Supports read scalability (with consistency sacrifices)	
Deployed in vertical scale up fashion	Deployed in horizontal scale out fashion

2.1.4 Cassandra Data Model:

Key-value data model means each value corresponds to a Key [14].

Column-oriented: column-store systems completely vertically partition a database into a collection of individual columns that are stored separately. By storing each column separately on disk, these column-based systems enable queries to read just the attributes they need, rather than read all rows from disk and discard unneeded attributes once they are in memory [15].

Document: document database and Key-value is very similar in structure, but the Value of document database is semantic, and is stored in JSON or XML format [14].

2.1.5 Security Issues in Cassandra

All passwords in Cassandra are encrypted using of MD5 hash function so that the passwords are very weak. If any malicious user can attack client authorization, user can extract the data because there is no authorization mechanism in internode message exchange. Cassandra is potential for denial of service attack because it performs one thread per one client and it does not support inline auditing [16]. In order to avoid this, the application must encrypt any sensitive information before writing it to the database. Also, operating-system level mechanisms should be used to prevent access to the files by unauthorized users [9].

Cassandra uses a query language called Cassandra Query Language (CQL), which is something like SQL. The authors show that injection attack is possible on Cassandra like SQL injection using CQL. Cassandra also has problem in managing inactive connection [16].

Table 3. Below Show the Different Measurements for Each Data Model.

Data Model	Performance	Scalability	Flexibility	Complexity	Functionality
Key-Value Store	High	High	High	None	None
Column	High	High	Moderate	Low	Minimal
Document	High	High	High	Low	Low
Oriented Store					

Cassandra uses a query language called Cassandra Query Language (CQL), which is something like SQL. The authors show that injection attack is possible on Cassandra like SQL injection using CQL. Cassandra also has problem in managing inactive connection [16].

2.2 Mongo DB

Mongo DB is an open-source document-oriented database written in C++ that uses JSON, which is used in a schema that require less data model. MongoDB's mainly provides horizontal scalability by using the automatic sharing. Replication is also supported using locks and the asynchronous master-slave model which means writing operations are only processed by the master node and reading operations can be made from both the master node and from one of the slave nodes. Writings are distributed to the slave nodes by reading from the master's operation log. Clients of database have the ability to select which kind of consistency models they wish, by defining whether reading from secondary nodes are allowed and from how many nodes the confirmation must be obtained [17].

In Mongo DB, document manipulation is a strong focus, also the database provides different frameworks and ways of interacting with documents. These can be queried, sorted, projected, iterated with cursors, and aggregated, among other operations. The changes to a document are guaranteed to be atomic. Indexing can be used on one or several fields (implemented using B-trees), with the possibility of using two-dimensional spatial indexes for geometry-based data. There are many different programming interfaces supported by MongoDB, with most popular programming languages having native bindings [17].

2.2.1 Mongo DB Features

MongoDB stores data in JSON documents. JSON provides a rich data model that maps to native programming language types, and the dynamic schema makes it easier to develop your data model than with a system that enforces specific schemas such as a RDBMS [13].

Power: MongoDB provides a lot of the features of a traditional RDBMS such as secondary indexes, dynamic queries, sorting, rich updates, and easy aggregation. This gives more functions that you are used to from an RDBMS, with the flexibility and scaling capability that the non-relational model allows [13].

Ease of use: MongoDB is very easy to install, configure, maintain, and use. Because it provides few configuration options [8]. This means you can begin right into developing the application, instead of spending a lot of time to search and try to make database configurations [13].

MongoDB can do very strong consistency by using two parameters: first set to read only from the master, meaning that only one node will be accessed for read. Another way is to set "write" parameter to "replica acknowledged", which ensures that write is successfully completed on all the nodes. These techniques actually force the data store to the synchronous replication and therefore decrease the performance [3].

2.2.2 MongoDB Architecture

A MongoDB cluster is different from a Cassandra cluster. The most noticeable difference is the lack of Homology: not each node in a MongoDB cluster is the same [9].

2.2.3 Security Issues in MongoDB:

All data in MongoDB is stored as plain text and there is no encryption mechanism to encrypt data files. This means that any malicious user with access to the file system can extract the information from the files. It uses SSL with X.509 certificates for secure communication between user and MongoDB cluster and intra-cluster authentication but it does not support authentication and authorization when running in Sharded mode. The passwords are encrypted by MD5 hash algorithm and MD5 algorithm is not a very secure algorithm. Since mongo uses Javascript as an internal scripting language, authors in show that MongoDb is potential for scripting injection attack [16].

2.3 SimpleDB

Amazon'sSimpleDB is a Web service that provides basic database functions of information indexing and querying in the cloud[18], SimpleDB has been published in 2007. As the name indicates its model is very simple, it has collection of simple operations such as Select, Delete, GetAttributes, and PutAttributes on documents. SimpleDB is simpler than other document stores, as well as it does not allow nested documents. Also it is support eventual consistency. Like most of the other systems, it does asynchronous replication. Unlike key-value data stores, and like the other document stores, SimpleDB supports more than one grouping in one database: documents are put into domains, which support multiple indexes. You can simply put domains and their metadata. Select operations are on one domain, and specify a conjunction of constraints on attributes, simply in the form of [19].

select<attributes> from <domain> where
<list of attribute value constraints>

SimpleDB is appropriate option for quick setup without any administration effort. However, the NoSQL model is main problem to applications already developed with relational databases. To adjust a relational-based application to a cloud platform may increase in a large maintenance effort. In order to decrease a situation like that, It is suggested to use an access layer that makes the translation of SQL requests to the SimpleDB API and returns data in a relational format. It is called SimpleSQL. In this first version, the basic layer is only able to perform the four traditional operations: INSERT, UPDATE, DELETE and SELECT, while SimpleSQL provides more details about its functionality and implementation. SimpleSQL is developed by Microsoft .NET Framework version 3.5, using C# as programming language. Figure 3 shows the layer architecture, which highlights the three steps of an SQL command processing [20].

SimpleDB does not automatically distribute data over servers. Some horizontal scaling can be achieve by reading any of the portions, if you Application don't effect by having the latest version. Writes do not scale, however, because they must go asynchronously to all copies of a domain. If customers want better scaling, they must do so manually by sharing themselves [19].

SimpleDB has currently constraints, some of which are quite limiting: a 10 GB maximum domain size, a limit of 100 active domains, a 5 second limit on queries, and so on. Amazon does not license SimpleDB source or binary code to run on your own servers [19].

2.3.1 Processing and Return in SimpleDB

When the user identify the command, SimpleSQL translate it to a SimpleDB that is called REST method. All the commands begin with the identification of the target SimpleDB domain from the target table, extracted from the command. DELETE and UPDATE commands return the number of affected items. INSERT returns the result of the operation (success or fail) and SELECT returns the data in a table structure using .NET class Data Table [20].

Figure 3. Layer architecture

2.4 CouchDB

CouchDB currently is one of the most popular NoSQL databases .The flexible document structure makes it ideal for using, fault-tolerant database, which supports data formats such as ISON and AtomPub, it provides REST-style API. CouchDB comply with ACID properties to ensure the consistency of data. Also, CouchDB provides a P2P-based distributed database solution that supports bidirectional replication. However, it also has some limitations, such as only providing an interface based on HTTP REST, concurrent read and write performance is not ideal and so on [14].

CouchDB is not only a NoSQL database, but it is also a web server for applications developed in JavaScript. some of feauters of using CouchDB as a web server is that applications in CouchDB can be deployed by simply putting them into the database and that the applications can directly access the database without any overhead of a query protocol [21].

CouchDB is a schema-less database which is called "document storage". Each document is store in JSON, which is a human-readable markup language similar to XML, but requiring much less overhead[22], Also CouchDB provides durability when the system down. All updates will be deleted to disk on commit, by writing to the end of a file. By default, it flushes to disk after every document update. Together with the MVCC mechanism, CouchDB's durability also provides ACID semantics at the document level. Clients call CouchDB through a RESTful interface [19].

2.5 HBase

HBase is an open source project, written in Java and developed by the Apache software foundation. It is an open source implementation. HBase works with Apache's Hadoop Distributed File System (HDFS) as basic data storage and it is considered as column-oriented. HBase is a good option for high performance real time queries of very huge amounts of distributed data [23].

In HBase, data is stored in the form of HBase tables (HTable) that are multidimensional sorted maps. The index of the map is the row's key, column's name, and a timestamp. Columns are grouped into column families. Column families must be created before data can be stored under any column key in that family. Data is maintained in order by row key. Finally, each column can have multiple versions of the same data indexed by their timestamp. A read or write operation is performed on a row using the row-key and one or more column-keys. Update operations on a single row are atomic. Any update performed is immediately visible to any read operation. HBase exports a non-blocking key-value interface on the data: put, get, delete, and scan operations. HBase closely matches the scale-out properties assumed for NoSQL databases [24].

2.5.1 Security Issues in HBase

The Security in HBase depends on SSH for inter-node communication, which supports user authentication by the use of SASL (Simple Authentication and Security Layer) with Kerberos. As well as it supports authorization by ACL (Access Control List) [16].

Different performance in Read, Write and delete in MongoDB, Cassandra and CouchDB

In this section, Evaluation some of NoSQL databases categories with a matrix on basis of few attributes design, integrity, indexing, distribution, system have been presented. See table 4 [25].

3.1 Compared between MongoDB, CouchDB, and Cassandra in Read Operation

First experiment compares the time taken to read values corresponding to given keys from the cluster. The below table summarizes the results. In the tables, the number of operations refers to the number of times a given operation (such as read) is executed in the test [26].

Table 4. Shows the Time for Reading

Number of Opertions	10	50	1000	10000	100000
MongoDB	8	14	138	1085	10201
CouchDB	23	101	1819	19508	176098
Cassandra	115	230	2385	19758	228096

Sorted by read performance the list of databases: is MongoDB, CouchDB, and Cassandra. Of these, Cassandra is column-family databases; and MongoDB, and CouchDB are documents-oriented databases. It is observed there is no correlation between the data model and performance. As well as the read performance of MongoDB is better than CouchDB and Cassandra [26].

3.2 Compared between MongoDB, CouchDB, and Cassandra in Writing Operation

Second experiment measures the time taken to write key value pairs to the bucket. If the key-value pair already exists in the bucket, this amounts to updating the existing value [26].

Table 5. Below Summarizes the Results in Writing Operations

Number of Opertions	10	50	100	1000	10000	100000
Mongo DB	61	75	84	387	2693	23354
Couch DB	90	374	616	6211	67216	932038
Cassandra	117	160	212	1200	9801	88197

Sorted by write performance we have the list of databases: MongoDB, Cassandra, and CouchDB. The write performance of CouchDB is worse than Cassandra and MongoDB.

3.3 Compared between MongoDB, CouchDB, and Cassandra in Delete Operation

The last experiment measures the time taken to delete key-value pairs from the bucket [26].

Sorted by delete performance the list of databases is: MongoDB, Cassandra, CouchDB. The delete performance of MongoDB is better than Couchbase and Cassandra [26].

4. Different Criteria for Comparison between NoSQL Databases SimpleDB, CouchDB, Cassandra and HBase:

4.1 Comparison between NoSQL Databases in in Terms of Design Side:

The following table7 shows some of Nosql criteria for comparison such as classification , Protocol, License, Storage Type and Query Method used for each NOSQL Databases and Fault Tolerance.

Table 6. Shows the Time for Deleting and Summarizes the Result

Number of Opertions	10	50	100	1000	10000	100000
Mongo DB	4	15	29	235	2115	18688
Couch DB	71	260	597	5945	67952	705684
Cassandra	33	95	130	1061	9230	83694

Table 7.

	Simple DB	CouchDB	MongoDB	Cassandra	Hbase
Nosql classification	Document Oriented [21].	Document Oriented (JSON) [21].	Document Oriented (BSON) [27].	Column Database[27].	Column Database [27]
Protocol	TCP/IP[21].	HTTP/REST[21]	TCP/IP[21]	TCP/IP[21].	HTTP/REST[21].
License	****	Apache[25]	AGPL (Drivers: Apache)	Apache[25].	Apache
Storage Type	Document [21].	Document[21]	Document[21]	Columns[21].	Columns[21].
Data Storage	S3 (Simple Storage Solution) [21].	Disk [21].	Disk [21].	Disk[21].	Hadoop[21] .
Query Method	String based query	Map/Reduce [21].	Map/Reduce [21].	Map/Reduce[21]	Map/Reduce[21]
Fault Tolerance	****	****	No single point of failure with peer to peer architecture.[27]	No single point of failure with sharding approach as we can configure multiple mongos instances. Single point of failure in master slave approach. [27]	Single point of failure in master slave approach. Can be overcome by failover clustering.[27]

4.2 Comparision between NoSQL Databases in in terms of System and Characteristics and Architecture side:

Table 8. shows the Architecture, Characteristics, programming language written in, Operating system used for each NOSQL Databases and maximum size.

	Simple DB	Couch DB	Mongo DB	Cassandra	Hbase
Written In	Erlang [21].	Erlang [21].	C++ [21]	Java [21]	Java [21]
Operating	Linux Mac OS	Linux Mac OS	Linux Mac OS	Linux Mac OS	Linux Mac OS
System	Windows [21].	Windows [21].	Windows [21].	Windows [21].	X
Value size max	****	20 MB[25]	16 MB [25]	2 GB [25]	2 TB [25]
Characteristics	High Available	High	Consistency	High	Consistency
	And Scalable [29].	Availability	Partition	Availability	Partition
		Partition	Tolerance	Partition	Tolerance
		Tolerance	Persistence [29].	Tolerance	Persistence [29].
		Persistence [29].		Persistence [29].	
Architecture	***	***	1. master slave	Peer to peer	Master Slave
			2. peer to peer via sharding [27]	architecture Model [27].	architecture Model [27].

4.3 Comparison between NoSQL Databases (MongoDB, Cassandra, Hbase) in Read and Write Operations:

Table 9. Shows how database is written and read through Mongo DB, -Cassandra, Hbase:

	Mongo DB	Cassandra	Hbase
Writes	Fast when data is in RAM[27].	Very fast writes [27].	Writes slower [27].
Reads performance	In a master/slave setup, any changes are written to the master and then passed on to slaves. This model is optimized for reading data, as it allows data to be read from any slave. In sharding reads depend on eventual/ strict consistency Level [27].	Performance based on consistency level (decreases in performance with increase in consistency level) and replication Factor [27].	Follows strict consistency model and are optimized for reads. Very fast reads in Hbase with Hadoop support [27].

4.4 Comparison between NoSQL Databases (MongoDB, Cassandra, Hbase) in Terms of System Integrity:

Table 10. Shows how each NOSQL Database differs in terms of (Atomicity, consistency, isolation, durability, integrity Model, Replication model Concurrency Control, Transactions and Replication)

	Simple DB	Couch DB	Mongo DB	Cassandra	Hbase
Atomicity	*******	Yes [25].	Conditional [25].	Yes [25].	Yes [25].
Consistency	NO[28]	Yes [25].	Yes [25].	Yes [25].	Yes [25].
Isolation	****	Yes [25].	No [25].	Yes [25].	Yes [25].
Durability		Yes [25].	Yes [30].	Yes [30].	Yes [30].
Integrity Model	*****	MVCC [25].	BASE [25].	BASE [25].	Log Replication [25].
Replication		Master Slave	Master Slave	MultiMaster	Master Slave
Model		Replication	Replica Replication	Replication [2]	Replication
Concurrency Control	None [21].	MVCC (Multi Version Concurrency Control) [21].	Locks (Instant update) [21]	MVCC (Multi Version Concurrency Control)[21].	Locks [21].
Transactions	No[21].	No [21].	No [21] .	Local [21].	Local [21].
Replication	Asynchrono us [21].	Asynchronous [21].	Asynchronous [21].	Asynchron ous [21]	Asynchronous [21]

4.5 Comparison between NoSQL Databases (MongoDB, Cassandra, Hbase) in where to use and the best use for each NOSQL Database:

The following table11 shows the best used and the area of use for each type of DB Types:

Table 11.

	Simple DB	Couch DB	Mongo DB	Cassandra	Hbase
Best used	For a large number of concurrent access [28]	For accumulating occasionally changing data, on which predefined queries are to be run. Places where vwerioning is important [25].	If you need dynamic queries. If you prefer to define indexes, not map/ reduce functions. If you need good performance on big DB. If you wanted CouchDB but your data changes too much, filling up disks [25]	When you need to store data so huge that it doesn't fit on server, but still want a friendly familiar interface to it [25].	Hadoop is probably still the best way to run Map/Reduce jobs on huge datasets. Best if you use the Hadoop/HDFS stack already [25].
Area of use	Amazon company [28]	****	CMS System, Comment Stroage [2]	Banking, Finance, logging [2].	****
Main points to use	Good option for fast setup without any a administration effort [20]	DB consistency ease of use [25].	JSON document store [25]	Store huge datasets in almost SQL [25].	Billions of rows X millions of columns [25].

4.6 Comparison between NoSQL databases (MongoDB, Cassandra, Hbase) in terms of Security:

Table 12. Below presents the security issues between each of NoSQL Databases types:

Assessment Criteria	Mongo DB	Cassandra	Couch DB	H Base	Simple DB
Authentication	Medium [29].	Low [29].	Medium[29]	Medium [29].	
Access Control	High [29].	Low [29].	Low [29].	Medium [29].	
Secure Configuration	Medium [29].	Low [29].	Low [29].	Low [29].	
Data Encryption	Medium [29].	Medium [29].	Medium [29].	Low [29].	
Auditing	Low [29].	Low [29].	Medium [29].	Medium [29].	

Value means.

High: Provides complete support of required features needed to secure data

Medium: Provides a limited set of security feature only and it is advisable to implement missing features

Low: Offers very basic security features or no security at all

CONCLUSION

Basically, the comparison shows NoSQL databases would not replace relational databases, but instead it will become a better option for specific types of projects. And no one of these NoSQL databases is best for all use cases. A user's prioritization of features will be different depending on the application, as well as the type of scalability and availability required. This survey may help the user to choose the most appropriate data store based on the use case, and some examples of applications that fit well with the different data store categories. And, a storage NoSQL. As overall results in terms of optimization, NoSQL databases can be divided into two categories the databases optimized for reads and the databases optimized for updates. Thus, MongoDB optimized to perform read operations and high availability in an unreliable environment, while Colum Family databases, such as Cassandra and HBase have a better performance during execution of updates, but delivering low latency. Also, CouchDB has some limitations, such as only providing an interface based on HTTP REST. Concurrent read and write performance is not ideal.

REFERENCES

[1] Zikopoulos, P. and C. Eaton, Understanding big data: Analytics for enterprise class hadoop and streaming data. 2011: McGraw-Hill Osborne Media.

[2] Mayer-Schönberger, V. and K. Cukier, Big data: A revolution that will transform how we live, work, and think. 2013: Houghton Mifflin Harcourt.

[3] Gurevich, Y., Comparative Survey of NoSQL/NewSQL DB Systems. 2015, The Open University.

[4] Băzăr, C. and C.S. Iosif, The Transition from RDBMS to NoSQL. A Comparative Analysis of Three Popular Non-Relational Solutions: Cassandra, MongoDB and Couchbase. Database Systems Journal, 2014. 5(2): p. 49-59.

[5] Bukharmetov, M., et al., Robust Method for Protecting Electronic Document on Waterway Transport With Steganographic Means by Embedding Digital Watermarks into Images. Reliability and Statistics In Transportation and Communication, 2016: P. 32.

[6] Hecht, R. and S. Jablonski. Nosql evaluation. in International conference on cloud and service computing. 2011. IEEE.

[7] Khanna Vadivelu, M., magevadi@ indiana. edu Indiana University Bloomington.

[8] Yu, M., Cassandra to back applications. 2011.

[9] Okman, L., et al. Security issues in nosql databases. in 2011 IEEE 10th International Conference on Trust, Security and Privacy in Computing and Communications. 2011. IEEE.

[10] Sakr, S., et al., A survey of large scale data management approaches in cloud environments. IEEE Communications Surveys & Tutorials, 2011. 13(3): p. 311-336.

[11] Lakshman, A. and P. Malik, Cassandra: a decentralized structured storage system. ACM SIGOPS Operating Systems Review, 2010. 44(2): p. 35-40.

[12] Jain, R., S. Iyengar, and A. Arora. Overview of popular graph databases. in Computing, Communications and Networking Technologies (ICCCNT), 2013 Fourth International Conference on. 2013. IEEE.

[13] Zvarevashe, K. and T.T. Gotora, A Random Walk through the Dark Side of NoSQL Databases in Big Data Analytics. International Journal of Science and Research, 2014. 3: p. 506-09.

[14] Han, J., et al. Survey on NoSQL database. in Pervasive computing and applications (ICPCA), 2011 6th international conference on. 2011. IEEE.

[15] Abadi, D., et al., The design and implementation of modern column-oriented database systems. 2013: Now.

[16] Sahafizadeh, E. and M.A. Nematbakhsh, A Survey on Security Issues in Big Data and NoSQL. Int'l J. Advances in Computer Science, 2015. 4(4): p. 2322-5157.

[17] Grolinger, K., et al., Data management in cloud environments: NoSQL and NewSQL data stores. Journal of Cloud Computing: Advances, Systems and Applications, 2013. 2(1): p. 1.

[18] Leavitt, N., Will NoSQL databases live up to their promise? Computer, 2010. 43(2): p. 12-14.

[19] Cattell, R., Scalable SQL and NoSQL data stores. AcmSigmod Record, 2011. 39(4): p. 12-27.

[20] Calil, A. and R. dos Santos Mello. SimpleSQL: a relational layer for SimpleDB. in East European Conference on Advances in Databases and Information Systems. 2012. Springer.

[21] Padhy, R.P., M.R. Patra, and S.C. Satapathy, RDBMS to NoSQL: reviewing some next-generation non-relational database's. International Journal of Advanced Engineering Science and Technologies, 2011. 11(1): p. 15-30.

[22] Vincent, M.L., F. Kuester, and T.E. Levy. OpenDig: In-field data recording for archaeology and cultural heritage. in Digital Heritage International Congress (Digital Heritage), 2013. 2013. IEEE.

[23] Weber, S., Nosql databases. University of Applied Sciences HTW Chur, Switzerland, 2010.

[24] Vilaça, R., et al. An effective scalable SQL engine for nosql databases. in IFIP International Conference on Distributed Applications and Interoperable Systems. 2013. Springer.

[25] Moniruzzaman, A. and S.A. Hossain, Nosql database: New era of databases for big data analytics-classification, characteristics and comparison. arXiv preprint arXiv:1307.0191, 2013.

[26] Li, Y. and S. Manoharan. A performance comparison of SQL and NoSQL databases. in Communications, Computers and Signal Processing (PACRIM), 2013 IEEE Pacific Rim Conference on. 2013. IEEE.

[27] Manoj, V., Comparative study of nosql document, column store databases and evaluation of cassandra. International Journal of Database Management Systems, 2014. 6(4): p. 11.

[28] Stein, R. and V. Zacharias. Rdf on cloud number nine. in 4th Workshop on New Forms of Reasoning for the Semantic Web: Scalable and Dynamic. 2010.

[29] Zahid, A., R. Masood, and M.A. Shibli. Security of shardedNoSQL databases: A comparative analysis. in Information Assurance and Cyber Security (CIACS), 2014 Conference on. 2014. IEEE.

[30] Energy management ((HACS4EM) HACS4EM using wireless sensor networks in smart grids. Procedia Comput Sci 2014; 32:469–76. http://dx.doi.org/10.1016/j.procs.2014.05.449.

[31] University of Delaware. Car prototype generates electricity, and cash – sciencedaily. Sciencedailyn.d.<http://www.sciencedaily.com/releases/2007/12/ 071203133532.htm> [accessed 29.11.17].

[32] Stastny L, Franek L, Bradac Z. Time synchronized low-voltage measurements for smart grids. ProcediaEng 2015; 100:1389–95. http://dx.doi.org/10.1016/j. proeng.2015.01.508.

[33] Yilmaz M, Dhansri NR. A smart grid intelligent control framework. IEEE Green Technol. Conf 2012;3(19–20):1. http://dx.doi.org/10.1109/GREEN.2012.6200983.

[34] Tarhuni NG, Elkalashy NI, Kawady TA, Lehtonen M. Autonomous control strategy for fault management in distribution networks. Electr Power Syst Res 2015;121:252–9. http://dx.doi.org/10.1016/j.epsr.2014.11.011.

[35] Reddy KS, Kumar M, Mallick TK, Sharon H, Lokeswaran S. A review of integration, control, communication and metering (ICCM) of renewable energy based smart grid. Renew Sustain Energy Rev 2014;38:180–92.

[36] Ferrari P, Sisinni E, Flammini A, Depari A. Adding accurate timestamping capability to wireless networks for smart grids. ComputNetw 2014;67:1–13. http://dx.doi.org/10.1016/j.comnet.2014.03.005.

[37] Smart Grid Interoperability Panel. About SGIP 2015.<http://sgip.org/AboutSGIP> [accessed 29.11.17].

[38] Samad T and A.M. Annaswamy, "The Impact of control technology-Control for renewable energy and Smart Grid" www.ieeecss.org. (eds), 2011.

[39] Yan Y, Qian Y, Sharif H, Tipper D. A survey on smart grid communication infrastructures: Motivations, requirements and challenges. IEEE CommunSurv Tutor 2013; 15(1):5–20.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Location of the Area of Logistics Customer Service Management in Organizational Structures of Enterprises in the Light of Research Results

Marta Kadłubek

Faculty of Management, Czestochowa University of Technology, Poland

ABSTRACT

Article presents recognition of the field of logistic customer service management in organizational structures of transportation enterprises. The setting in organizational structures of transportation enterprises, the diversity of dependability and functions on the basement of the accomplished investigation, along with the size of the examined business entities as a cognitive factor of the assortment of logistics customer service management are designated. The paper is realized on the basement of the findings of the investigation accomplished on a sample of 147 commercial cargo motor transport enterprises situated in the Silesian Voivodship in Southern Poland.

KEY WORDS: USE LOGISTICS CUSTOMER SERVICE; ORGANIZATIONAL STRUCTURE; TRANSPORTATION COMPANY

INTRODUCTION

In a dynamically changing economic environment, many of today's business success factors have diminished in importance and the current development trends are focused on customer service in logistics management. The shift in interest from quality improvement, price reduction, or territorial product availability to the precise definition of the factors which decide about customer's professional logistic service management is highlighted today by Chen et al. [1], Christopher [2], Coyle et al. [3], Kempny [4], Nowosielski [5], Skowron-Grabowska [6]. The literature studies, reports or results of research concerning the area of management of logistics customer service in organizational structures of transport companies seem to be rare as in Polish as foreign publications. The article is an attempt to respond to an identified gap in the subject.

The aim of the paper is to present the field of logistic customer service management in organizational struc-

ARTICLE INFORMATION:

**Corresponding Author: martakadlubek@wp.pl*
Received 1st Nov, 2018
Accepted after revision 1st Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/4

tures of transportation enterprises in the light of the research results. The setting in organizational structures of business entities, the diversity of dependability and functions on the basement of the accomplished investigation, along with the size of the examined transport enterprises as a cognitive factor of the assortment of logistics customer service management are designated. The paper is realized on the basement of the findings of the investigation accomplished on a sample of 147 commercial cargo motor transport enterprises situated in the Silesian Voivodeship in Southern Poland.

2. Literature Review

The logistic concept as a modern business paradigm [7-11] focuses on satisfying the needs and expectations of the customer [12] through proper service which determines the company's numerous benefits: improvement of profitability, acceleration of development, and increase of competitiveness. Customer service is the essence of logistic activities and processes [13-18] which in current standards of cooperation with the environment, points to the need to direct the enterprise's logistics to increase customer satisfaction [19-20].

Customer service in logistics management can be analyzed in one of respective regards. Frequently logistic customer service is perceived as an activity, as everything that the enterprise offers. Correspondingly logistic customer service management may be examined as a evaluation of performance or philosophy.

The wide-ranging description of the term of logistics customer service should stabilize essentials from all three configurations [21]. Primary, the company should assume on the whole the orientation to the customers philosophy [22]. In other words the management must order capabilities to recognize and meet customers' requirements [23-27]. In view of the fact that it is complicated to determine performance beside a management philosophy, another assignment is to identify particular measures for assessing performance [28-29]. The subsequent analysis categorizes a number of detailed measures and their qualified significance. On the other hand, the designation of logistic customer service measures does not mean simultaneously satisfaction of customers' needs. The last duty is to ascertain a development to achieve and determine logistic customer service activities.

Another example of the term definition is proposed by Ballou [13], who determines customer service in logistics as many logistical operations coupled with customer satisfaction when purchasing a product or service. Then logistic customer service is focused on enabling customers to purchase the product at the right time and place, and the measure of that service is the ability to perform the contract of the current reserves [4, 30, 31].

In relation to the discussed problem, it is worh referring to the results of the research by authors from Polish and abroad approached below, where the area of logistics customer service is identified with logistics and its references to the location in organizational structures of the analyzed enterprises, performed functions or employment [32-34].

The survey conducted annually by the Council of Logistics Management in years 1993-1999 aimed at the isolation of enterprises whose organization of logistics may be assigned to one of the three degrees of centralization. In the enterprises characterized by the highest degree, i.e. full centralization, there were also included the tasks of logistics customer service in this area. These enterprises amounted to 29% (the sample of 171 entities) in 1993 and 33% (the sample of 234 entities) in 1999. Frequently, the tasks of handling orders themselves were regarded separately from other tasks of logistics customer service in 31% of enterprises in 1993 and in 23% of companies in 1999 [35].

The research concerning the assignment of tasks performed by the company to the "logistics" organizational unit was also conducted among 279 enterprises in Europe, Asia and the USA by Baumgarten and Herter [36]. The area of logistics customer service was split into two separate tasks: processing orders, performed by 63% of entities and customer service, performed by 47%of enterprises.

According to Langford [37] functional, multilevel (hierarchical) organizational structures of enterprises become irrelevant also in terms of logistics and logistics customer service. In opinion of Kisperska-Moron [38] the course of evolution of organizational structures there have occurred matrix organizations and then completely flat organizational forms – dynamic network organizations – and they are the ones to implement the prospective logistics concepts and customer service globally and regionally.

The confirmation of the above opinion is the results of the research of the area of logistics conducted on a sample of 145 transport companies in the area of France and Great Britain by Sowe and Morel [39]. The authors of the research located 12% of horizontal organizations, based entirely on exchange of information in real time, fully applying modern information technologies [40] and the concept of demand-driven logistics [41]. A particular position is also held in here by the area of logistics customer service, performing both headquarters and operational functions by the staff of the operational and executive level.

In the opinion of Skowronek and Sarjusz-Wolski [42], when looking at the functioning of logistics processes in Polish enterprises through the prism of western experiences it can be concluded that they are at the beginning of their way leading to logistics treatment of the processes of flow of materials. Formalized organizational structures, applied solutions as well as the awareness of

managers should be subjected to reorientation towards the complex approach to logistics processes in the company [43].

3. Methodological Basis of Research

The paper is predicated on the results of the research introduced below, realized on a sample of 147 commercial cargo motor transport enterprises situated in the Silesian Voivodeship in Southern Poland.

With regard to recognition of the subjected sphere of logistics customer service, which was in attendance within the examined enterprises, the assessments of such a service were realized on the basement of the inquiry questionnaire [44,45] used in the investigation, intended for the representatives of the examined companies. The practiced comprehensible method was the investigation in the framework of which there was classified the technique to acquire crucial information.

A sample of 147 correctly assigned questionnaire forms of 147 commercial cargo motor transport enterprises from the Silesian Voivodeship formed the adequate representation of the principality tested.

On the basis of the collected primary data, there has been made an attempt to examine the dependence of the range of logistics customer service, occurring in the surveyed cargo transport companies for hire or reward of the Silesian Voivodeship, on the size of these entities. For this purpose, to analyze the primary data in terms of the indicated subject matter, there have been used statistical measures such as [46]:

1. Pearson's correlation coefficient:

$$r_{xy} = \frac{\sum_{i=1}^{k}\sum_{j=1}^{l} n_{ij} \cdot (\dot{x}_i - \bar{x}) \cdot (\dot{y}_j - \bar{y})}{\sqrt{\sum_{i=1}^{l} n_i (\dot{x}_i - \bar{x})^2 \sum_{j=1}^{k} n_j (\dot{y}_j - \bar{y})^2}} \quad (1)$$

where:

x, y – single samples indexed with i,j

n_{ij} – sample size;

2. χ^2test of independence:

$$\chi^2 = \sum_{i=1}^{r} \frac{(n_i - np_i)^2}{np_i} \quad (2)$$

where:

$\chi 2$ – chi-squared dependence coefficient,

r – number of class intervals,

p – probability that the attribute adopts the value belonging to the ith class interval,

np – the number of units that should be included in the ith class interval, with the assumption that the attribute has a distribution compliant with the hypothesis;

3. χ^2 with Yates correction:

$$\chi^2 = \frac{(|ad - bc| - \frac{n}{2})^2 n}{(a+b)(c+d)(a+c)(b+d)} \quad (3)$$

where:

a, b, c, d – values corresponding to the frequency of individual fields of the four-fold table;

4. φ-Yule coefficient:

$$\varphi = \sqrt{\frac{\chi^2}{n}} \quad (4)$$

5. Czuprow's convergence coefficient:

$$T = \sqrt{\frac{\chi^2}{n\sqrt{(r-1)(s-1)}}} \quad (5)$$

where:

T - Czuprow's convergence coefficient,

r – number of rows,

s – number of columns;

6. Q – Kendall's coefficient :

$$Q = \frac{ad - bc}{ad + bc} \quad (6)$$

Below, there are presented the results of the conducted analysis.

4. The Size of the Surveyed Transport Companies as a Determinant of a Range of Logistics Customer Service

The problem beginning the exploration of the conception of logistic customer service management in the examined enterprises was its isolation in organizational structures of the companies. From among 147 commercial cargo motor transport enterprises located in the Silesian Voivodeship just 7 entities (4.76%) confirmed the isolation of the unit being in charge of logistic service of their customers in their organizational structures.

The research carried out on the basis of the distribution of the obtained responses, included in Table 1, indicated statistically significant relationship between the size of enterprises and willingness to isolate the units dealing with logistics customer service. On the one hand, this is usually associated with more complex organizational structures in larger enterprises and, on the other, with the capabilities of their staff. This relationship, in spite of being strong – 0.696 – is at the indicated level mainly due to lack of willingness on the side of small enterprises.

The next two questions were directed to those 7 respondents who, as answer to the question 1, affirmed the isolation of the unit being in charge of logistic customer service in their structures. In question 2, there was

Table 1. Isolation of the unit dealing with logistics customer service in organizational structures of the surveyed companies by the size of enterprises

Has there been isolated the unit dealing with logistics customer service in the organizational structure of the company?	Type of the company			
	micro	small	medium	large
yes	0	0	4	3
no	112	24	4	0

Source: own study.

considered the matter of the functions allocated to the structured organizational form, due to the elements of logistic customer service. From among every one the achieved answers, the preponderance of companies - 63.66% (which is 7 companies having the unit responsible for logistic customer service in their organizational structures), specified the achievement of service functions which maintain other functional spheres through this structured arrangement of management of logistic customer service. Cross-cutting functions, i.e. organizing logistics operations, were achieved by the units being in charge of logistic customer service in 3 companies, while process functions which join together all logistic processes were pointed out only by one respondent (9.1%).

In Table 2, there is indicated the issue of the functions assigned to the structured organizational form, performing tasks of logistics customer service. In practice, only 5% of the surveyed companies possessed the unit dealing with logistics customer service. Nearly 2/3 of them performed service functions and 27.3% - cross-cutting functions. Only one company indicated the performance of process functions, integrating logistics processes and, therefore, assigning the most extensive range of functions to the unit dealing with this service.

The assessment of the settlements derived from the responses for the second question is next number of the investigation tool, relating to the staff engaged in the unit being in charge of logistic customer service in the inquired companies. The deficiency or occurrence of the employed in the levels: operational, executive, management board may certainly guide to two kinds of endings: the idea of management of logistic customer service is weakly, satisfactorily or appropriately seen in companies; the approved organizational compound specify the level of development of this conception. From the acquired answers, such a the great part as 50% (all 7 companies having the unit being in charge of logistic customer service in their organizational structures), pointed out to the engagement of the employees of the operational level in this prearranged appearance of management of logistic customer service. The staff of the executive level were engaged in the units being in charge of logistic customer service in 5 companies (35.7%), while the board members - in 2 entities (14.3%).

From the point of view of employment, in the unit dealing with logistics customer service, indicated in Table 3, in fifty percent of the cases, the service in the indicated unit was dealt with by the staff of the operational level. In large enterprises, there were also the cases of involvement of the activity of the board members since the lack or the presence of the staff of the levels: operational, executive, management board may lead to twofold conclusions: the concept of management of logistics customer service is poorly, sufficiently or appropriately perceived in enterprises; the adopted organizational solutions indicate the level of advancement of this concept in general.

Next inquiry was directed to those 140 questioners who, in reply to the first issue, did not affirm having of the unit being in charge of logistic customer service in their organizational structures. In response to the question 4, the questioners choose one of the preferences of the answers.

In question 4 of the investigation tool, the companies in which there was not the prearranged appearance of management of logistic customer service were inquired if the activities, processes and/or decisions of logistic

Table 2. Function of the unit dealing with logistics customer service i by the size of enterprises

If isolated, what functions does the unit dealing with logistics customer service perform?	Type of the company			
	micro	small	medium	large
service (supporting other functional areas)	0	0	4	3
cross-cutting (coordinating logistics activities)	0	0	1	2
process (integrating logistics processes)	0	0	0	1

Source: own study.

Table 3. The staff employed in the unit dealing with logistics customer service by the size of enterprises

If isolated, who does the unit dealing with logistics customer service employ?	Type of the company			
	micro	small	medium	large
the staff of the operational level	0	0	4	3
the staff of the executive level	0	0	3	2
board members	0	0	0	2

Source: own study.

Table 4. The relationships of activities, processes and/or decisions of logistics customer service of entities not possessing the unit dealing with logistics customer service by the size of enterprises

If the unit dealing with logistics customer service has not been isolated, activities, processes and/or decisions of logistics customer service are:	Type of the company			
	micro	small	medium	large
centralized/concentrated	14	19	3	0
decentralized/dispersed	95	5	1	0
do not apply to the activity of the company	3	0	0	0

Source: own study.

service were supposed by the questioners as the ones regarding the activity of the examined enterprises and whether they run in centralized/concentrated or decentralized/dispersed relations. From among 140 enterprises, only 3 of them (2.1%) confirmed the requirement of reference of the activities, processes and/or decisions of logistic customer service to the business performance.

The data illustrated in Table 4 refer to the inquiry of representatives of enterprises, in which there was no structured form of management of logistics customer service, whether the activities, processes and/or decisions of logistics service were regarded by the respondents as the ones concerning the activity of the surveyed entities and if so, whether they took place in centralized/ concentrated connections or decentralized/ dispersed ones. In the activity of cargo transport companies for hire or reward of the Silesian Voivodeship in the field of activities, processes and/or decisions of logistics customer service, there is observed significant decentralization. As much as 72.1% of the total number of enterprises and 94.1% of microenterprises indicated the decentralization of activities/processes and/or decisions beneficial for the rapidity of their implementation and mobility of enterprises and efficiency of management of the area of logistics customer service. On the other hand, it is surprising that 79.2% of small enterprises indicated the decentralization of decisions. As far as, in the case of microenterprises, a certain share of central decisions is unavoidable due to sole proprietorship, the result for small enterprises suggests rather a wrong approach to enterprise management.

The study of the relationship between the indicated characteristics was carried out using measures: χ^2, φ-Youle's and *Q*–Kendall's. The relationship was found statistically important (χ^2 = 53.75) and rather clear (φ = 0,434). After appropriate data aggregation the *Q* coefficient = - 0.886 allowed to indicate the fact that small and medium enterprises are characterized by significantly greater centralization of activities, processes and/or decisions of logistics customer service compared to microenterprises.

CONCLUSION

Central to the implementation of logistics customer service [47, 48] is the pattern of organization adopted. A concern with organization requires a concern for the functions of the organization, the activities involved in performing that function, and a series of operating rules to determine specific system responses to the situations [49].

Mostly enterprises' organization chart finds the responsibility for the management of the elements of logistics customer service that have been identified spread over several functions. What is rarely encountered is the situation where responsibility for the elements of logistics customer service come under an individual manager or department at the corporate planning level.

Many uncertainties of the enterprises' managers are around the question of whether customer logistics service should fill a line or a staff function in the total organization structure. Due the results of the research indicated in the paper, the uncertainties are irrelevant as logistics customer service needs to fill all the functions. However, there is no doubt that initially the staff role is easier to introduce to a company because it does not require any substantial reassignments of people or re-allocation of lines of authority.

Within the enterprises decisions involving logistics customer service area are at three levels: strategic, tactical and operational. The fact that these levels are independent, and that at each levels decisions taken in one area will have impacts on others implies that a means of coordination must be devised in appropriates to the enterprises' hierarchy, the interdependence of decisions, which is reflected in the enterprises' organization structures. The need for the logistics customer service policy in the enterprise that will cut across existing functional boundaries is necessary, especially if logistics coordination takes place at the highest director level. The split between operations and planning/control is often made on a logical basis. The coordination of these two areas is mostly achieved through the director whose responsibility is to translate corporate policy into logistics customer service requirements.

At the operational level coordination of material and associated information flows between the functional areas of purchasing, distribution or marketing is often achieved. The sphere of logistics customer service must be work together harmoniously with the companies' departments areas not only at the top level, but all the way dawn. In this way it becomes possible to

translate the conceptual model of the firms as a series of interacting sub-systems into a viable organizational framework. From among 147 commercial cargo motor transport enterprises located in the Silesian Voivodeship (Southern Poland), about 95% of the companies did not have the unit which was in charge of the area of logistic customer service in their organizational structures. No more than 2.1% accomplished the deficiency of referral of the activities, processes and/or decisions of logistic customer service to the business area.

The rest of the companies affirmed the discernment of the association of the conception of logistic customer service with the commercial activity, though the companies affirming the centralization/concentration of responsibility for the activities, processes and/or decisions of logistic service of their customers were the marginal group, in view of the fact that they were of 25.7% of the entire number of the questioners. These companies are possibly making efforts to look for organizational forms which would ease the management of the elements of logistic customer service. It is also the confirmation of the fact that the serious efforts are imperative for the advancement of the enterprises' management in the subject. Further helpful future research in the objective area can refer to comparison of the performance received from the customers among the groups of companies.

REFERENCES

[1] K. K. Chen, C. T. Chang and C. S. Lai, Service quality gaps of business customers in the shipping industry". Transportation Research Part E, vol. 45, pp. 222-237, 2009.

[2] M. Christopher, Logistics & Supply Chain Management. Harlow, Financial Times Prentice Hall, 2011.

[3] J. J. Coyle, C. J. Jr. Langley, R. A. Novack and B. J. Gibson, Supply Chain Management. A Logistics Perspective". USA, South Western College Pub., 2013.

[4] D. Kempny Logistyczna obsługa klienta. Warszawa, PWE, 2001.

[5] S. Nowosielski, Procesy i projekty logistyczne. Wrocław, Wyd. UE we Wrocławiu, 2008.

[6] B. Skowron-Grabowska, Centra logistyczne w łancuchach dostaw. Warszawa, PWE, 2010.

[7] S. Harsono, H. Widyantoro, T. Prawitowati and B. Rahmat, The development of service quality model as a criterion in selecting the banks in Indonesia. Polish Journal of Management Studies, vol. 15(2), pp. 82-92, 2017.

[8] B. T. Hazen, C. A. Boone, J. D. Ezell and L. A. Jones-Farmer, Data quality for data science, predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications. International Journal of Production Economics, vol. 154, pp.72-80, 2014.

[9] B. Nogalski and R. Ronkowski, Współczesne przedsię biorstwo, Problemy funkcjonowania i zatrudniania Warszawa, TNOiK, 2007.

[10] J. Pyka and J. Brzóska, Zmiany modeli biznesowych współczesnych przedsiebiorstw, in Kierunki i dylematy rozwoju nauki i praktyki zarzadzania przedsiebiorstwem, H. Jagoda and J. Lichtarski, Eds. Wrocław: Wyd. UE we Wrocławiu, pp. 244–257, 2010.

[11] M. Romanowska, Podstawy organizacji i zarzadzania. Warszawa, Difin, 2001.

[12] Niemczyk J and E. Stanczyk-Hugiet, Klient w strategiach organizacji biznesowych, Nauki o Zarzadzaniu, Uniwersytet Ekonomiczny we Wrocławiu, vol. 2 (19), pp. 33-43, 2014.

[13] R. H. Ballou, Business Logistics: Supply Chain Management. United Kingdom, Prentice Hall, 2003.

[14] R. Barcik and M. Jakubiec, The Significance of Customer Service in Logistics, Logistics and Transport, vol. 17 (1), pp. 5-10, 2013.

[15] S. Chopra and P. Meindl, Supply Chain Management: Strategy, Planning, and Operation. New Jersey, Pearson Prentice Hall, 2009.

[16] B.J. Lalonde and P.H. Zinszer, Customer Service: Meanings and Measurement. Chicago, National Council of Physical Distribution Management, 1976.

[17] M. Kramarz, Elementy logistyczne obsługi klienta w sieciach dystrybucji. Warszawa, DIFIN, 2014.

[18] J. Lewandowski, I. Jałmuzna and M. Sekieta, , I. Jałmużna and M. Sekieta, Logistics aspects of management in organization. Łódź, Wydawnictwo Politechniki Łódzkiej, 2011.

[19] R. Florez-Lopez and J.M. Ramon-Jeronimo, Managing logistics customer service under uncertainty: An integrative fuzzy Kano framework. Information Sciences, vol. 202, pp. 41-57, 2012.

[20] R. Zhou and A. Pritchard, Using SERVQUAL to measure the service quality of Travel agents in Guangzhou. Journal of Services Research, vol. 9(1), pp. 129-143, 2009.

[21] D. J. Bowersox, D.J. Closs and M.B. Cooper, Supply Chain Logistics Management. United Kingdom, McGraw Hill, 2009.

[22] A. Jonas, J.W. Wiktor, A. Czubała and T. Smoleń, Marketing usług. Warszawa, Wolters Kluwer, 2012.

[23] Sz. Cyfert and K. Krzakiewicz, Outsourcing procesu zarządzania zasobami ludzkimi studium przypadku przedsiebiorstwa ABC in Nowoczesnosc przemysłu i usług: metody i narzedzia nowoczesnego zarzadzania organizacjami, J. Pyka, Ed. Katowice: TNOiK, 2008.

[24] K. Jędralska and W. Dyduch, Nauki o zarzadzaniu. Dokonania, trendy, wyzwania. Katowice, Wyd. Uniwersytetu Ekonomicznego w Katowicach, 2017.

[25] A. Kaleta, Realizacja strategii. Warszawa, PWE, 2013.

[26] J. Kisielnicki, Zarządzanie. Warszawa, PWE, 2010.

[27] J. Lichtarski, Praktyczny wymiar nauk o zarządzaniu. Warszawa, PWE, 2015.

[28] R. Borowiecki and J. Kaczmarek, Zarzadzanie przedsiebiorstwem w warunkach współczesnych wyzwae gospodarczych. Modele – Metody – Procesy. Kraków, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, 2014.

[29] A. Sopińska and P. Wachowiak, Wyzwania współczesnego zarządzania strategicznego. Warszawa, Oficyna Wydawnicza SGH, 2017.

[30] A. Rushton, P. Croucher and P. Baker, The Handbook of Logistics & Distribution Management. London, Kogan Page, 2014.

[31] P.C. Verhoef and K.N. Lemon, "Successful customer value management: Key lessons and emerging trends. *European Management Journal*, vol. 31, pp.1-15, 2013.

[32] M. Gableta, Interesy pracowników oraz warunki ich respektowania w, przedsiębiorstwach. Wrocław, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2012.

[33] Jeżak, Aspekty społeczne w zarządzaniu strategicznym - próba reasumpcji, in Paradygmat sieciowy wyzwania dla teorii i praktyki zarzadzania, A. Karbownik, Ed. Gliwice: Wydawnictwo Politechniki Slaskiej, pp. 134-148, 2013.

[34] S. Nowosielski, Ciągłe doskonalenie procesów w organizacji. Możliwości i ograniczenia. Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, vol. 340, pp. 303-317, 2014.

[35] B. J. LaLonde and T. L. Pohlen, The Ohio State University 1999 Survey of Career Paterns in Logistics. in Council of Logistics Management (CLM) Annual Conference Proceedings, Oak Brook, vol. 1, pp. 359-377, 1999.

[36] H. Baumgarten and M. Herter, Internationalisierung der Logistik. in Handbuch Logistik, J. Weber and H. Baumgarten, Eds. Stuttgart: Schäffer-Poeschel Verlag, 1999.

[37] J. Langford, Logistics: Principles and Applications. USA, McGraw-Hill Logistics Series, 2007.

[38] D. Kisperska-Moron, Logistics customer service levels in Poland: changes between 1993 and 2001. International Journal of Production Economics, vol.93-94, pp.121-128, 2005.

[39] A. Stowe and G. Morel, Transport enterprises and its structures, strategies and dilemmas. France, internal materials of SCL Company, 2015.

[40] A. Mesjasz-Lech, The use of IT systems supporting the realization of business processes in enterprises in supply chains in Poland. Polish Journal of Management Studies, vol. 10/2, pp. 94-103, 2014.

[41] M. Ingaldi, Management of the Packaging Waste in Companies in Poland, in 15th International Multidisciplinary Scientific Geoconference (SGEM 2015), Sophia, pp. 385-392, 2015.

[42] Cz. Skowronek and Z. Sarjusz-Wolski, Logistyka w przedsiębiorstwie. Warszawa, PWE, 2012.

[43] E. Kardas and Z. Skuza, Evaluation of effectiveness of raw materials and materials use in a blast furnace department of a steelworks,Metalurgija, vol. 56, iss. 1-2, p. 5-8, 2017.

[44] H.G Adamkiewicz-Drwiłło, Współczesna metodologia nauk ekonomicznych. Torun: Dom Organizatora, 2008.

[45] A. Bryman, Social research methods. United Kingdom, Oxford University Press, 2012.

[46] M.F. Triola, Elementary Statistics. London, Pearson, 2012.

[47] D. Jelonek, J. Nowakowska-Grunt and C. Stępniak, Innovation Co-creation in E-business. Customer Perspective, in The Publications of the MultiScience - XXVIII. microCAD International Multidisciplinary Scientific Conference, Miskolc, 2014.

[48] M. Kadłubek, Analysis of Critical Incidents of Logistics Customer Service According to Critical Incident Technique. in Carpathian Logistics Congress (CLC 2015), Jesenik, 2015.

[49] Sz. Dziuba, K. Szołtysek and C. Kozyra, Application of FAM-Fail Assessment Method- to optimization of unit costs of producing flours for special purposes. in Improvement of Production Processes, S. Borkowski, M.Krynke, Eds. Trnava: TRIPSOFT, 2011.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

A Suggested Form to Manage the Interreligious Dialogue in the Light of the Explicit Knowledge Contained in the Prophetic Biography: Analytical Study

Noura Ahmed Hamed Al Harthy
Deanship of Scientific Research-Bisha University, Bisha, Saudi Arabia

ABSTRACT

This study aims to discuss the method of the prophet Mohamed "peace be upon Him" in the dialogue with the followers of the other religions and extract a form to the interreligious dialogue through analyzing the explicit knowledge regarding to the Prophetic biography. The problem in this study is being in the need to a systematic performance in the dialogue with the follower of the other religions, especially in the shade of the campaigns of distortion Islam especially in the western world, as well as makes use of the forums, seminars and conferences which aim to the convergence with the other religions through the interreligious dialogue and analyzing the explicit knowledge which moved the prophet Mohamed "peace be upon Him" method to dialogue with the Islam followers and makes use of these methods. The importance of this study is how to dialogue with the followers of the other religions that helped to the convergence with the followers of the other religions and change the bad picture which was drown by the amines of Islam in connecting it with the terrorism. This study seeks to find the problem and create answers to two main questions, the first, which method did the prophet Mohamed "peace be upon Him" follow to dialogue with the followers of the other religions?, the second, what is the suggested form to manage the interreligious dialogue in the shade of the explicit knowledge which contained in the Prophetic biography? The results of this study reached determining the objectives of the interreligious dialogue in the light of the Prophetic biography, showing the dialogue method of the prophet Mohamed "peace be upon Him", narrating a group of dialogue situations which happened in the Prophetic biography and affected in this study, as well as extracting a suggested form to manage the interreligious dialogue in the light of the explicit knowledge which contained in the Prophetic biography. This method forms of three (3) levels (1)- Preparing (2)- Applying (3)- Evaluating and reviewing.

KEY WORDS: DIALOGUE MANAGEMENT-INTERRELIGIOUS DIALOGUE-PROPHETIC BIOGRAPHY-ISLAMIC CALL-EXPLICIT KNOWLEDGE

ARTICLE INFORMATION:

**Corresponding Author: alharthy@kku.edu.sa*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/5

INTRODUCTION

It is useful to realize that we are different whatever we are so close, and close whatever we are so far. The difference and approach are two kinds of the life traditions that the penalty, rewards and our position depends on. We should use a good strategy to make use of our difference and closeness, make this difference positive and balanced and complete the shortfall to achieve the understanding and cooperation between people. The most important example that shows this difference and closeness between people is the interreligious dialogue. Most of people seek to dialogue to pass the differences that happened because of the religions and doctrines, for that the interreligious dialogue forums and conferences were established and discussed several topics. As we are the followers of the Islam religion, we are the most people who need these dialogues that enable us to change the bad picture which was drawn by the amines of Islam to say that Islam is the source of terrorism.

This study came to show ways to dialogue and its strategies that enable us to achieve the desired objectives. There is no one best of the prophet Mohamed "peace be upon Him" to be an example to the convinced and successful dialogue method. For that this study seeks to show the prophet Mohamed "peace be upon Him" strategies and methods and abstracting the most important sides of them to reach to the form that enable us to manage the interreligious dialogue between the difference religions.

The importance of this study is represented in the dialogue with the followers of the other religions through the Prophetic biography. We should discuss this subject today and focusing on the Prophetic dialogues with the Christians by using the Prophetic method in dialogue. This study cares of showing the ways of Prophetic dialogue with the followers of the other religions, the importance of this dialogue regarding to its timing and understanding the Prophetic dialogue method to guide us especially at this time, because we and our religion became threatened and accused as a result of what contained in The Holly Quran and Sunnah regarding to the difference with the others.

The content analysis and focus groups methods were used to answer the study's questions. The model was a group of explicit knowledge in Prophetic biography and Sunnah and it was represented in documents then using the method of content analysis to answer the study's questions. Then create the suggested form to manage the interreligious dialogue in the light of the explicit knowledge regarding to Prophetic biography.We will show later in this study the previous studies that discussed or connected with this study's subject. As well as showing the study's problem and how to make questions, thus showing the methods that used to answer these questions, and then show the results of the model content analysis.

Literature Review

The study (1) aims to discuss the civil and social conflict that based on the main believes of the different religious groups and search on the ways to process this problem though encouraging the interreligious dialogue. And this study reached the two stages of the interreligious dialogue. The first stage: is exchanging the information, find the interactions with the other religions believers according to the mutual respect and openness and respect the facts that regarding to all religions. The second stage: that the interlocutors should understand each other to reach the deepest humanity level. That supports this current study in the subject of the dialogue levels and to anyway we can make use of it in the suggested form.

The study (2) aims to review some scientific ways which may be support the interreligious dialogue in the religions' study, and shows that the interreligious dialogue is subject to the constant change for different reasons. Thus it is important to the participants in the religious dialogue to study the change and interpret processes and adopt with the changes, and stressed on the innovation in the dialogue ways and interreligious dialogue and provided a group of innovations regarding to the religious dialogue that the innovation according to the current organizations rules. Thus the authorized repairs to the career regulation, innovates the specialist groups in the innovations and change fields and innovates new organizational forms in the interreligious dialogue field. According to this study, we should separate between the religious dialogue and the religions' study, but this study stresses on the importance of religions' study and the changed which happened in the religious dialogue field and the necessary of the specialists' participation in the religions' study. The modern discussions in the interreligious dialogue keep the academic discipline in these dialogues. This study connects with the current study in the calling to religions' study as a main side of the interreligious dialogue, as well as support the religious dialogue to achieve the academic discipline.

The study alsoaims to explore the dialogue nature in the Prophetic biography, show the dialogue politeness and study the affection on the Muslims' modern life. Thus determines the cultures and religions dialogue objectives that correct the distorted picture in the non-Islamic countries and calls to God in the right method. And participates in the modern world solving problems, in addition to declares the justice principles and the equality between humans and works on preparing

the development programs to the poor and third world countries. And works on establishing an economic system depends on the individual freedom. And publish the dialogue culture, negotiation and understanding between the different cultures and remove the hostility and arrogance. And employ the several social media to serve the dialogue calling and make a relationship with the others. In addition to anti- organized terrorism around the world.

This study also provided a group of basics which considered necessary to success the interreligious dialogue. The study mentioned the mutual respect between all parties and agrees to consider this dialogue to acquaintance not to miss the right of the others. And agrees that the human culture and its diversity and multiculturalism are mutual human legacy to find a mutual basic to the religious dialogue and reject the cultural conflict concept. And prove that Islam is a religion of dialogue. Thus this study connects with the current study in providing a group of objectives which enable us to create the suggested form, as well as it is provided some of the basics that the success religious dialogue depend on.

Study Problems

The problem in this study is being in the need to a systematic performance in the dialogue with the follower of the other religions, especially in the shade of the campaigns of distortion Islam especially in the western world, as well as makes use of the forums, seminars and conferences which aim to the convergence with the other religions through the interreligious dialogue and analyzing the explicit knowledge which moved the prophet Mohamed "peace be upon Him" method to dialogue with the Islam followers and makes use of these methods. The researcher suggest create a form to manage the interreligious dialogue in the light of the explicit knowledge which contained in the Prophetic biography, and answer on two main questions, the first, which method did the prophet Mohamed "peace be upon Him" follow to dialogue with the followers of the other religions?, the second, what is the suggested form to manage the interreligious dialogue in the light of the explicit knowledge which contained in the Prophetic biography?

Methodology

To answer the study's questions I used two methods, the content analysis method to answer the first question that which method did the prophet Mohamed "peace be upon Him" follow to dialogue with the followers of the other religions?. And to answer the second question that what is the suggested form to manage the interreligious dialogue? I used the focus groups method through a group of academic experts (5 experts).

Table 1. Documents under the application of content analysis

Document	Document title	Document scope of work	Reference
First	Call and dialogue with Jews.	Sahih al-Bukhari, page No. (1412), Hadith No. (6944)	(4)
Second	Call and dialogue with christen- Abyssinia delegate.	IbnIshaq: Prophetic biography, page No. (252-253)	(5)
		IbnHishām: Prophetic biography, page No.(36-37)	(6)
Third	Call and dialogue with christen- The king of Abyssinia (Al-Najashi).	IbnIshaq: Prophetic biography, page No. (152-153)	(7)
		IbnKathir: Al-Bidayah wan Nihayah (The Beginning and The End), page No. (80-81)	(8)
		IbnQayyim al-Jawziyyah, Provisions for the Hereafter (Zaad Al-Ma'ad), page No. (620-621)	(9)
Fourth	Call and dialogue with christen- Najran delegate.	IbnQayyim al-Jawziyyah, Guidance for the Confused concerning Answers to Jews and christen, page No. (57)	(10)
		IbnIshaq, Prophetic biography, page No. (899) Hadith No. (4394)	(11)
		Ibn Abdel Barr: Al-Isti'ab fi ma'rifat al-ashab, page No. (256)	(13)
		Al-Tirmidhi, Sunan at-Tirmidhi, page No. (882) Hadith No. (3106)	(14)
Fifth	Call and dialogue with christen-Adī ibnHātim al-Tā'ī.	al Tabari: Tarikh el Tabari which is called "History of the Prophets and Kings" page No. (147)	(15)
		IbnKathir: Al-Bidayah wan Nihayah (The Beginning and The End), volume No. (3-6) page No. (313)	(16)

Study applied side

Through applying the content analysis method on the explicit knowledge which contained in the Prophetic biography, Holly Quran, Hadith and Sunnah the researcher got the following results:

The analyzed evidences and documents regarding the dialogue of the Prophetic biography and Sunnah.

The final findings and the outputs of document analysis:

Through the content analysis methodology and the way to apply it with samples in order to answer the main question: "which method did the prophet Mohamed "peace be upon Him" follow to dialogue with the followers of the other religions?" the outcomes are just like the following:

First: Prophet Mohamed "peace be upon Him" situations which the followers of other religions:

- Prophet Mohamed "peace be upon Him"started His speech to Najranwith the common religious beliefs which have a great effect on listeners. At the outset, He said: "In the name of the God of Ibrahim, Ishaq and Jacob, I call you to worship Allah rather than the humans and to the mandate of Allah instead of His servants, in the case of objection you will be obligated to pay a tax (Jizya) (In return for protection), if you refused, you would engage to the war. Finally, peace and Allah mercy and blessings be upon you.
- Prophet Mohamed "peace be upon Him" received the people of Najran with greetings, generosity and Tolerance, in addition to allowing them to pray in his mosque. The reason for His action was that: when the people of Najran came to Prophet Mohamed "peace be upon Him" after the Asr prayer, they wanted to pray their prayer, but the people in the mosque wanted to prevent them. In this moment, Prophet Mohamed "peace be upon Him" said: "let them pray their prayers" so, they prayed.
- Prophet Mohamed "peace be upon Him" wanted to purify the heart of the people of Najran from pride, confusion and arrogance. He did not dialogue with them or answer their question until they put off silk and gold. He "peace be upon Him" said: "By the One Who sent me with the truth as a Prophet, I saw Satan among them in the first time they came."
- In an attempt to make the dialogue positive and fruitful, Prophet Mohamed "peace be upon Him" dialogued the lords and inks of christens including: Adī ibnHātim al-Ta'ī and zaid al khail...etc.
- Prophet Mohamed "peace be upon Him" drawn attention to dimensions and objectives of the dialogue, He was cared about the Non- Muslim feelings without religious adulation. In all cases, Prophet Mohamed "peace be upon Him" endeavors to tell the truth. During the dialogue between Prophet Mohamed "peace be upon Him" and two christen inks of Najran named: Al-`Aqib and Saiyid (The rulers of Najran), He called them to Islam and said: "convert to Islam" they said: "we already did" He said: "no, you are not" they said: "yes, we do, we convert to Islam even before you" He said: "you lied, you did not convert to it because of claiming that Allah Has a son, worshiping the cross and eating the pork."
- Prophet Mohamed "peace be upon Him" did not upset from the beliefs of the Najran christens, in the contrary; He defended religion from their adulation depending on dialogue. The accomplishment of Prophet Mohamed "peace be upon Him" did not reduce from the value of religion, He was clear enough to reveal the truth. The Prophet called them to Islam after naming the God of Ibrahim, Ishaq and Jacob in order to mollify the atmosphere, He said: "After that, I call you to worship Allah rather than the humans and to the mandate of Allah instead of His servants."
- After Christians of Najran discovered that Prophet Mohamed "peace be upon Him" is the truth and the miracle, they refused to convert to Islam, the idea of Event of Mubahala was come up, that Invoke a curse on the lairs, so they were afraid of performing it. They asked the Prophet not to do it and He accepted because of His mercy, commission and humanity.
- Prophet Mohamed "peace be upon Him" obeyed Allah commands: "Let there be no compulsion in religion." His actions were a reflection of Holy Quran texts. That is way He only call the people of Najran to convert Islam and did not obliged or forced them to be Muslims.
- One of the great lessons was the answer of Prophet Mohamed "peace be upon Him" when they asked about Prophet Essa "peace be upon Him", He said: "I have nothing to tell about Prophet Essa now, keep standing to inform you what I have been known about Essa "peace be upon Him". From my point of view, this lesson is the greatest one ever; it taught us to silent is a solution when the answer is not founded.
- Prophet Mohamed "peace be upon Him" focused on the general and Doctrinal issues and avoiding details unless he was asked. His speech with

NajranChristians, He highlighted the monotheism and humanity of Essa "peace be upon Him".

- The attempt to show miracles for "People of the Book" to convert them to Islam, Prophet Mohamed "peace be upon Him" came with Holy Quran, However He presented some miracles to nonbelievers, perhaps they have chance to believe.
- Proving that Islamic law is the one which corresponding to Bible and Torah.

Second: Prophet Mohamed "peace be upon Him" dialogue attitude:

- Prophet Mohamed "peace be upon Him" enjoyed eloquence tongue, rhetoric speech and most beautiful attitude.
- The attitude of Prophet Mohamed "peace be upon Him" was characterized by diversity. His sentences were varied and marked by using reporter speech, rhetorical speech, the question and answer, exclamation, swearing and calling. Prophet Mohamed "peace be upon Him" used aphorism and proverbs. He also made use of historical events and prophesied others future. So, we can realize that the Prophet dialogue is the source of rhetoric.
- During His dialogue, Prophet Mohamed "peace be upon Him" frequently mentioned to other prophets while dealing with People of the Book. The prophet dialogue with them aimed to reflect a straight message that: "Islam came to complete the previous religions and prophets and Prophet Mohamed "peace be upon Him" is the seal of the prophets.
- Some of Prophet Mohamed "peace be upon Him" dialogue skills: the depth of psychological impact and the ability of convincing others with mental persuasion.
- Prophet Mohamed "peace be upon Him" always use his words in the right context, and He convinced people once with mercy and other with warning.
- In performing dialogue, Prophet Mohamed "peace be upon Him" cheerful and open faceted, He did not ignore anybody. In addition, He paved the way towards His subject, giving all necessary reasons and providing answers with evidences and affirmation.
- In His dialogue with People of Book, Prophet Mohamed "peace be upon Him" based on the sacred miracle of The Holy Quran, not on material miracles.
- When People of Book tried to make the Prophet unable to answer their claims arising from holy books and heritages, Prophet Mohamed "peace be upon Him" gave them the definitive answer supporting with providence and proofing. He was never being provoked or upset with them except for the matters considering Allah and the religion of Islam.
- Prophet Mohamed "peace be upon Him" highlighted the similarities between Islam and other holy books such as: eating carcass of People of Book and marriage to a woman from the People of the Book. As well, the Prophet advised to take care of People of Book.

Third: The objectives of the dialogue with the followers of the other religions:

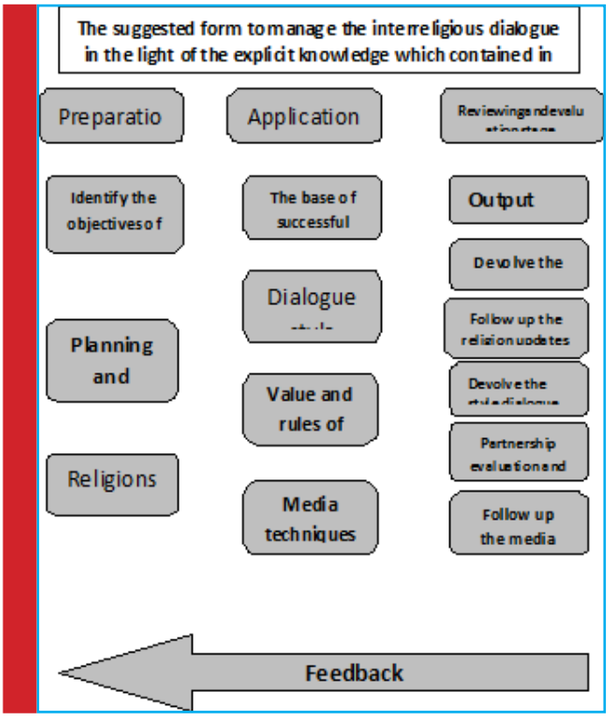
- Call to Islam.
- Evidencing.
- Reconcile opinions.

Fourth: Rules of the Prophet dialogue with the followers of the other religions:

- The point of the dialogue shall clarify the right bath and guide them through.
- The dialogue should not be only for talking, so that, objective and issue of the dialogue must be identified.
- It is not necessary to undergo with details and to discuss the sub-issues until agree on the substantive issues of the dialogue in order to achieve the promising benefits.

Fifth: The value of dialogue:

- **The psychological value of dialogue**: It is related to prepare a healthy atmosphere for performing dialogue, meet our presenter and undergo with general dialogue aims to break the psychological borders make hearts more close. In dialogue, we have to enjoy with good intension, morality, humble, patience, good listening and respect.
- **The scientific value of dialogue**: Any dialogue has scientific values. Let's start with the common theme existing in acknowledge, awareness, examples and make mistakes. The dialogue must base on evidences and affirmation not on whims and personal desires. The terms and sentences used by the presenter must consist of good words, exposure and allusion, not of rudeness, prejudice and harshness. Also, we have to avoid the loudness, argumentation, drawling, deviation and pride. We also should Endeavour to tell the truth, not be



exaggerated in speaking and give others (The presenter) chance to speak and express his opinion.

The suggested form to manage the interreligious dialogue in the light of the explicit knowledge which contained in the Prophetic biography

According to the content analysis related to the subject of the study. This analysis seeks to answer the study question: "What is the suggested form to manage the interreligious dialogue in the light of the explicit knowledge which contained in the Prophetic biography?" This form was presented in its primary level and given to the focus group which consists of (5) experts in order to take amendments and to approve them. Now, this form was presented in its final edit as follows:

Diagram No. (1) Illustrates the proposed form to run the dialogue of religions according to the right acknowledges of Prophetic biography:

First: Preparation stage

This stage consists of the following:

(1) Determining the objectives of religion dialogue:

As per the said diagram, the religion dialogue aims to the following:

- Call to Islam (religion of peace).
- Limit the proofs of other religions and refuting them with evidences and persuasion.
- Reconcile opinions considering argumentative issues with the other religions.
- Highlight the good ethics of Islam.
- Refuting claims of being Islam as a terrorism religion published by the enemies of Islam.

(2) Planning and preparation:

In this stage, we work on primary preparation to embark upon the study as follows:

- Spread religion dialogue culture.
- Practice on the religion dialogue.
- Prepare the material and human infrastructure.
- Establish partnerships with societies and organizations.
- Choose the effective Cadres to run the dialogue.

(3) Religions study:

In this stage, the studies of religion and the process of analysis are performed for the following purposes:

- Determine the advantages and disadvantages in the other religions.
- Focus on the similarities and differences between Islam and the other religions.
- Mention the effective point considering dialogue with each religion.
- Choose the Cadre Human Resources that are able to run dialogue with the other religions.
- Create teamwork to be responsible for a specific religion.

Second: Application stage:

It is the actual stage for managing the dialogue. This stage consists of the following:

(1) The basics of successful dialogue:

To reach a successful dialogue, the following basics shall be taken in consideration:

- The mutual respect among the parties.
- Agree on considering the dialogue as a way of acquaintance, not as a way of deprivation of other rights.
- Agree on that the human civilization with all of its variations and multicultural societies is a common heritage of humankind.
- Determine a common point in order to embark on the religion dialogue.
- Erect the concept of "Clash of Civilizations."
- Clarify that the Islam is the religion of discussion.

(2) Dialogue Method.

Trough religious dialogue, we should be aware of the following:

- The presenter should enjoy with fluency, rhetoric phrases in addition to beautiful and smooth words.
- Use reporter and rhetorical phrases as well as a question and answer style.
- Gain others hearts and emotion through the dialogue and the prophets of audience; to Reconcile the opinions.
- Adapt clear and direct explanation and not to use allusion except in necessary need.
- Use reasonable method to persuade other with your point of view.
- Simplicity, smoothness, non-rebuke manner, considering circumstances and giving the accurate answer are the keys of dialogue success.
- Evidencing the miracles of Holy Quran and connecting them to the modern science and global discovers.
- Establish a case on interlocutor through questions arising from the religion of "People of Book".
- Reflect the matching points of Islam with the other religions to persuade them (nonbelievers).

(3) Value and rules of dialogue:

In religious dialogue, there are some value and rules which shall be adapted:

- The dialogue purpose should be crystallized to reveal the truth.
- The objective of dialogue is not to argument, it is necessary to highlight issues and aims of the dialogue.
- It is important not to dwell on the details or subpoints only after agree on the dialogue essences for achieving the promising outcome.

Considering psychological side:

Prepare the suitable atmosphere for discussion, breaking the ice and make souls closer.

Considering scientific side:

The presenter has tounderstand the common theme in order to reach the point. He also considers using evidences, proofs and examples in adding to admire making a mistake.

- The presenter should be smooth tongue, making use of allusion.

(4) Tools and Techniques of Media:

In order to develop the art of dialogue with the followers of other religious, we should follow up the modern way of conversation especially, the modern technical tools as the following:

- Television programs
- Radio programming
- Magazines and journals
- Electronic newspapers
- Social media
- Scientific publishing
- Electronic publishing
- Programs and Internet applications

Third stage: Reviewing and Evaluation Stage:

In this stage, we make an evaluation of the work and reviewing used styles and techniques. Also, determining and updating the study objectives in accordance with the fresh developments. Such as:

- Evaluating the work output to start the development process.
- Modernizing the study objectives in accordance with the common updates.
- Following up the other religions developments and starting to work according to their updates.
- Continuous development of dialogue methods.
- Evaluating the partnerships and study their impact on religious dialogue.
- Continuous following up the updating process considering traditional and modern media, social media, programs and Internet applications.

REFERENCES

[1] A Abdool, F Potgieter, J L van der Walt & C Wolhuter (2007). "Inter-religious dialogue in schools: A pedagogical and civic unavoidability. HTS 63 (2) 2007.

[2] Pye, Michael (2001). "The study of religions and the dialogue of religions". Marburg Journal of Religion: Volume 6, No. 2 (June 2001).

[3] Khader: Elsayed Ali (2010). "Dialogue in the prophetic Biography". Islamic World League: The World Organization for the Definition of the Prophet of Mercy.

[4] Al-Bukhaari: Saheeh al-Bukhaari, the section of Compulsion, a chapter on the sale of impiety and the like in the right and others, p. 1412. Hadeeth No.: 6944.

[5] Ibn Ishaq: Muhammad: Prophetic Biography, checked and commented by: Ahmed Almazidi, part 1, edition 2, Beirut: House of Scientific Books, 1430 H - 2009, pp. 252-253.

[6] Ibn Hisham: Abd al-Malik: Prophetic Biography, checked by: Muhammad al-Qutb, and Muhammad Balata, Part 2, Beirut: Modern Library, 1415 H - 1994, pp: 36-37.

[7] Ibn Ishaq: Prophetic Biography, Part 2, P.: 248-249-250; Althahabi: the conduct of the flags of the nobles, supervised and achieved its Hadeeth by: ShoaibArnaout, Part 26, Edition 11, Beirut: Alresala Foundation, 1422 H - 2001, P. 152- 153 - 153.

[8] Ibn Katheer: Isma'il: The Beginning and the End, Confirmed and Accepted by: Ali Moawad and Adel Abdul-Muqayyad, and commented by: Ahmad Melhem and Ali

Atwi et al., M 2, Part 3 (Beirut: Dar al-Kuttab al-Alami, 1421 H - 2001, P. 80-81.

[9] Ibn Qayyim al-Jawziyyah: Zad al-Ma'aad in Huda Khair al-Abbad, P. 620-621.

[10] Ibn Qayyim al-Jawziyyah: Muhammad ben AbiBakr ben Ayyub, Hidayat al-Hayari in the answers of the Jews and the Christians. Checked by: Othman Juma'a al-Damariyah, Islamic Fiqh Academy, Jeddah, 1429 H, P. 304; IbnKatheer: The Beginning and the End, 3, Part 5, P. 57.

[11] Ibn Ishak, Prophetic Biography, part 2 P. 649 – 65 – 651, al-Bukhari, Sahih al-Bukhari, Book: Al-Maghazi, Bab: The Story of Delegation of Tyae by Uday bin Hatem, P. 899. Hadith No.: 4394.

[12] Ibn Abed al-Barr: Yusuf: Understanding the Companions, M3, Beirut: Dar al-Jail, 1412 H, p. 256; IbnKatheer: The Beginning and the End, M3, Part 5, P. 67-68-69-70-71-72.

[13] Ibn Hisham Prophetic Biography, Part 2, P. 197.

[14] Al-Tirmidhi: Muhammad, Sunan al-Tirmidhi, investigated by: Sidqi al-Attar, book: interpretation of the Koran from the prophet Mohamed Peace Be upon Him, Section: al tawba surah, Beirut: Dar al-Fikr, 1422 H-2002, p. 882, Hadith No.: 3106.

[15] Al-Tabari: Muhammad: The History of the Tabari, "The History of Nations and Kings," Volume 3, Beirut: Dar al-Kuttab al-Alami, 1422 H-2001, P. 147.

[16] Ibn Katheer: Beginning and End, Volume 3, Part 6, p. 313; Dakhil, Muhammad, News of the Delegations that came to Medinain the Covenant of the Prophet, Master Thesis, Medina: Islamic University, 1410H-1990M, P. 263-264-26

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

The Reality of Tacit Knowledge Sources in Supporting Professional Development in Health Care Sector in Bisha Province: A case study of King Abdullah bin Abdul-Aziz Hospital in Bisha

Abdullah Mohammed Abdullah Aalyateem* and Mohammed Shaleh Mubarak Al Shahrani

ABSTRACT

The purpose of this study is to recognize and understand the reality of tacit knowledge sources in supporting professional development in Health Care Sector at King Abdullah bin Abdul-Aziz hospital in Bisha. This study seeks to answer the main question: "What is the reality of tacit knowledge sources in supporting professional development in Health Care Sector in Bisha province?" The importance of this study lies in providing a vision of the role of implicit sources of knowledge in order to have the ability to invest in knowledge and experiences. In this study, both researchers used Descriptive approach of the case study to answer all its questions and questionnaire as the tool of this stud. The study community consisted of Heads of Department at King Abdullah bin Abdul-Aziz hospital. The study samples consisted of (40) persons. The study concluded that tacit knowledge sources play an important role in creating knowledge for developing professional performance in health care sector at King Abdullah bin Abdul-Aziz hospital in Bisha. The arithmetic mean was (3.18), which means that the tacit knowledge sources has a positive role in creating knowledge by (72.70%) for developing professional performance considering health care sector at King Abdullah bin Abdul-Aziz hospital in Bisha. In addition, tacit knowledge sources play a positive role in knowledge sharing for developing professional performance considering health care sector at King Abdullah bin Abdul-Aziz hospital in Bisha. The arithmetic mean was (3.00), which means that the tacit knowledge sources play a positive role in knowledge sharing by (66.70%). It also has a positive role in applying knowledge for developing professional performance considering health care sector at King Abdullah bin Abdul-Aziz hospital in Bisha. The arithmetic mean was (2.93). Knowledge technologies play a role in developing tacit knowledge by (54.33%) for developing professional performance. Generally, the study concluded that tacit knowledge play a role in supporting professional development in health care sector at King Abdullah bin Abdul-Aziz hospital in

ARTICLE INFORMATION:

*Corresponding Author: aalyateem@hotmail.com
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/6

Bisha. The arithmetic mean was (2.98) which mean that tacit knowledge sources support professional development by (66.00%) considering health care sector at King Abdullah bin Abdul-Aziz hospital in Bisha. The study recommended spreading knowledge culture in health care sector, documenting and recording seminars and lectures and holding courses in order to be shared with other concerned authorities. Finally, the study recommended carrying out researches to study tacit knowledge sources in health care sector.

KEY WORDS: TACIT KNOWLEDGE SOURCES-PROFESSIONAL DEVELOPMENT-MINISTRY OF HEALTH-KING ABDULLAH BIN ABDUL-AZIZ HOSPITAL IN BISHA PROVINCE- KNOWLEDGE TECHNOLOGIES

INTRODUCTION

As known, every nation seeks to be prosperous in political, developmental, organizational, economic and human fields. All the said advantages grant competitiveness for a nation in order to achieve effective impact between other nations. There is no doubt that the dominating nation will control others.Human being is the main core on which a nation along with its organizations and establishments are based. Any development for the human being will lead to developing the society; consequently, it will lead to developing the nation. For that reason, states gave a special attention to human development in all fields. The matter did not depend on education stages only but also training during service for developing human resources, raising work efficiency and upgrading products and services quality.

Health care sector In the Kingdom of Saudi Arabia ranks the most important places in professional development area. It concerns with people and their health. One of most important aspects of professional development is the ability of organizations to invest in its knowledge in general and tacit knowledge in particular. Therefore, this study will highlight the role of tacit knowledge sources in professional development in health care sector in general and at King Abdullah bin Abdul-Aziz hospital, Kingdom of Saudi Arabia in particular.

The study problem will be discussed as well as its methodology, questions, society and samples. Also, we will deal with the literature reviews related to the study subject. Then, the study will discuss and explain the numerical results. Finally, the study will review its findings, recommendations and proposals.

Literature Review

Study No. (1) wasaimed to realize the reality of tacit knowledge sources in educational training center in department of education of Bisha province. It also aimed to identify the role of tacit knowledge technologies in professional development in educational training center in department of education of Bisha province.

In this study, the researcher used the descriptive case study in order to answer questions. The researcher tools were interviews and questionnaires. The study found that tacit knowledge sources have a rule with rate of 70.00% in the field of professional development in Educational training center in the Department of Education in Bisha province. In addition, the study found the knowledge technologies play an important role in the development process of tacit knowledge considering developing professional performance in Educational Training Center in Bisha province. The arithmetic mean was (2.80), which means that knowledge technologies have an important role by (70.00%) in development of tacit knowledge that develops professional performance in Educational Training Center in Bisha province.

Study No. (2)was aimed to identify the role of tacit knowledge in the development of human resources in multinational companies under the concept of Management Globalization. Through identifying the perceptions of employees, who work in multinational companies in Jordan for using tacit knowledge and their characteristics, and the effect resulting on human resource development under the concept of Management Globalization. The study also aimed to reach conceived proposal for the development of human resources through using the tacit knowledge Approach in such companies under the concept of Management Globalization. The problem of study came to try to answer the following question, “What is role and impact of tacit knowledge on human resource development in the multinational company under the concept of Management Globalization?” This study depended on descriptive analytical method, and the study community included multinational companies that work in the city of Amman. The study sample was a random sample included 15 companies.

The study found a number of results including: That tacit knowledge in terms of usage and application and characteristics affect and has a role on human resource development in multinational companies under the concept of Management Globalization;

There is a relationship between the variables of the study a strong positive relationship; and there are no significant differences due to the following variables: (Qualification, years of experience and Career Levels) between the study sample in the extent of the use of tacit knowledge and their characteristics and human resource development and Management Globalization.

Study No.(3)was aimed to recognize the relationship between tacit knowledge along with its technical and

cognitive dimensions, and the products quality level of Palestinian telecommunications companies along with its all tangible and intangible hardware contents, which represented in the powers and characters of the knowledge. Consequently, this process gives us a chance for identifying the mutual influence between tacit knowledge and the products quality level. It also offers the way of enhancing the influence of this knowledge in the case of weakness or positivity. The study concluded that the result of this relationship is statistically implied. The study also recommended carrying out more studies in this regard in order to identify this relationship.

Study No. (4) wasaimed to explain two fundamental approaches to knowledge management. The tacit knowledge approach emphasizes understanding the kinds of knowledge that individuals in an organization have, moving people to transfer knowledge within an organization, and managing key individuals as knowledge creators and carriers. By contrast, the explicit knowledge approach emphasizes processes for articulating knowledge held by individuals, the design of organizational approaches for creating new knowledge, and the development of systems (including information systems) to disseminate explicit knowledge within an organization.

This study summarized the benefits and defects of its approaches. The presentstudy has recommended designing a complex approach, which consists of the management of both tacit and explicit knowledge in order to practice knowledge management.

Study No. (5) wasaimed to highlight the importance of tacit knowledge in construction and to underline the significant contribution of tacit knowledge towards the organizational performance. The study also reviewed literature on principal insights of dominant views on knowledge and organizational resources to highlight the strategic nature of tacit knowledge. Further, intrinsic characteristics of the construction industry are discussed to underline the people factor and the role of the tacit knowledge.

The study concluded that tacit knowledge plays an important role in the changing work environment and contributes largely in continuing work performance. The study recommended taking into consideration the fact that tacit knowledge depends on skills, experience and talent of persons. The study showed the important role of tacit knowledge in linking organizational performance and achieving the competitive advantage.

Study Problem

Health care sector in general and hospitals in particularare of a great importance to the society in a way that makes it one of the neediest sectors for continuing professional development. In light of the great knowledge and technological explosion in recent times; there are many sources of knowledge that can contribute to professional development in the health care sector through knowledge sources, which provide such contributions with regard to the inherent experience in the expert minds and specialist (tacit knowledge).

Hence, the problem of this study is to identify the reality of these sources of tacit knowledge in professional development in the health care sector provided at King Abdullah Bin AbdulazizHospital in Bisha Province. The study will seek to answer the main question as the following: "What is the reality of tacit knowledge sources in supporting professional development of health care sector in Bisha Province? The sub- questions derive from the main question are as the following:

1. What is the role of tacit knowledge sources in creating knowledge for developing professional performance?
2. What is the role of tacit knowledge sources in knowledge sharing for developing professional performance?
3. What is the role of tacit knowledge sources in knowledge application for developing professional performance?
4. What is the role of knowledge technologies in developing tacit knowledge for developing professional performance?

Study Methodology

Both researchers used in this study used the descriptive case study in order to answer questions. The researcher tool was the questionnaire that was developed from study No. {1} used by the researcher to answer subquestions, its credibility was measured at 0.8729 where it has a high reliability. The reliability of the tool was also measured with a stability of 0.934. The study community consisted of department heads at King Abdullah bin Abdulaziz Hospital. The study sample consisted of (40) individual as shown in the following tables:

Table 1. distributing study samples according to having computer skills

Computer Skills	Repetition	Percentage %
Accepted	2	5.0
Good	20	50.0
Excellent	18	45.0
Total	40	100.0

The results showed that 20 persons of the study sample representing 50.0% of the total study sample have a good command of computer skills. About 18 persons of the study sample representing 45.0% of the total study sample have an excellent command of computer skills. Finally, 2

persons only representing 5.0% of the total study sample have an accepted command of computer skills.

Table 2. distributing study samples according to Internet skills

Options	Repetition	Total study samples Percentage
Search engines skills	37	92.5
Database skills	22	55.0
Email skills	33	82.5
Total	92	230.0

The results showed that 37 persons representing 92.5% of the total study sample had search engines skills and they are the majority, followed by 33 persons representing 82.5% of the total study sample had email handling skills, and finally 22 persons representing 55.0 % of the total study sample have database skills.

Table 3. distributing study samples according to used social networks

Options	Users Number	Total Sample individual Percentage
Twitter	29	72.5
Face book	16	40.0
WhatsApp	35	87.5
YouTube	33	82.5
Blogs	6	15.0
Other	7	17.5
Total	126	315.0

The results showed that 35 persons representing 87.5% of the total study samples use WhatsApp and they are the majority, followed by 33 persons representing 82.5% of the total study samples use YouTube. 29 persons representing 72.5% of the total study samples use. 16 persons representing 40.0% of the total study samples use face book and 7 persons representing 17.5% of the total study sample participate in other Channels (e.g. Instagram and Snapchat). Finally, 6 persons representing 15.0% of the total study samples use blogs.

Numerical Results

The researcher reviewed numerical results of the study as follows:

Answering the First Question: What is the role of tacit knowledge sources in creating knowledge for developing professional performance?

(T) Test results are as follows:

The results showed that (P.value) = 0.000 less than (α= 0.05) value, and calculated (T) value = 14.844 is more than (T) value table = 2.023 of degrees of freedom = 39. This means that tacit knowledge sources play a positive role in knowledge creation for developing professional performance of health care sector at King Abdullah Hospital in Bisha province. Based on this study, thearithmetic mean equals (3.18), which means that tacit knowledge sources off play a positive role in knowledge creation by 72.70% for developing professional performance of health care sector at King Abdullah Hospital in Bisha province.

Table (5) showed that the total average of study samples responses concerning tacit knowledge sources in creating knowledge for developing professional performance is (3.18), which means that tacit knowledge sources play a role in creating knowledge for developing professional performance with a rate of 72.70%. While the subject standard deviation generally reached about (0.501), this indicates that there are no differences between the study sample opinions considering the subject in general.

Answering Second Question: What is the role of tacit knowledge sources in knowledge sharing for developing professional performance?

T) Test results are as follows:

The results showed that (P.value) = 0.000 less than (α= 0.05) value, and calculated (T) value = 16.125 is more than (T) value table = 2.023 of degrees of freedom = 39, which means that tacit knowledge sources plays a positive role in knowledge sharing for developing professional performance of health care sector at King Abdullah Hospital in Bisha province. The results concluded that theArithmetic Mean equals (3.00), which means that tacit knowledge sources play a positive role in knowledge sharing of 66.70% in developing professional per-

Table 4. first sub-question (T) Test results

Subject	Arithmetic Mean	Degrees of Freedom (df)	Calculated (T) value	(Sig) P.value
Role of tacit knowledge sources in creating knowledge for developing professional performance	3.18	39	14.844	0.000

Table 5. (Likert scale) test of the first sub-question

Phrases	Average Opinions	Standard Deviation	Percentage %	Agreement level	Order of Items
Hospital manager plays a role in knowledge creation	3.10	0.379	70.00	Agree	9
Training Centre manager plays a role in knowledge creation	3.02	0.768	67.33	Agree	10
Training supervisors contribute to creating knowledge	3.13	0.723	71.00	Agree	8
Heads of Section contribute to creating knowledge	3.18	0.549	72.67	Agree	4
Trainees participate in creating knowledge	3.15	0.834	71.67	Agree	7
Administrative staff and technicians of training centre participate in creating knowledge	2.77	0.832	59.00	Agree	12
Training experts of Trainers contribute to creating knowledge	3.20	0.823	73.33	Agree	3
Consultancy firms contribute to creating knowledge	3.15	0.662	71.67	Agree	6
Training courses contribute to creating knowledge	3.45	0.552	81.67	Strongly agree	1
Conferences contribute to creating knowledge	3.35	0.662	78.33	Strongly agree	2
Health forums contributes to knowledge creation	3.18	0.636	72.67	Agree	5
Ministry senior leaderships contribute to creating knowledge	2.83	0.71	61.00	Agree	11
Total Subjects	3.18	0.501	72.67		

Table 6. Second sub-question (T) Test results

Subject	Arithmetic Mean	Degrees of Freedom (df)	Calculated (T) value	(Sig) P.value
Role of tacit knowledge sources in knowledge sharing for developing professional performance	3.00	39	16.125	0.000

Table 7. (Likert Scale) test of the second sub-question

Phrases	Average Opinions	Standard Deviation	Percentage %	Agreement level	Order of Items
Hospital manager plays a role in knowledge sharing	2.85	0.662	61.67	Agree	11
Training Centre manager plays a role in knowledge sharing	3.05	0.714	68.33	Agree	8
Training supervisors contribute to knowledge sharing	3.05	0.677	68.33	Agree	7
Heads of Section contribute to knowledge sharing	3.08	0.474	69.33	Agree	6
Trainees participate in sharing knowledge	2.88	0.686	62.67	Agree	10
Administrative staff and technicians of training centre participate in sharing knowledge	3.03	0.660	67.67	Agree	9
Training experts of Trainers contribute to sharing knowledge	3.13	0.648	71.00	Agree	5
Consultancy firms contribute to sharing knowledge	3.78	0.577	92.67	Strongly agree	1
Training courses contribute to sharing knowledge	3.25	0.543	75.00	Agree	2
Conferences contribute to sharing knowledge	3.23	0.480	74.33	Agree	3
Health forums contributes to knowledge sharing	3.18	0.636	72.67	Agree	4
Ministry senior leaderships contribute to sharing knowledge	2.83	0.712	61.00	Agree	12
Total Subjects	3.00	0.392	66.67		

Table 8. Third sub-question (T) Test results

Subject	Arithmetic Mean	Degrees of Freedom (df)	Calculated (T) value	(Sig) P. value
Role of tacit knowledge sources in knowledge application for developing professional performance	2.93	39	12.333	0.000

formance of health care sector at King Abdullah Hospital in Bisha province.

From the data of Table No. (7)it is concluded that the total average of responses of the study samples concerning tacit knowledge sources role in creating knowledge for developing professional performance is (3.00), which means that tacit knowledge sources play a positive role in creating knowledge for developing professional performance by 66.67%. While the subject standard deviation generally reached (0.392), this indicates that there are no differences between the study sample opinions considering the subject in general.

Answering Third Question: What is the role of tacit knowledge sources in knowledge application for developing professional performance?

(T) Test results are as follows:

The results showed that (P.value) = 0.000 less than (α= 0.05) value, and calculated (T) value = 12.333 more than (T) value table = 2.023 with degrees of freedom = 39, which means that tacit knowledge sources play a positive role in knowledge application for developing professional performance of health care sector at King Abdullah Hospital in Bisha province. Based on the study, theArithmetic Mean equals (2.93), which means that tacit knowledge sources play a positive role in knowledge application by 64.33% for developing professional performance of health care sector at King Abdullah Hospital in Bisha province.

Data from Table No. (9) show that the total average of responses of the study samples concerning tacit

Table 9. (Likert Scale) test of the third sub-question

Phrases	Average Opinions	Standard Deviation	Percentage %	Agreement level	Order of Items
Hospital manager plays a role in knowledge application	2.90	0.591	63.33	Agree	10
Training Centre manager plays a role in knowledge application	3.08	0.616	69.33	Agree	6
Training supervisors contribute to knowledge application	2.92	0.764	64.00	Agree	9
Heads of Section contribute to knowledge application	3.05	0.597	68.33	Agree	7
Trainees participate in applying knowledge	3.08	0.572	69.33	Agree	5
Administrative staff and technicians of training centre participate in applying knowledge	2.83	0.675	61.00	Agree	11
Training experts of Trainers contribute to applying knowledge	3.15	0.662	71.67	Agree	2
Consultancy firms contribute to applying knowledge	3.03	0.733	67.67	Agree	8
Training courses contribute to knowledge application	3.13	0.748	71.00	Agree	4
Conferences contribute to knowledge application	3.18	0.747	72.67	Agree	1
Health forums contributes to knowledge application	3.13	0.723	71.00	Agree	3
Ministry senior leaderships contribute to knowledge application	2.80	0.648	60.00	Agree	12
Total Subjects	2.93	0.474	64.33		

Table 10. fourth sub-question (T) Test results				
Subject	Arithmetic Mean	Degrees of Freedom (df)	Calculated (T) value	(Sig) P.value
Role of knowledge technologies in developing tacit knowledge for developing professional performance	2.63	39	5.922	0.000

knowledge sources role in knowledge application for developing professional performance is (2.93), which means tacit knowledge sources play a positive role in knowledge application for developing professional performance by 64.33%. While the subject standard deviation generally reached the rate of (0.474), this indicates that there are no differences between the study sample opinions considering the subject in general.

Answering Fourth Question: What is the role of knowledge technologies in developing tacit knowledge for developing professional performance?

(T) Test results are as follows:

The results showed that (**P.value**) = 0.000 less than (α= 0.05) value, and calculated (T) value = 5.922 more than (T) value table = 2.023 with degrees of freedom = 39, which means that knowledge technologies play a positive role in developing tacit knowledge for developing professional performance of health care sector at King Abdullah Hospital in Bisha province. Based on the study, theArithmetic Mean equals (2.63), which means that knowledge technologies play a positive role in developing tacit knowledge by 54.33% for developing professional performance of health care sector at King Abdullah Hospital in Bisha province.

Table No. (11) Information has concluded that the total average of responses of the study samples concerning knowledge technologies role in developing tacit knowledge for developing professional performance is (2.63), which means that knowledge technologies play a positive role in developing tacit knowledge for developing professional performance by 54.33%. While the subject

Table 11. (Likert Scale) Test of the fourth sub-question					
Phrases	Average Opinions	Standard Deviation	Percentage %	Agreement level	Order of Items
Search engines play a role in knowledge creation	3.03	0,557	67.67	Agree	3
Search engines play a role in knowledge sharing	3.13	0.686	71.00	Agree	2
Databases play a role in knowledge creation	2.95	0.677	65.00	Agree	6
Databases play a role in knowledge sharing	3.53	0.645	84.33	Strongly agree	1
E-mail contributes to knowledge creation	2.73	0.847	57.67	Agree	9
E-mail contributes to knowledge sharing	2.70	0.791	56.67	Agree	10
E-mail contributes to knowledge application	2.55	0.749	51.67	Agree	14
Twitter contributes to knowledge creation	2.40	0.841	46.67	Disagree	19
Twitter contributes to knowledge sharing	2.68	0.859	56.00	Agree	13
Twitter contributes to knowledge application	2.45	0.815	48.33	Disagree	18
Face book contributes to knowledge creation	2.20	0.966	40.00	Disagree	21
Face book contributes to knowledge sharing	2.38	1.005	46.00	Disagree	20
Face book contributes to knowledgeapplication	2.18	0.958	39.33	Disagree	22
WhatsAppcontributes to knowledge creation	2.47	0.877	49.00	Disagree	17
WhatsAppcontributestoknowledge sharing	2,85	0,770	61,67	Agree	8
WhatsAppcontributes to knowledge application	2,70	0,758	56,67	Agree	12
YouTube contributes to knowledge creation	2,97	0,698	56,67	Agree	5
YouTube contributes to knowledge sharing	2,98	0,698	66,00	Agree	4
YouTube contributes to knowledge application	2,87	0,939	62,33	Agree	7
Blogs contribute to knowledge creation	2,53	0,847	51.00	Agree	15
Blogs contribute to knowledge sharing	2.70	0.758	56.67	Agree	11
Blogs contribute to knowledge application	2.50	0.816	50.00	disagree	16
Total Subjects	2.63	0.667	54.33		

Table 12. Main question (T) Test results

Subject	Arithmetic Mean	Degrees of Freedom (df)	Calculated (T) value	(Sig) P.value
The reality of tacit knowledge sources in supporting professional development	2.98	39	17.265	0.000

standard deviation generally reached the rate of (0.667), this indicates that there are no differences between the study sample opinions considering the subject in general.

Answering the main question as follows:

What is the reality of tacit knowledge sources in supporting professional development of health care sector in Bisha Province?

(T) Test results are as follows:

The results showed that (P.value) = 0.000 less than (α= 0.05) value, and calculated (T) value = 17.265 more than (T) value table = 2.023 with degrees of freedom = 39, which means that tacit knowledge resources play a positive role in supporting professional development of health care sector at King Abdullah Hospital in Bisha province. Based on the study, theArithmetic Mean equals (2.98), which means that tacit knowledge support professional development with a rate of 66.00% of health care sector at King Abdullah Hospital in Bisha province.

The previous table shows that tacit knowledge sources in supporting professional development as the following:

With descending order of these main points according to the arithmetic mean of study samples. By comparing these results with table of agreement limits, the subject of (Role of Tacit knowledge sources in knowledge creation for developing professional performance) came at the first place.

The opinion agreed on the mentioned with an arithmetic mean of (3.18), which means that tacit knowledge sources of knowledge creation support developing professional performance with a rate of 72.76%. The standard deviation has reached (0.501), which proves that there is no difference between the study samples opinions in this regard.

The subject of (Role of tacit knowledge sources in knowledge sharing for developing professional performance) came at the second place with agreement degree of (3.00), which means that tacit knowledge sources of knowledge sharing support developing professional performance with a rate of 66.76% with standard deviation of (0.392). This proves that there is no difference in study samples opinions in this point.

The subject of (Role of tacit knowledge sources in knowledge application for developing professional performance) came at the third place with an agreement level of (2.92), which means that tacit knowledge sources of knowledge application support professional performance with a rate of 64.00% with a standard deviation of (0.474). This proves that there is no difference in study samples opinions in this point.

The subject of (Role of knowledge technologies in developing tacit knowledge for developing professional performance) came at the last and fourth place with an agreement degree of (2.63), which means that knowledge technologies of developing tacit knowledge support developing professional performance with a rate of 54.33% with a standard deviation of (0.667), which proves that there is no difference between the study samples opinions in this regard. In general, the total average of study samples responses concerning the role of tacit knowledge sources in supporting professional development was (2.98), which means tacit knowledge sources support professional development with a rate

Table 13. (Likert Scale) test of the main question

Phrases	Average Opinions	Standard Deviation	Percentage %	Agreement level	Order of Items
Role of Tacit knowledge sources in knowledge creation for developing professional performance	3.18	0.501	72.67	Agree	1
Role of tacit knowledge sources in knowledge sharing for developing professional performance	3.00	0.392	66.67	Agree	2
Role of tacit knowledge sources in knowledge application for developing professional performance	2.92	0.474	64.00	Agree	3
Role of knowledge technologies in developing tacit knowledge for developing professional performance	2.63	0.667	54.33	Agree	4
Total Subject	2.98	0.357	66.00		

of 66.00% in the health care sector at King Abdullah Hospital in Bisha province. The total standard deviation reached (0.357), which proves that there is no difference between study samples opinions concerning the role of tacit knowledge sources in supporting professional development.

Summary of Findings and Recommendations

The researcher reviews the summary of study findings and recommendation as the following:

Concerning the first question "What is the role of tacit knowledge sources in creating knowledge for developing professional performance", the researcher concluded by using tests of **"One-Sample T Test"** and "**Likert quadrature scale**" that tacit knowledge sources play a positive role in creating knowledge for developing professional performance in health care sector at King Abdullah bin Abdulaziz hospital, Bisha province. The arithmetic mean equals (3.18), which means that tacit knowledge sources play a positive role in knowledge creation by 72.70% for developing professional performance in health care sector in King Abdullah bin Abdulaziz hospital, Bisha province.

The first item of the subject was (training courses contribute to knowledge creation) with an arithmetic mean of (3.45), while the last item was (Administrative staff and technicians of training centre participate in applying knowledge) with an arithmetic mean of (2.77). The total average of responses of study samples concerning the role of tacit knowledge sources in knowledge creation for developing professional performance was (3.18). This means that tacit knowledge sources play a role in knowledge creation for developing professional performance by 72.20%. The standard deviation reached (0.501), which proves that in general, there is no difference in study samples opinions in this point.

Concerning the second question "What is the role of tacit knowledge sources in knowledge sharing for developing professional performance?" the researcher concluded by using tests of **"One-Sample T Test"** and "**Likert quadrature scale**" that tacit knowledge sources play a positive role in knowledge sharing for developing professional performance in health care sector at King Abdullah bin Abdulaziz hospital, Bisha province. The arithmetic mean is (3.00), which means that tacit knowledge sources play a positive role in knowledge sharing by 66.70% for developing professional performance in health sector in King Abdullah bin Abdulaziz hospital, Bisha province.

The first item of the subject was (consultancy firms contribute to knowledge sharing) with an arithmetic mean of (3.78), while the last item was (Ministry senior leaderships contribute to knowledge application) with an arithmetic mean of (2.83). The total average of responses of study samples concerning the role of tacit knowledge sources in knowledge sharing for developing professional performance was (3.00). This means that tacit knowledge sources play a role in knowledge sharing for developing professional performance by 66.67%. The standard deviation reached (0.392), which proves that in general, there is no difference in study samples opinions in this point.

Concerning the third question "What is the role of tacit knowledge sources in knowledge application for developing professional performance?" the researcher concluded by using tests of **"One-Sample T Test"** and "**Likert quadrature scale**" that tacit knowledge sources play a positive role in knowledge application for developing professional performance in health care sector at King Abdullah bin Abdulaziz hospital, Bisha province. The arithmetic mean is (2.93), which means that tacit knowledge sources play a positive role in knowledge application by 64.33% for developing professional performance in health sector in King Abdullah bin Abdulaziz hospital, Bisha province.

The first item of the subject was (conferences contribute to knowledge application) with an arithmetic mean of (3.18), while the last item was (Ministry senior leaderships contribute to knowledge application) with an arithmetic mean of (2.80). The total average of responses of study samples concerning the role of tacit knowledge sources in knowledge application for developing professional performance was (2.93). This means that tacit knowledge sources play a role in knowledge application for developing professional performance by 64.33%. The standard deviation reached (0.474), which proves that in general, there is no difference in study samples opinions in this point.

Concerning the fourth question "What is the role of knowledge technologies in developing tacit knowledge for developing professional performance?" the researcher concluded by using tests of **"One-Sample T Test"** and "**Likert quadrature scale**" that knowledge technologies play a positive role in developing tacit knowledge for developing professional performance in health care sector at King Abdullah bin Abdulaziz hospital, Bisha province. The arithmetic mean is (2.63), which means that knowledge technologies play a positive role in developing tacit knowledge by 54.33% for developing professional performance in health sector in King Abdullah bin Abdulaziz hospital, Bisha province.

The first item of the subject was (databases contribute to knowledge sharing) with an arithmetic mean of (3.53), while the last item was (Face book contribute to knowledge application) with an arithmetic mean of (2.18). The total average of responses of study samples concerning

the role of knowledge technologies in developing tacit knowledge for developing professional performance was (2.93). This means that knowledge technologies of developing tacit knowledge play a role in developing professional performance by 54.33%. The standard deviation reached (0.667), which proves that in general, there is no difference in study samples opinions in this point.

Finally, concerning the main question "What is the reality of tacit knowledge sources in supporting professional development of health care sector in Bisha Province?" the researcher concluded by using tests of **"One-Sample T Test"** and "**Likert quadrature scale**" that tacit knowledge sources support professional development in health care sector at King Abdullah bin Abdulaziz hospital, Bisha province. The arithmetic mean is (2.98), which means that tacit knowledge sources support professional development by 66.00% in health care sector at King Abdullah hospital in Bisha province.

The first subject of tacit knowledge sources was (the role of tacit knowledge sources in knowledge creation for developing professional performance) with an arithmetic mean of (3.18), while the last axis was (the role of knowledge technologies in developing tacit knowledge for developing professional performance) with an arithmetic mean of (2.63). The total of study samples average responses concerning the role of tacit knowledge sources in supporting professional development was (2.98), which means that tacit knowledge sources support professional development by 66.00% in health care sector at King Abdullah bin Abdulaziz hospital, Bisha province. The standard deviation, in general, reached (0.357), which indicates that there is no divergence of views of the study samples concerning the role of tacit knowledge sources in supporting professional development in general.

Based on the above findings, the study recommends the following:

- Spreading knowledge culture in health sector;
- Documenting seminars, lectures and training courses;
- Organizing and storing these documentations to be shared with interested bodies; and
- Conducting research to study tacit knowledge sources in medical sector.

REFERENCES

[1] Alyateem, Abdullah Mohammed Abdullah (2016). The reality of tacit knowledge sources in educational training center in department of education of Bisha province: Saudi Arabia case study. Communication, Management and Information Technology .Taylor & Francis Group, London. November 2016.

[2] Al Saleh, AsmaaRashadNayef. (2012)Tacit knowledge and its role in improving and developing human resources in light of globalization management concept: an applied study on multinational companies. International Scientific Conference of Globalization Management in Knowledge Age 15-17 December 2012. Tripoli, Lebanon.

[3] Khaseeb, Khalid, Abu Fadah, Marwan (2012). Tacit knowledge and its relationship to product quality: an applied study on Palestinian telecommunications companies". The Economic Conference of Al Quds Open University towards Enhancing Competitiveness of Palestinian Products 16-17 October 2012. Ramallah, Palestine.

[4] Sanchez. Ron, (2005) Tacit Knowledge versus Explicit Knowledge Approaches to Knowledge Practice", at: www.knowledgeboard.com.

[5] Pathirage, Chaminda, DilanthiAmaratunga and Richard Haigh, (2007) Tacit knowledge and organizational performance: construction industry perspective, Journal of Knowledge Management, v. 11, N. 1, Pp. 115-126

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Internet of Things–IOT–New Reality

Ali Theeb Alaklabi
Deputy Supervisor of King Saud University of Scientific Press, Riyadh, Saudi Arabia

ABSTRACT

This study aims to identify Internet of Things, in addition to fields in which internet of things can be used to improve different fields of life and also, helping to function internet of things capabilities. This study seeks to answer main question: "what is internet of things in the new reality"? Importance of this study is that internet of things is one of modern subjects that are still under research, and the matter needs to be more researched. Based on researcher experience, his strong connection to work environment in Information Institutions, and what he observed of incredible improvements in internet of things services, He feels the importance of internet of things and the urgent need to prepare this study that from its results, social, practical and scientific benefit can be achieved. In order to answer the main question of this study, the researcher uses Descriptive analytical research method that copes with this kind of studies. This study reaches in its results to the description of set of challenges that face internet of things, in addition to explanation of most important advantages of internet of things in life fields of present reality such as active participation in improving services of civil organization and institution, and also, improvements of Artificial intelligence capabilities assisting in real increscent of things connects to internet and devices equipped with Sensors in which humans wear to identify their hobbies and addresses which produces and will produce massive quantity of huge information. This study recommends increasing awareness of internet of things role in improving activities and services in all fields of life. It also recommends improving and processing automatic systems of different institutions and organizations in order to comply with requirements of internet of things applications, furthermore fixing a lot of discussions and internet of things specialized seminars in order to find more promise opportunities, and finally, studding concerns that threaten investment of internet of things applications in work and several services.

KEY WORDS: INTERNET-INTERNET OF THINGS-HUGE INFORMATION-INSTITUTIONAL SERVICES-ANALYTICAL METHOD

ARTICLE INFORMATION:

**Corresponding Author: aalaklubi@ksu.edu.sa*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/7

INTRODUCTION

The term of "internet of things" appeared for the first time in 2000 A.D in order to add new chapter of advancement in Information Technologies **[1]** to transfer internet from being internet of communications to be internet of things. Thus, a lot of organizations and companies tend to continuity of functioning internet of things capabilities meeting modern life needs, and providing best services achieving best benefits, and best services to beneficiations.

Due to Arab researches Lack for discussing and functioning internet of things in modern life, according to the knowledge of the researcher, and because of urgent need of coping with new things in the activities and services based on internet of things technology, the researcher feels the importance of preparing this study to clarify some available potentials of internet of things in order to invest in works and activities of organizations and institutions in Arab countries or in other countries.

In recent years, several scientists and specialists in the field of information and communication technology started to consider and follow the usage of internet of things in modern life; and tended to identity internet of things. They also asked to be trained on samples of internet of things as being one of the subjects which was tackled in works papers in international conferences, became researchers and associations focus, and was discussed largely in blogs, therefore, the subject is very important, [2].

According to researcher feeling of the study importance on internet of things as a concept, advantages and benefits, and in addition to discuss available and hoped application methods providing the main question: "how can we benefit from internet of things in modern life?", branching into two subsidiary questions: "what is the internet of things?" and "in which field can we use internet of things in order to improve several services and activities?".

Study sample consists of a group of previous studies and literary works discussing this subject using content analysis method, this study sums up with number of results of a group of challenges that face internet of things. In addition to explanations of most important advantages and benefits of internet of things in life fields such as active participation in improving services of civil institutions and organizations, potential of using internet of things in serving society, and forming a lot of groups cooperating in common interests fields, also improving artificial intelligence capabilities helping in real increscent of things connected to internet and devices equipped with Sensors in which humans wear to identify their hobbies and addresses which produces and will produce massive quantity of huge information.

Later, through this practical paper, present study problems, its composition, its main and subsidiary questions was submitted, in addition to previous works related to the subject symbolizing study sample. Also, submitting study method "content analysis method" in which he defined as a subject of the study, and submitting study findings and recommendations reached through applying study method in order to answer main and subsidiary questions.

2- Previous works and researches:Study of Magdalena Wójcik [2] tackles libraries benefits from internet of things services used in other institutions. This study aims at identifying activities which can be applied using internet of things in libraries services. This study focuses on designing theoretical model of appropriate usages of internet of things in libraries. The study compares between activities effect in commercial institutions and non commercial institutions identifying activities effect using or planning to use internet of things which can be applied in libraries. Through this method, theoretical model of internet of things applications was designed which can be used in improving library activities. The findings show that internet of things technology can be used in library activity and services can be used similarly to what executed in commercial institutions.

Study of Massis [3] discusses internet of things applications and its possible effect on libraries. The importance of this study is that it seeks to reach accurate information in addition to practical suggestions in order to overcome security gapes or concerns about invasion of internet of things to privacy. This study provides study findings and comments made in this subject through scientific researches prepared by practitioners and researchers. This study confirms that upon reporting about invasion of privacy and security gapes in internet of things, this must not prevent libraries from using internet of things applications as its results will be huge. The study refers that library secretary should make conversations with beneficiaries on invasion of privacy, answer their questions, and give confidence to them after internet of things invades their privacy because their privacy is subject to supervision of library employees. The study presents practical suggestions to overcome security gapes or concerns about invasion of internet of things to privacy.

Chaves-Dieguez et al., [4] provide internet of things services to smart cities, refers that it is expected that smart cities will improve types of citizens depending on new samples like internet of things that enjoys huge abilities to connect thousands of sensor devices and motors all over the city, receiving requests in addition to movable smart personal devices that enable civil entities to perform its duties professionally in the same moment of requesting with the potentially of receiving reports

from population and sending support through the city connection network in a record and in high quality.

Study of Xu.et al., [5] tackles internet of things applications in smart libraries. The study shows that the reader during book cycling process through library system can re-get book information through internet, defining necessity or apriority in order to borrow or get it back if he was a borrower if there is another beneficiary. Smart library is center of information networks which uses internet of things to make all books and essays in the library smart in which all materials in the library is controlled. Data form will be dealt with electronically through network. Also the library will be internet web center in which library devices and equipments will be controlled trough remote sensing technology in order to serve better and faster for all beneficiaries.

Work of Al-Fuqaha. et al., [6] focuses to enable internet of things technologies, protocols and application survey. This study provides overview on internet of things and concentrates on enabling technologies, protocols and application issues. The study aims to provide information about internet of things application issues in order to enable researchers and application improvers to benefit from it in improving different protocols and applications with each other to provide required functions. The study aims to discover the relation between internet of things and other emerging technologies including analysis of huge information and Cloud computing, and provide information helping in improving horizontal integration between services of internet of things.

The study shows that the internet of things is able to engaging recent improvements including Radio-frequency Identification (RFID) technology, smart sensor devices, communication technologies, and internet protocols. The main hypothesis of this study is possession of smart sensor devices collaborates with each other directly without human intervention in order to present a new class of applications through internet of things. Study findings also shows that the directly deal from machine to machine (M2M) without real human intervention as the first phase of internet of things phases. In following years, it is expected that internet of things will connect several technologies to enable new applications to connect materials together and that in turn supports smart decision taking.

Shamprasadand Satyanarayana [1] discusses internet of things and libraries. It shows level of huge technical Upspring caused by internet of things. Internet of things transfers internet of communication to internet of things which make connecting of things and transferring data through internet is possible with or without any human interference. The study expects that internet of things will cause a revolution in the way of living in all life fields such as: other service industries. Also, internet of things will provide huge capabilities that may help in improving library services. The study tries to explain what is "internet of things", what is the technology it uses and the way of improving. It also presents samples of internet of things samples that can be used in library services and defining possible fields that can be actively executed in library services.

3- Identifying the problem:We need, in the present life, continuity improvements in all activities and services in our daily life in order to cope with technology developments and to increase the coverage space to include largest number of beneficiaries. Internet of things revolution presents new form of internet services and applications. Thus it causes quality upspring in kind and style of services achieving high levels of easiness and fastness in serving human. The researcher desires to make this study due to his desire of coping with these improvements and contribution in spreading culture hoping that it will helps with other results to fasten processes of engaging internet of things in improving different services and activities in our daily life helping to meet living, educational, industrial, healthily, touristic and industrial needs etc. The problem of the study is this question: "what is internet of things applications in the modern life?" branching into two subsidiary questions: "what is the internet of things?" and "in which field can we use internet of things in order to improve several services and activities?"

4- Study Method: Because of the nature of this study which trying to define the term Internet of things and highlighting on its features and to know how to use it in developing various services and activities that affect contemporary life, based on the objectives of the study and its questions which seeks to answer it, the method used in the study is an analytical descriptive method that adapt to this type of study through studies of what has already been dealt with in the field of Internet of things and services and activities that affected it and benefit from it in the study by referencing the available literature that the researcher is able to reach.

5-The practical side of the study The concept of internet of things: Internet of things refers to as an abbreviation in English: (IOT, Internet of Things) which is the initials of each word from Internet of Things (IOT) and it is o0ne of the new terminologies that looks at the future of the new generation of the Internet and its uses and the advanced applications based on the internet," Kevin Ashton is the first to use the word internet of things in 1999" Sheikh [7].

Ashton considers one of the pioneers in the field of technology, he is the founder of the first research Center at the Massachusetts Institute of Technology, it's still in the beginning, and this term means that things will be

able to be more useful with less effort by enabling things to communicate with each other through their Internet connection. And the things which may understand through internet are all the things that have a specific address and identity on the Internet either through their real site or for example by connecting a smart chip or a smart bracelet with a special sensor, glasses or Google clock where the other thing can communicate and understand with it across the internet address through the sensors in the thing or the smart piece added to it and the human himself can be among these things as soon as he has his own smart chip Adjoining to him and looks like clock, bracelet or something like that.

Abu Bakr and Hisham [8] refer to the importance and future of Internet of Things and the last report for International Data Corporation (IDC) which interested in Information Technology shown their expectations for internet of things risks depending on the studies and Follow-ups that observe, noting the expectation tremendous growth in the sales of internet of things up to 2020 with an annual growth rate amounting to 16.9%, one of the most important of these investments is health services.

Health care is one of the most important fields that Internet of things applications and technologies can be applied to, because it is regarded one of the most significant requirements of human life and even organisms such as animals and others. Thus, providing medical and health care and medical treatment services represent an obsession for governments. With the existence of equipment and devices connected to Internet of things , improving medical care services can be easily applied through achieving communication between patients and medical care providers and following-up patients online in some diseases that do not require the patients to be present in hospitals for so long. Such as cancer diseases with children as the hospital take the daily readings through connecting the device provided for the patient at his home. The same can be applied to the rest of specialties in which the Internet of things can be used in providing medical advices and correcting some wrong procedures.

In industrial sector, the need to use Internet of things in production, distribution and operation works and controlling the multiple industries whether computers, equipments, transportation means or safety equipment has largely increased. Internet of things is to be connected to a great quantity of huge data that include origin and post-use data. It is known that huge data needs Internet of things services to reuse, control and analyze these data. Internet of things is of great importance to artificial intelligence as it is regarded the resource of improving it and the most important means for artificial intelligence operators. The same applies to computer and programming works.

Without Internet of things, a lot of ideas and development projects will be just dreams. Internet of things can be used to control robots, perform a lot of works in security, industrial and medical fields and others. Internet of things will be one of the most important applied technologies in managing and controlling the house, turning off and on air conditioning, lighting equipment and surveillance cameras, opening and closing doors and windows and moving movable devices and equipment connected directly to Internet of things. Thus, Internet of things will be in the heart of controlling many things in life.

Internet of things has many advantages including but not limited to the following:Internet of things saves time, effort and money through enabling individual and organization to control things online in order to work efficiently. Internet of things also makes harmony between things through sensors connected by the internet. This advantage saves time, effort and money. Internet of things frees a human from time and place constraints as he can manage and control things through internet protocol without the need to be in their places and to manage directly, if he gave instructions in advance.

Internet of things can work through using smart phones, other handheld devices, and generations of data transmission services by phones and software that depend on satellite systems or GPS. Internet of things researchers managed to develop tools, software and conversational Language between things, which led to what is known today as Internet of things.

The things that work through internet are all tangible and material things (smart things), which are connected through the network. These things can be recognized through labeling clear and fixed IP addresses on them. For example; cars, television, goggles Google and different household tools such as fridges, Washing machines, alarms, houses entrances, air conditioning, goods, products at shops shelves, animals in farms and any other thing meant to be managed, monitored or interacted with electronically through software and sensors that can be connected to the network. Therefore, all the previously mentioned things can collect and exchange date. A human in this case is the sole beneficiary of all these understandings and connections between things that are connected through the internet. These things can be monitored and controlled through smart phones applications. Once again, all these things whether in airports, roads, shops, hospitals, schools, universities, homes and places of work became under control and can be managed and controlled through Internet of things by using mobile phones or any means that is connected to the internet.

Technical developments in information services field resulted in a clear change in information system specialist works and those who work in the field of Ref-

erence Data Services at information institutions. Information institutions must cope with these developments and adapt its services to meet the needs of beneficiaries according to the most updated technical developments especially the development of Internet of things applications.

Internet of things can be applied in the field of information services in all organizations through supplying things used and concerned by beneficiaries and information institutions employees with suitable sensors. Communication devices can be connected to these things through the internet to perform its required works such as information, reservations, recall and return of traditional and electronic Information Resources, in addition to finding lost or displaced information. These works also include controlling the internal environment in terms of lightening, air conditioning, opening and closing doors, monitoring in and out the library and collecting the number of visiting the library or using a definite source by one or more users. In addition to that, Internet of things develop group works, technical procedures and many other things, and it is clear enough that Internet of things revolution can be used in all areas of life.

Internet of things enables a human to things effectively and easily whether closely and remotely. Internet things or networked things as stated by [9] are everything that can be recognized by the internet by known internet protocols. A human in this case is the sole beneficiary of all these understandings and connections between things that are connected through the internet. As a kind of science fiction, a human himself can be a "thing", if he or his surroundings is labeled by a definite Internet address as glass, watch, bracelet, electronic cloths or medical equipment labeled whether on or in his body.

The concept of Internet of Things (Internet of things) was initially raised by Kevin Ashton in the early 2000s while working on a project for Proctor and Gamble to improve their supply chain management by linking RFID data to the Internet. In January 2000 LG announced plans for first Internet connected refrigerator. In 2005, International Telecommunications Union (ITU) took cognizance of the development and mentioned about 'Internet of things' in a published International Telecommunications Union report. In 2008, IPSO alliance was formed to promote the use of Internet Protocol (IP) networked devices in energy, consumer, healthcare and industrial applications. In 2012 IPv6 (Internet Protocol version 6) was launched7, which made it possible to assign IP address to every atom on this earth without having any constraints, thus ensuring connectivity between and across millions of devices.

Internet of things is expected to be used quickly as a source of things that are connected through the internet. The importance of Internet of things is generally attributed to the several reasons or factors, including but not limited to the following:Internet of things works by connecting things through private identification.Internet of things does not differ largely from RFID data as workers in information institutions find them quite similar. Both technologies track things through sensors that can be connected online. However, in the Internet of things, connection between things and devices is only done through the internet.

Internet of things is regarded as an effective means to solve some problems that hinder the traditional institutions such as loosing things or not finding them if they are not placed in their usual places. Internet of things can promote the relation between a reader and a book based on the famous concept of Ranganathan (i.e. book for every reader). A reader can access his book through Internet of things before any other person through the advance reservation. In the future, a book can be instructed to move toward the direction of the reader, if there are robots to serve readers and bring them books on their tables. Internet of things represents a successful means of effective marketing for its services through connections between things and persons registered with it continually.

The future under the Internet of Things (IOT):After the processes of research making, education and rest of life areas have transformed from the traditional way to using the computer at all its development stages, the world became ready to move to the next stage represented in technical developments. These technical developments moved from using handheld devices, smart phones, and social media applications through IOT, which reveals many changes in human Life style, pattern and works largely.

Al Nasser [10] Indicates that the people in the world now live in the age of smart devices and mobile phones, which expected to continue for several years, but there is a great transformation to what we may describe as the Internet of Things (IoT). Internet of things has started to appear now, that is to say that some things we use have the ability to be connected to the internet such as watches, televisions, glasses and many other things. Internet of things concept includes all things that we can imagine for examples; cloths, furniture, household utensils, streets, a human himself and any other thing that can be labeled by electronic sensors to be connected to the internet.

Al Nasser [10] adds that the expectations of using the Internet of Things will be amazing in the future. By 2020, the capacity of Internet of things market will excel the markets of mobile phones, computers and tablets and the financial revenue or sales of Internet of things market will exceed 600 billion dollars. Data that will arise

out of using the Internet of things will be more than 40.000 Exabyte of huge data; this number equals 40 trillion Gigabytes now, which is a very huge storage area.

The applications of internet of things in organizations and institutions:Hawkins, Don [11] states that Internet of things will provide many services expected to develop organizations and information institutions including but not limited to the following:

- Controlling electronic Inventory:

  Internet of things can ease and adjust controlling electronic Inventory by the ability to contact, follow-up and manage the inventory materials and receive the data related to the revenues and expenses of the inventory permanently and accurately.
- Organizations can make payment and registration fees related to participating in training and educational events through its respective application. Organizations can also enable beneficiaries to pay all financial dues for services that require fees and pay fines if any through electronic portal. In addition, beneficiaries can register in activities, get registration card and choose lectures and workshops that they want to attend and so on by the applications of such organizations or even general applications.
- One of the services provided by Internet of things is the possibility to access the electronic portal and ratify the identification of the beneficiary by the contact between the beneficiary recognized by his identification and Electronic Library through the internet. Electronic Library through the internet enables the beneficiary after recognizing his identification to read and benefit from the electronic sources.
- Internet of things eases access to the required subjects in an organization. Such service is based on the Internet of things applications, which allows the beneficiary to track the subject through RFID data labeled on the subject and then determine its place through the digital map of the site.
- Mobile devices applications, which contribute to developing services, enable the beneficiary to perform many operations and requests, get their results, and communicate directly with the relevant employee. An authorized beneficiary can get the information, articles and electronic references from information centers electronically through using applications of mobile devices. applications of mobile devices is only allowed to recognize the beneficiary and confirm his identification, then send the digital content to his device only for reading, not to be saved or copied and paste, in order to preserve the intellectual property rights of different authors. Mobile handheld devices connected directly to the Internet of things achieve all of that [12].

Challenges of Internet of things (IOT):

Concern and fear are ones of the dangerous factors surround any developments provided by information institutions in favor of the internet of things. A lot of beneficiaries suffer from such fear. Here,Rainie [13] refers to many factors considered as a source of fear resulting from the use of internet of things applications that affect on work sequences in the current time, Such as:

- Over use of internet of things may cause wide piracy and exploit any available cavities to disrupt services, as well as make information acquisitions.
- There is a growing concern about the capacity of maintaining privacy because of the use of internet of things, for it causes a disclosure of personal or sensitive information.
- The service's security standard and the ability to overcome any circumstances lead to lack of communication between things.
- The extent of bad effects resulting from the use of internet of things in major fields such as: heath, education, banks etc... such as the unintended mistakes or hacking websites and control things by others.
- The capacity of hacking many of networks connected to things via internet.
- Possibility of threatening many fields that use internet of things; security, health and banking sector with malware programs.
- There are concerned fears that tweak internet of things in order to service non-standard work such as: hacking and unorganized way to get information, in addition to manipulate borrowing and recovering processes in the information institutions.
- Things and communication sets connected to the internet of things are increasingly in growth. In the future, the control over these sets will be confusing. Thus, the entities that willing to invest in internet of things: including information institutions will be worried.

6-Conclusion, Future works and Recommendations:The study concluded many findings divided in two important sections.

First, challenges that face Internet of things, which indicate that the huge quantity of data around the world may raise concerns about privacy and human abilities to control and manage their own private lives continually. Also, the desire of commercial companies and else

to track and target the behavioral Pattern of human connected to the Internet of things and exploit it to realize significant gains is regarded one of these challenges. Many beneficiaries may not access quickly to the Internet of things due to challenges related to complex networks. The expansion in using the Internet of things may increase the number of cyber attacks, exploit any possible faults to break down some or all services and posses data related to the beneficiaries. Using Internet of things may disclose or publish some personal and sensitive information; therefore, there is a great concern about the ability to maintain privacy.

There is also a concern about the continuity of the service and being not affected by any circumstances that may arise or lead to not connection or week connections between things. The bad effects of Internet of things on important areas such as; health, education, banks and else in terms of unintended faults, hacking networks or letting others control things is regarded one of these challenges. In addition to that, the contemporary reality, especially in our Arab societies, which is not yet ready to activate the Internet of things applications on a large scale. This is due to the lack of readiness of the automated systems to include these applications except for RFID data technology. All networks connecting things with the internet can be penetrated. Malware programs may target many areas benefiting from the internet in banking, health and security sectors.

Nowadays, the number of things and devices connected to the internet is becoming increasingly significant, and controlling them in the future is not so clear, and that results in a great concern with the entities that desire to invest in the Internet of Things. The issue of unifying communication standards and protocols in order to enable everything to participate and communicate with a each other is a huge challenge for companies investing in the Internet of things sector. Using the Internet of things is still under some concerns and fears, especially when we speak of the issue of privacy, security and piracy (which represents a great obsession for entities desiring to invest in Internet of things applications). Using the Internet of things requires an expensive financial cost, and the related technical support and training for employees is quite difficult.

Second: this section discusses the advantages and benefits of Internet of Things on the contemporary reality, as the Internet of Things can effectively contribute to developing services of institutions and organizations in several areas including the ability to track things lost or placed in wrong places through the feature of tracking things offered by the Internet of Things. This reduces time and efforts of relevant persons and keeps things from being lost. Internet of things can identify the site of the beneficiary to provide his required services online, answer his questions or even deliver things to him. A beneficiary can download the map of thing site and find it in the market, organization or city by the feature of tracking things. Self-operations in most services and needs can be done independently without intervention by humans whether by devices provided by institutions and organizations in their sites or in public places or by their relevant application on the smart phone of the beneficiary.

By using Internet of things, a beneficiary can recognize due amounts as fines or amounts against paid services and pay the same electronically through the application of the organization. A beneficiary can also control the temperature and lightening of a place online the application related thereto according to the available potentials. A beneficiary can also register in different workshops and activities and get entry card online. Internet of things also enables the beneficiary to access virtually all kinds of electronic or printed information sources available at information centers and book whatever he desires. Employees' performance in organizations can be adjusted and followed-up through the feature of tracking things connected to their smart phones or to things they were assigned to transfer or store for example. The beneficiary can register requests that he desires to get from shops, libraries, pharmacies or any other places through the smart phone application of the organization, and the application will communicate with the organization system at the stated times and request to reserve these things and send them to the beneficiary or identify its delivery site.

The second section refers to that the Internet of Things can contribute to serving the community and forming collaboration groups in several areas of common interests through defining the identifications and places of peers who are connected to the Internet of things and specialized in the same major or share definite interests with the beneficiary. The beneficiary can recognizes his peers, communicate with them and form work groups without prior knowledge. Internet of things also develops the abilities of artificial intelligence, which resulted in increasing the number of things connected to the internet and devices equipped with sensors worn by human to identify their identifications and addresses. These devices produced and will continue to produce a great quantity of huge data to enable service entities to communicate permanently with the beneficiaries in areas of health, education and other services, especially the services provided by information institutions.

Based on the current study findings, it is recommended that further studies should be carried out to deal with the issue of enabling the Internet of Things to provide more services that cope with the requirements

and ambitions of planners to develop the contemporary reality and its applications. It is also recommended to raise awareness of the role of the Internet of Things in developing activities and services in all areas of life through workshops, specialized fairs, and share experiences that managed to use the Internet of Things applications. It is also recommended to develop and process the automated systems of different organizations and institutions to be able to comply with the requirements of the Internet of Things applications. Many seminars and Symposiums should be held to discuss the services of Internet of things to discover more promising chances and handle difficulties that hinder using the Internet of things. Finally, it is very important to study the concerns that threaten the investment of the applications of the Internet of Things in different services and operations that affect the environment and the contemporary reality and try to find solutions to them.

REFERENCES

[1] Shamprasad P. M; Satyanarayana, K.V. (2015). Internet of Things and libraries. Annals of Library and Information Studies (ALIS). Vol 62, No 3 (2015).

[2] Magdalena Wójcik, (2016) "Internet of Things – potential for libraries", Library Hi Tech, Vol. 34 Iss: 2, pp.404 – 420, from: http://dx.doi.org/10.1108/LHT-10-2015-0100

[3] Bruce Massis, (2016) "The Internet of Things and its impact on the ... paper is to consider the Internet of Things (IOT) and its potential impact on libraries

[4] Chaves-Dieguez, D., Pellitero-Rivero, A., García-Coego, D., Gonzalez-Castaño, F. J., Rodríguez-Hernandez, P. S., Piñeiro-Gómez, Ó.,... Costa.

[5] Xu. Li. Da, He. Wu, Li. Shancang Li. (2014). Internet of Things in Industries: A Survey. IEEE Transactions On Industrial Informatics, Vol. 10, No. 4, November 2014.

[6] Al-Fuqaha. Ala, Guizani. Mohsen, ,Mohammadi. Mehdi, Aledhari. Mohammed, Ayyash. Moussa. 2015. Internet of Things: A Survey on Enabling: Technologies, Protocols, and Applications IEEE Communication Surveys & Tutorials, Vol. 17, No. 4, Fourth Quarter 2015.

[7] Sheikh Raed. 2015. Internet of things: when the fridge marketing herself. Qafilah magazine, Dhahran, p 3, 64, May-June 2015,from: http://qafilah.com/ar/%D8%A5%D9%86%D8%AA%D8%B1%D9%86%D8%AA-%D8%A7%D9%84%D8%A3%D8%B4%D9%8A%D8%A7%D8%A1/

[8] Abu Bakr, Hisham. 2016. the Internet of things. Dammam: today's newspaper, issue 15644, Thursday 7/7/1437/April 14, 2016,from: http://www.alyaum.com/article/4131167.

[9] Fraihat, Haidar 2015. Internet of things. Division of technology For development in ESCWA. Publication on Wikipedia, from: https://ar.wikipedia.org/wiki/%D8%A5%D9%86%D8%AA%D8%B1%D9%86%D8%AA_%D8%A7%D9%84%D8%A3%D8%B4%D9%8A%D8%A7%D8%A1.

[10] AL Nasser, Nasser. 2014. What do you know about Internet things?. Technical world site. March 4, 2014, from: http://www.tech-wd.com/wd/2015/03/04/internet-of-things/.

[11] Hawkins, Don.(2016). The Internet of Things and Libraries: The Wednesday Evening Session March 11, 2016 in CIL2016.FROM: http://www.libconf.com/2016/03/11/internet-things-libraries-wednesday-evening-session/

[12] Joan K.2010. Mobile Reference: What Are the Questions? The Reference Librarian, vol. 51 (1) January –March, 2010, pp. 1-11Joan K. Lippincott Coalition for Networked Information. From http://old.cni.org/staff/joanpubs/mobile.RefLibn.final.pdf

[13] Rainie, L.2014. The Internet of Things And what it mean for librarians.Pew Research Center Internet Project Presented to: Internet Librarian ,October 28, 2014.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

The Impact of Social Media Adoption on Entrepreneurial Ecosystem

Bodor Almotairy,[1] Manal Abdullah*[2] and Rabeeh Abbasi[3]

[1]*Department of Information System at King Abdualaziz University, Jeddah, Saudi Arabia*
[2]*Department of Information System, King Abdualaziz University, Jeddah, Saudi Arabia*
[3]*Department of Computer Science, Quaid-i-Azam University, Islamabad, Pakistan*

ABSTRACT

Since entrepreneurial is important driving for economic growth, researchers should be helpful to develop greater strategic insight into innovation technology in this group. This paper is a content analysis that seeks to systematize the studies carried out on the use of social media in the entrepreneurial ecosystem. Twenty-four studies were reviewed using a synthesis-and-interpretation-based approach. The results of the content analysis reveal the effectiveness of social media in connecting the key actors in the entrepreneurial ecosystem such as such as partners, suppliers, universities, and resource providers in many aspects. The available literature suggests that social media-Twitter and Facebook-in particular-have been the most platforms used by entrepreneurs. Startups presence in social media more than established companies. Social media affects positively on startups' performance. The use of social media in the entrepreneurial ecosystem is affected by a number of variables, such as the organization culture, region, gender, age, and business environment. Moreover, most of the studies follow a quantitative approach, to measure frequency of the use of social media by SMEs. The relevance of this study lies in the fact that it illuminates future research as it identifies the research gaps in the use of social media as a communication channel between Small and Medium Enterprise SMEs and other stakeholders in the entrepreneurship ecosystem.

KEY WORDS: SOCIAL MEDIA, ENTREPRENEURSHIP ECOSYSTEM, STARTUPS, ENTREPRENEURS, TWITTER, FACEBOOK, LINKEDIN, SMES

ARTICLE INFORMATION:

*Corresponding Author: maaabdullah@kau.edu.sa
Received 3rd Nov, 2018
Accepted after revision 31st Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/8

INTRODUCTION

In the last few decades, new information and communication technologies have taken the world of entrepreneurship by storm. The market dynamics and the competitiveness of businesses-be they established companies or startups- have been challenged by the increasing power of the Internet and Internet-based social media. These new technologies have a significant impact on how entrepreneurs operate and how they interact with each other [1]. They provide new ways of firm-to-firm communication, information sharing and thus link companies to the different players in the ecosystem [1][2][3].

Social media is a set of "virtual communities" that allow users to sign up for a public profile and establish a network of relationships with people of same interests [4]. Advances in information technologies, such as the advent of Web 2.0 and the rise of social media applications (Facebook, LinkedIn, Twitter, Slack etc.) have revolutionized the communication landscape. People can now connect with their real-life friends or make new friends with whom they interact and exchange news. It is noteworthy; however, that social media have more to them than mere chatting and networking. Their impact on news, politics, economy and marketing should not be downplayed [5]. For instance, social media have modernized business management and strategic thinking, and they have introduced a new form of firm-to-firm and firm-to-ecosystem communications [6]. It is for this reason that social media are being hailed as great asset for individual entrepreneurs who are wary of entering the market [7]. They help attenuate uncertainty and give new businesses a good start-up [8]. Moreover, social media allow the entrepreneur to diversify their communication tactics, claim new customers and manage crises [5]. In today's competitive and complex business world, entrepreneurs need to be constantly present on social media to interact with their customers and communicate with the different stakeholders [9]. By increasing their presence on social media, entrepreneurs increase their crisis management skills.

The number of social media applications and platforms is increasing every day. To ensure their survival, these applications and websites work hard to offer unique features that make them stand out from the rest. Each of these applications seem to provide its users with different functions and uses. For example, Facebook is now considered as the largest online-based social network with 2.2 billion active users per month. Its uniqueness lies in the way it allows friends and family to connect and communicate easily. Other platforms, such as LinkedIn, choose to focus on professional matters to enrich the job market with growing individual experience [10]. However, Twitter seems to be the best platform for entrepreneurs due to its follow and share feature [7].

This paper is motivated by the scarcity of literature on the role of social media in the entrepreneurial ecosystem. This paper is a content analysis that seeks to systematize the studies carried out on the use of social media in the entrepreneurship ecosystem. It defines the entrepreneurial ecosystem in detail to establish the link between social media and the ecosystem. Then, it reviews and analyzes twenty-four studies carried out on the issue. Finally, it reports the latest findings and finding the gap in the literature, which will enlighten future researches.

To ensure relevance and replicability, this paper adopts a systemic approach. A systemic review reflects a satisfactory trustworthiness of the existing body of literature [11]. This approach has as its purpose to discover, summarize and analyze any relevant literature in the light of transparency and replicability [11].

The remaining parts of this paper are organized as follows: section 2 discusses the theoretical background. Then, Section 3 explains the methodology, which followed in this paper. Section 4 defines the entrepreneurial ecosystems based on previous studies. Finally, section 5 reviews and analyzes the studies carried out on the issue of using social media by entrepreneurial ecosystem stakeholders.

BACKGROUND

In this section, the research discusses the theoretical background that defines SMEs and its role in economic growth, the important of social media in the business world, and the relation between the entrepreneurs' success and their social relationship.

Small & Medium-Sized Enterprises (SMEs)

There is a significant variance in the way SMEs are defined. It seems that the notion of SME defies formal definitions [12]. Different criteria are used to define this type of business, such as the amount of economic activity, status within the country [13], capital assets, labor skills, level of turnover, legal status, method of production and type of activity [12]. Whatever the definition may be, it is evident in the literature that SMEs play an important role in the economy of any nation. These types of businesses have a high potential to generate job, provide jobs, increase export and bring innovations for Young. SMEs are a fertile ground to experiment with new forms of innovation in order to empower young entrepreneurs. This cannot be achieved unless a strong supply chain is created to improve competitive [13].

Social Media

Social media becomes essential for business [13]. Facebook and Twitter are considered the most used social

media [10]. However, Twitter seems to be the best platform for entrepreneurs due to its follow and share feature [7].

Twitter is a microblogging platform that offers an effective way for people to interact through the creation and sharing of tweets. Its effectiveness is enhanced by its 280-character limit that suits people who are looking for quick, precise and to the point information [7]. The character limit increases the speed and the frequency of tweets on a daily basis [14]. Moreover, Twitter allows its users to choose whom and what to follow and once following is done, the follower will automatically receive all updates of the followed user, including tweets, news and information. This feature makes the microblogging application an effective tool to disseminate information [15] and to enjoy transparency with little or no filtering of the content [16]. This accounts for the popularity of Twitter in the business world as communication platform between companies and their customers and between companies and the different stakeholders. In fact, a review of the biographical profiles of Twitter's most active members reveals that the majority of them introduce themselves as entrepreneurs [7].

Social media is, then, an asset in the hands of young entrepreneurs who seek to connect with their ecosystems. This research hypothesizes that social media have radically changed the entrepreneurial ecosystem, which is in line with the findings of many studies [8] [7]. Traditional forms of communication within the ecosystem were inefficient, which slackens economic growth and sustainability. The ineffectiveness of the ecosystem in the pre-social media era made it difficult for entrepreneurs to access and share information [1]. The idea of this research was born out of the intersection between social media and the business world. Given the effectiveness of social media (Twitter in particular) as a communication platform, startups should employ it to build and extend a large network of business relationships. The assumption behind this research is that Twitter can be effectively used to enhance firm-to-firm and firm-to-ecosystem interaction for SMEs.

Social Networks and Entrepreneurial Activities

The use of social network in entrepreneurial activities is growing in importance. There have been numerous studies on how social networks benefit entrepreneurial activities [17]. It has been found that social networks or social relationships help entrepreneurs to have access not only tangible resources, such as labor and capital [18], but also to intangible resources, including social support, information, reputation and risk-taking habits [18][19]. Moreover, social networks make it possible for entrepreneurs to create new business ideas [20], and enhance business performance [19]. Another way these networks can benefit business is by alleviating demand uncertainty and enlightening decision-making [21]. Access to venture capitalists is another key benefit provided by social networks as investors are more likely to be interested in business proposals by people in their networks [22]. Intangible resources, such as knowledge and experience through social networks are also key factors of the success of startups [23]. It can be argued, therefore, that having strong network connections is a prerequisite to success.

Analysis Methodology

This paper is a content analysis that seeks to systematize the studies carried out on the use of social media in the entrepreneurship ecosystem. The research consists of three sections. The first section defines the entrepreneurial ecosystems based on previous studies. This definition seeks to establish the link between social media and the ecosystem. The second section reviews and analyzes twenty-four studies carried out on the issue. This section aims at reporting the latest findings and finding the gap in the literature, which will enlighten future researches.

Understanding the Entrepreneurial Ecosystem

Entrepreneurship plays a vital role in the economic growth and stability of any nation. It is through entrepreneurship that the gaps and the shortcomings of the national economic systems are addressed. The launching of new businesses should aim at filling these gaps. However, entrepreneurship is not a unilateral process, as it is contingent on the environment in which the entrepreneur operates. For instance, the success of Silicon Valley is largely due to the systematic cooperation between venture investors, entrepreneurs, researchers, anchor companies and business supporters [24]. These key players make up what is referred to in the literature as the "entrepreneurial ecosystem" [25]. It is a socio-economic framework, with different actors who collaborate together to promote initiatives and entrepreneurship at the local level. However, what these actors really are has been a matter of variance among scholars.

There have been several attempts at defining and understanding the entrepreneurial ecosystem. The diversity of studies on the topic reflects two verities about the ecosystem. First, the entrepreneurial ecosystem is not a constant entity. It is a multifarious concept that adjusts to the socio-economic changes, which accounts for the addition of new factors in every new study. Second, the ecosystem is culture specific. The actors that affect entrepreneurship vary from one geographical region to another.

One of the first theories of the ecosystem as a systemic entity recognizes it as a complexity of actors (basically environmental) that determine the regional performance

of the ecosystem [26]. This conceptualization stresses the locality or the regionalism of the different factors and assigns a symmetrical role to each of the factors. Later attempts departed from the notion of a systemic entity to investigate what these actors really are. For example, a study carried in Washington D.C. in 2001 identified social capital, venture capital, support services of entrepreneurship, entrepreneurs and universities as active players in the entrepreneurial environment of the region [27]. The results of this study differ from another study done in Boulder, CO. The latter recognizes six factors in the ecosystem: spin-off firms, networks (both formal and informal), incubators, culture and physical infrastructure [28]. This concept of the ecosystem highlights the importance of the interaction between these six elements to create the entrepreneurial environment.

Over the last decade, interest in the entrepreneurial ecosystem takes a turn from identifying the different elements to highlighting their roles anchors for entrepreneurial innovations and activities. For instance, the World Economic Forum (2013) identifies 8 factors "accessible markets, human capital/workforce, funding and finance, support systems, government and regulatory system, education and training, universities, and cultural support". All of these elements intersect with a previous study carried out by Isenberg [29]. Theories of the ecosystem continue to develop in recent years. What is remarkable in recent years is the tendency in the literature to use categorical labeling to group those factors that are similar in nature. In 2014, the ecosystem was defined as the systemic collaboration of three major factors: 1. Entrepreneurial actors (both existing and potential), 2. Entrepreneurial corporations (firms, banks, venture investors) and 3. Institutions (universities, public agencies and financial institutions) [30]. The relevance of this categorization lies in the way it categorizes the factors into three types: entrepreneurship, and the type of support it can access either financial or in the form of research and planning. Another attempt at categorizing these actors appeared in the same year from The Center for Rural Entrepreneurship [31]. Within this study, the ecosystem is the sum of the five Cs: "Capital (financial resource), Capability (entrepreneur and owner skillset), Connection (resource and relationship network), Culture (the local communities' perception and support of entrepreneurship) and Climate (regulatory, economic development and policy environment)".

In 2017, another attempt at presenting the actors in the form of categories was published. Within this study, the ecosystem is introduced as a community made up of two levels: the system level and the socioeconomic contextual level [32]. This view focuses on the socioeconomic environment as a matrix for entrepreneurship. This implies that entrepreneurial activities are set by their socio-economic environment and that these activities vary across cultures. Similarly, the factors of the ecosystem can be grouped into three classes: cultural attributes (attitudes to entrepreneurship in a specific culture as told by the success stories), social attributes (support from investment capital, mentors and talents) and material attributes (tangible support from universities and policy makers) [33]. These three categories are equally important and mutually-contingent in their support of entrepreneurship. It is noteworthy, however, that no definition of the ecosystem can be exhaustive unless it recognizes culture-specific parameters [34]. The dynamics of entrepreneurial ecosystem vary from one country to another and largely depend on the organizational context and the level of economic development. What these studies have tried to do is identifying the different actors involved in the entrepreneurial ecosystem. However, the nature of the relationship between these elements still need to be investigated.

Focusing on the constituent elements of the ecosystem does not account for the internal relationships between them. Studying the different ways these elements interact with each other is a necessary step if we were to understand the dynamics of the ecosystem. Otherwise, how can such disparate elements as social capital and networks be reconciled? The past 5 years have been characterized by two tendencies in the research on the ecosystem. The first tendency was-as discussed above-to classify these elements into big generic categories. The second tendency is a remarkable shift from an "element-based approach" to a "connection-based approach" [35]. A system-based approach has significant implication not only for pioneering entrepreneurs, but also for policymakers. It provides them with an exhaustive view of how the performance of a business is mediated by a bunch of economic activity [36]. One way of studying the dynamics of the ecosystem is by looking at spin-off from the prism of a local anchor company, like "entrepreneurial recycling" [37]. In 2018, there was an attempt to account for the social connectivity among entrepreneurs. The connection that this study established were long-term and region-based [38]. The shortcoming of these connections is that they do not explain the day-to-day activities of entrepreneurs. Measuring daily activities is a prerequisite to understand how the different stakeholders interact with each other. What entrepreneurs are keen to get is state of the art information to help them cope with the volatile nature of the market and technological innovations.

Social Media and Entrepreneurial Ecosystem

Applying the systemic review, this revealed table1, which summarizes the findings of twenty-four studies on the use of social media as communication tool

between the entrepreneurs, startups, and SMEs and the different stakeholders in the ecosystem. Special focus has been laid on startups and SMEs. A synthetical discussion sections follows the review. The attributes of the table are: the purpose of the study, the stakeholders and social media sites that targeted by the study, the sample size, the method that used to analysis the samples, and finally the relevant findings.

Social Media Platforms and Entrepreneurship

Twitter and Facebook are the most popular social networks used by entrepreneurs. Their popularity in the entrepreneurial ecosystem can be easily ascribed to their popularity as social networks [39]. Accordingly, using these two social networks helps young entrepreneurs to maximize their presence in the ecosystem and to reach new potential customers and business partners. SMEs seem to be more active and present on social network than big companies [40]. The presence of the CEOs of big established companies on Twitter and Facebook is insignificant [40][39]. Moreover, entrepreneurs have employed different social media platforms for diverse reasons.

The Drivers of Social Media Adoption.

There are a few differences in the way social media is used in SMEs. The choice of one social platform over the other is determined by the type of services the platform provides [41]. However, there are other factors that influence the choice of a platform, such as the geographical location, organizational and environmental constructs of SMEs [13], gender and age [42], technological and organizational [43].

The studies have revealed that the discourse of the entrepreneurs is also different across cultures [44]. For example, the discourse of African entrepreneurs seems to be loaded with negative emotions, while that of the entrepreneurs from the developing economies is more positively loaded.

The Motivations and Benefits for Entrepreneurs to Use Social Media

Entrepreneurs use social media for different reasons, such as mobilizing financial resources, [45][46], connecting with potential investors in an attempt to get funding [47][48][49][50], connecting with other startups [49]. Another use of social media was to consult with advisors for knowledge creation, [51], the process of innovation [40][43][52] and innovation capabilities [53], which allows them to find more opportunities [54]. Moreover, novice entrepreneurs and CEOs of established companies seem to be looking for different things via social media: the former would search for any type of support from any source, while the latter is more interested in knowledge and experience [40][39][55].

Entrepreneurship Activities Analysis Techniques in Social Media Networks

According to the literature available, there are six techniques to analyze activities on social media:

- Social Network Analysis (SNA) Techniques.
- Natural language processing Techniques.
- Grounded Theory Approaches
- Statistical Techniques.
- Case Studies Approaches.
- Hand Labeled Classification.

Social Network Analysis (SNA) Techniques

SNA is a sophisticated field that joins statistics, social psychology, sociology, and graph theory. It is beneficial in extracting insights from networks and consequently solving problems [56]. As to entrepreneurship on Twitter, SNA was used to analyze the interaction between startups and organizations of support in developing countries. The authors used community detection algorithms and measures of density to understand the interconnectedness of network, and Betweenness centrality and degree centrality to recognize the role of a specific actor in the network [1]. SNA-based metrics are also used to analyze the data gathered around Twitter hashtags, understanding the active factors and stakeholders in the innovation startup ecosystem [3].

To understand and identify the factors that drive crowdfunding, community detection algorithms were employed to cluster companies according to investors [47]. Another use of SNA was to reveal where entrepreneurs take information [40].

Natural language processing Technique

Natural language processing (NLP) is part of artificial intelligence (AI). NLP can understand and decode human language [57]. In the study context, NLP was used to analyze the speeches of Entrepreneurs on social media [44].

Grounded Theory Approaches

Grounded Theory is a research method that enables researchers to categorize and integrate the concerns of the population and produce it as theory. Simply put, the grounded theory provides researchers with guidelines to recognize categories and set relations between them. Thus, Grounded theory gives framework to explain the phenomenon under study [58]. In the current literature, the Grounded theory was used to Study the effect of social media on business leadership [9], and to study

how social media is used by opportunity-based entrepreneurs to meet their resource challenges [53].

Statistics Approaches

Statistical methods are mathematical techniques, models, and formulas. Statistical methods are used to collect, organize, analyze, and interpret the raw research data [59]. Two statistical methods are employed in the previous literatures to analysis the data; they are inferential statistics descriptive statistics. Descriptive statistics provide information that represent the data in a particular manner. Inferential statistics, on the other hand, uses samples of data to inferences and make generalizations on the populations of these samples [59].

Descriptive statistics

Descriptive statistics are used to describe a correlation between social networks in startups and their financial performance [50], the effectiveness of online social media among entrepreneurs in the Arab Gulf [60], to demonstrate that there are correlations between the UK startups' activity in Twitter and the amount of invested they get [48], to measure the effectiveness of online social media among entrepreneurs in the Arab Gulf [60], to analyze the presence of CEOs on SNS, and their use of Twitter as a communication tool [39]. Identifying the motivations, benefits and intentions for entrepreneurs to use online social media [42].

Several studies used Partial Least Squares method (PLS) to describe entrepreneurships' phenomena. PLS uses latent variables to estimate complex relationship of cause-effect models. PLS is getting popular in management and entrepreneurship research [54].

As to entrepreneurship in social media, PLS was used to investigate the relation between environmental, organizational, and technology context and the adoption of social media by SMEs [13]. It was also used to discover whether the employees' sharing knowledge through social media affects the relationship between innovation performance and human resource practice [43].

Another use of PLS was to Study the relationship between social networks, innovation & performance, and absorptive capacity [52], and to Identify the factors of the two stages of the business-creation process: opportunity discovery and creation [54].

Structural Equation Modeling (SEM) is another statistical description methods used to analyze structured relationships between latent constructs and measured variables [61]. For example, SME was used by [62] to study the relation between companies' usage of the social media in their innovation process and their long-run performance.

Inferential statistics

Ordinary Least Squares (OLS) is one of the of linear regression methods, it uses samples of data to infer and generalize on the populations. OLS estimates the obscure parameters in a linear regression model by reducing the sum of squared errors between variable being predictor's values and the values predicted by the linear function [63]. Ordinary Least Squares (OLS) were employed to study the relationship between social media use and venture capital financing [49] , and to study the impact of social media on knowledge creation process in SMEs [51].

Case Studies Approaches

Case studies are in-depth investigations on individual, groups, events or communities. In case studies, the researchers gather the data from diverse sources and use various methods such as interviews and observations [64]. Some studies observed entrepreneurs' behaviors in social media [55]. They applied a case study in *communities of practice* (COPs) to identify how entrepreneurs express themselves and engage in conversations. Another case study of entrepreneurship activities in social media interviewed and studied in detail how SMEs in North America perceive Social media [65] .

Hand Labeled Classification.

Some of authors of previous literature labeled the data manually to investigate impact of social media on emerging existing entrepreneurial firms, B2B relationship through resource mobilization [2], and to Investigate the dialogic communication between stakeholders [66].

DISCUSSION

Social media is a good way for entrepreneurs to interact with the other stakeholders in the ecosystem, such as partners, suppliers, universities, and resource providers [1] [2] [66] [3]. Social media as connection tool, can also allow entreprneurs to reach out to acutal or potential customers for feedback and inquiries [60][65]. It is remarkable also that startups are more active on Twitter than established companies, which will have a positive effect on their performance in the long run [62]. This is all the more so given the fact that social media positively affect the entrpreneurual leadership both intra-orgnaizational and inter-organizational [9]. What seems to be evident, however, is the effectiveness of social media in connecting the key actors in the entrepreneurial ecosystem in many aspects. This can range from crowdsourcing, to crowdfunding, to marketing. Accordingly, communication channels between SMEs and the whole ecosystems have to be in place. However, researches on this topic

Table 1. Comparison between studies of entrepreneurship activities in social media

Study	Study Purpose	Target	Social media	Sample Size	Method	Relevant Findings
[1]	Content analysis of interaction between startups and organizations of support in developing countries.	Support Organizations & startups	Twitter	3200 tweets	SNA techniques	• There is interaction between startups and support organizations as per their technology profile, business model and region. • The profile of the startup determines the interaction behavior.
[47]	Identifying the factors that drive crowdfunding.	Startups	AngelList, Twitter, Facebook, and CrunchBase	744,036 AngelList, 10,156 CrunchBase, 37,761 Facebook and 70,563 Twitter companies' profiles	SNA techniques using Spark	There is a positive correlation between social media engagement and the company's success to raise funds. When companies have no social media accounts its likelihood to raise fund is only 0.04%. if it uses Facebook it is 12.2 % and Twitter 10.2%.
[3]	Understanding the active factors and stakeholders in the innovation startup ecosystem	The Entrepreneurial Ecosystem	Twitter	An ongoing project in 33 European Countries. 200,000 tweets and 1,792 stakeholders	SNA techniques	Social media allows us to see the regional differences in startup and innovation ecosystem. Twitter has attracted the same stakeholders with an average of 88%. The remaining 12% were drawn otherwise.
[13]	Understanding why SMEs use social media	SMEs	Twitter	questionnaires in 144 SMEs	Partial least squares	The decision to adopt social media by SMEs is determined more by the organization and the environment constructs than by technology.
[50]	Establishing a correlation between social networks in startups and their financial performance	Startups' Founders	Linked In	227 founders' accounts	statistics	• LinkedIn Founder Profiles are positively correlated with success. • The number of LinkedIn followers indicates the rate of fundraising by the company.
[55]	How do entrepreneurs use CoPs to express themselves?	Entrepreneurs	Young Entrepreneur.com	Observations	Case Studies	Entrepreneurs use CoPs in a story-telling way, while the domain expert has little command on the discussion.
[42]	Identifying the motivations, benefits and intentions for entrepreneurs to use online social media.	Entrepreneurs	Twitter	368 Turkish firms analyzing 8000	statistics	Turkish young male entrepreneurs are aware of the benefits they can get from online social media.

	[2]	The impact of social media on emerging existing entrepreneurial firms, B2B relationship through resource mobilization.	Firms	Facebook and Twitter	Facebook / Twitter posts, then Interviews with 8 firms to understand the data	Hand labeled classification	Facebook and Twitter increase the firms' network engagement, information sharing, collaboration, reconfiguration processes, operations and coordination.
	[54]	Identifying the factors of two stages of the business-creation process: opportunity discovery and creation	Entrepreneurs and CEOs	General	questionnaires in 177 Entrepreneurs and CEOs	Partial least squares	• The use of social media decreases the negative effects of prior knowledge • Information got from social media may intervene with the finding of business opportunity as per previous knowledge and experience. • Social media can disrupt business planning and model built upon the entrepreneur's previous knowledge and experience.
	[43]	Identifying the factors affecting online knowledge sharing on the performance of SMEs.	Manufacturing SMEs	General	questionnaire in 1291 participation	Partial least squares	• Social online knowledge sharing is mainly driven by technological and organizational factors. • This sharing mediated between HR and innovation practice.
	[66]	Investigating the dialogic communication between stakeholders.	All stakeholders	Twitter	93 accounts and 930 tweets posted by them	Hand labeled classification	61 % of organizations use Twitter dialogically to conserve their visitors compared to 39 % who have no dialogic orientation.
	[40]	Who do entrepreneurs get inspiration from in terms of information?	Entrepreneurs	Twitter	74 active Entrepreneurs' accounts with of 18,928 followers	SNA-based metric to interrupt the network.	• Entrepreneurs rely more on local sources for information. • In their early stages, entrepreneurs follow Twitter accounts from various sources. • At an advanced stage, entrepreneurs rely on sources that focus on entrepreneurship. • Entrepreneurship-focused sources are more popular among entrepreneurs.
	[48]	Investigating the use of Twitter by Startups in EU	Startups' Founders	Twitter	15,192 Twitter's Accounts	Statistics	There is a positive correlation between the use of Twitter in EU startups and the amount invested in the country per capita.
	[62]	Studying the way social media technologies (SMT) improve the proficiency of firms and redefine business resources.	Firms	General	Questionnaires on 201 technological firms	Structural Equation Modeling	The more a company uses the potential of connectivity and innovation of social media in its innovation process, the better its performance in the long-run.
	[51]	Studying the impact of social media on knowledge creation process in SMEs.	SMEs	General	A questionnaire in 96 SMEs.	Ordinary Least Squares (OLS)	Social media favors the innovation process by influencing three of the four knowledge creation processes.

[60]	Measuring the effectiveness of online social media among entrepreneurs in the Arab Gulf	Entrepreneurs	Facebook	questionnaires in 50 entrepreneurs	Statistics	• 87 % of the participants think that their Facebook profiles were helpful. • 98 % of the participants believe that social websites help entrepreneurs.
[44]	Analyzing the speeches of Entrepreneurs on social media	Entrepreneurs	Twitter	219 M posts, authored by 135K entrepreneurs of 65 countries	Natural language processing	• African entrepreneurs display more negative emotions than the rest of the population. • Entrepreneurs from developed economies display more positive emotions than their counterparts in the developed world.
[52]	Studying the relationship between social networks, innovation & performance, and absorptive capacity.	SMEs	Twitter	A Questionnaire in 215 SMEs.	Partial least squares	There is positive correlation between social networks, innovation & performance, and absorptive capacity.
[53]	Studying how social media is used by opportunity-based entrepreneurs to meet their resource challenge.	Entrepreneurs	General	Interviews in 19 entrepreneurs	Grounded theory coding	Entrepreneurs use social media to create new types of capabilities and to maximize efficiency by using social networks to solve their resource limits. • Social media has a positive impact on entrepreneurial leadership.
[9]	Studying the effect of social media on business leadership	Entrepreneurs	General	An interview with 7 entrepreneurs.	Grounded theory coding	• Social media helps the company to manage its internal tasks and communication. • Social media is a database of human capital that helps build a network with other entrepreneurial leaders in the ecosystem.
[39]	Analyzing the presence of CEOs on SNS, and their use of Twitter as a communication tool.	CEOs	General	14,153 tweets	Statistics	• Only 25% are present, LinkedIn is by far the most elected SNS by CEOs. • Only 25% of those present on SNS are using their Twitter accounts.
[65]	Studying the use of social media by SMEs in North America.	SMEs	General	An Interviews in 12 SMEs	Case Studies	• Facebook is the most widely used platform. • The social media are used to claim new customers
[49]	Studying the relationship between social media use and venture capital financing	Startups	Twitter	2,880 startups twitter account	Ordinary Least Squares (OLS)	• The Presence of startups in social media has a positive effect on their funding outcome. • Social media facilitates the entrepreneurial financing strategy by luring investors.

is still in its infancy. While the studies reviewed in this paper have managed to establish correlations between social media and the ecosystem, their work is largely quantitative. What still needs to be studied is the potential of Twitter to create an interactive entrepreneurial ecosystem.

CONCLUSION

This paper is motivated by the scarcity of literature on the role of social media in the entrepreneurial ecosystem. Through a systemic approach, the paper has demonstrated that -so far- research has focused on determining the different actors in the ecosystems and on demonstrating the effective use of social media in the ecosystem. Empirical evidence on the use of social media in the ecosystem is relatively scarce. What has been understood is the role of Twitter to create an interactive entrepreneurial ecosystem. Further research is needed to explore the perspective of each stakeholder in the ecosystem to use the social network, especially in identifying the obstacles and barriers that hamper them. Moreover, most of the studies reviewed in this paper made a quantitative approach, focusing on the frequency of the use of Twitter by SMEs. The effects and the motivations behind using Twitter in the ecosystem are better grasped when approached qualitatively.

REFERENCES

[1] E. Park, D. S. Hain, and R. Jurowetzki, "Entrepreneurial Ecosystem for Technology Start-ups in Nairobi: Empirical analysis of Twitter networks of Start-ups and Support organizations," in the 17th DRUID Summer Conference, 2017.

[2] C. Drummond, H. McGrath, and T. O'Toole, "The impact of social media on resource mobilisation in entrepreneurial firms," Manag. Ind. Mark., 2018.

[3] O. Mohout, "The power of Twitter: Building an innovation radar using social media," in The International Society for Professional Innovation Management (ISPIM) 2015.

[4] D. Kuss, M. Griffiths, D. J. Kuss, and M. D. Griffiths, "Social Networking Sites and Addiction: Ten Lessons Learned," Int. J. Environ. Res. Public Health, vol. 14, no. 3, p. 311, Mar. 2017.

[5] D. Gruber, R. Smerek, M. Thomas-Hunt, and E. J. Horizons, "The real-time power of Twitter: Crisis management and leadership in an age of social media," Bus. Horiz., vol. 58, no. 2, pp. 163–172, 2015.

[6] J. Kietzmann, K. Hermkens, I. McCarthy, and B. Silvestre, "Social media? Get serious! Understanding the functional building blocks of social media," Bus. Horiz., vol. 54, no. 3, pp. 241–251, 2011.

[7] E. & R. Fischer, "Online entrepreneurial communication: Mitigating uncertainty and increasing differentiation via Twitter," J. Bus. Ventur., vol. 26, no. 1, pp. 1–18, 2011.

[8] E. Fischer and R. Rebecca, "Online entrepreneurial communication: Mitigating uncertainty and increasing differentiation via Twitter," J. Bus. Ventur., vol. 29, no. 4, pp. 565–583, Jul. 2014.

[9] C. Johan and P. Gratell, "How does social media affect entrepreneurial leadership A qualitative study on entrepreneur's perceptions regarding social media as a tool for entrepreneurial leadership," Mass Commun. Journal., 2018.

[10] J. Van Dijck, "'You have one identity': performing the self on Facebook and LinkedIn," Media Cult. Soc., vol. 53, no. 2, pp. 199–215, 2013.

[11] M. Petticrew and H. Roberts, "Systematic reviews - Do they 'work' in informing decision-making around health inequalities?," Heal. Econ. Policy Law, vol. 3, no. 2, pp. 197–211, 2008.

[12] A. M. B. Cheng, Wei-Hin, Kadzrina Abdul Kadir, "The strategic planning of SMEs in Malaysia: a view of external environmental scanning," Int. J. Bus. Soc., vol. 15, no. 3, p. 437, 2014.

[13] A. AlSharji, S. Ahmad, and A. Abu Bakar, "Understanding social media adoption in SMEs: Empirical evidence from the United Arab Emirates," J. Entrep. Emerg. Econ., 2018.

[14] A. Java, X. Song, T. Finin, and T. B, "Why we twitter: understanding microblogging usage and communities 9th", Web KDD 1st SNA-KDD 2007 Work. Web Min. Soc. Netw. Anal., 2007.

[15] I. Hidayanti, L. E. Herman, and N. Farida, "Engaging Customers through Social Media to Improve Industrial Product Development: The Role of Customer Co-Creation Value," J. Relatsh. Mark., vol. 17, no. 1, pp. 17–28, Jan. 2018.

[16] K. R. S. and S. Lakshmi, "Social media as a tool for brand building in the automobile industry," TRANS Asian J. Mark. Manag. Res., vol. 18, p. 19, 2017.

[17] S. Lippmann and H. E. Aldrich, "A Rolling Stone Gathers Momentum: Generational Units, Collective Memory, and Entrepreneurship," Acad. Manag. Rev., vol. 41, no. 4, pp. 658–675, Oct. 2016.

[18] T. B. Venturing, "Financing small business creation: The case of Chinese and Korean immigrant entrepreneurs," - J. Bus., 1997.

[19] P. Witt, A. Schroeter, and C. Merz, "Entrepreneurial resource acquisition via personal networks: an empirical study of German start-ups," Serv. Ind. J., vol. 28, no. 7, pp. 953–971, Sep. 2008.

[20] R. Singh, G. Hills, M. Wellesley, and R. Hybels, "Opportunity recognition through social network characteristics of entrepreneurs," Babson Coll., 1999.

[21] E. Autio, L. Dahlander, and L. Frederiksen, "Information Exposure, Opportunity Evaluation, and Entrepreneurial Action: An Investigation of an Online User Commu-

nity," Acad. Manag. J., vol. 56, no. 5, pp. 1348–1371, Oct. 2013.

[22] V. Fried and Management, "Toward a model of venture capital investment decision making," RD Hisrich - Financ., 1994.

[23] J. Roure and M. Maidique, "Linking prefunding factors and high-technology venture success: An exploratory study," J. Bus., 1986.

[24] Anna Lee Saxenian, Culture and Competition in Silicon Valley and Route. 1994.

[25] H. V. de V.-J. of B. Venturing, "The development of an infrastructure for entrepreneurship," Elsevier**,** 1993.

[26] O. R. Spilling, "The entrepreneurial system: On entrepreneurship in the context of a mega-event," academia.edu, 1669.

[27] M. Change, "The entrepreneurial event revisited: firm formation in a regional context," Feldman Ind. Corp., 2001.

[28] H. M. Neck, G. D. Meyer, B. Cohen, and A. C. Corbett, "An Entrepreneurial System View of New Venture Creation," J. Small Bus. Manag., vol. 42, no. 2, pp. 190–208, Apr. 2004.

[29] Isenberg, "How to start an entrepreneurial revolution," institute.coop, 2010.

[30] B. Colin Mason and R. Brown, "Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship," 2014.

[31] M. S. Wortman, "Rural entrepreneurship research: An integration into the entrepreneurship field," Agribusiness, vol. 6, no. 4, pp. 329–344, Jul. 1990.

[32] D. B. Audretsch and M. Belitski, "Entrepreneurial ecosystems in cities: establishing the framework conditions," J. Technol. Transf., vol. 42, no. 5, pp. 1030–1051, Oct. 2017.

[33] B. Spigel, "The Relational Organization of Entrepreneurial Ecosystems," Entrep. Theory Pract., vol. 41, no. 1, pp. 49–72, Jan. 2017.

[34] Z. J. Acs, S. Desai, and J. Hessels, "Entrepreneurship, economic development and institutions," Small Bus. Econ., vol. 31, no. 3, pp. 219–234, Oct. 2008.

[35] D. Breznitz and M. Taylor, "The communal roots of entrepreneurial–technological growth – social fragmentation and stagnation: reflection on Atlanta's technology cluster," Entrep. Reg. Dev., vol. 26, no. 3– 4, pp. 375–396, Mar. 2014.

[36] B. Feld, "Startup communities: Building an entrepreneurial ecosystem in your city," John Wiley Sons, 2012.

[37] C. M. Mason and R. T. Harrison, "After the exit: Acquisitions, entrepreneurial recycling and regional economic development," Reg. Stud., vol. 40, no. 1, pp. 55–73, Feb. 2006.

[38] X. Neumeyer and S. C. Santos, "Sustainable business models, venture typologies, and entrepreneurial ecosystems: A social network perspective," Clean. Prod., vol. 172, pp. 4565–4579, Jan. 2018.

[39] P. Capriotti and R. Laura, "How CEOs use Twitter: A comparative analysis of Global and Latin American companies," nternational J. Inf. Manag., vol. 39, pp. 242–248, 2018.

[40] Y. Motoyama, S. Goetz, and Y. Han, "Where do entrepreneurs get information? An analysis of twitter-following patterns," Small Bus. Entrep., vol. 30, no. 3, pp. 253–274, 2018.

[41] J. Journalism, "The Influence of Social Media Platforms for Startups," J. Mass Commun. Journal., vol. 05, no. 06, 2015.

[42] M. Turan and A. Kara, "Online social media usage behavior of entrepreneurs in an emerging market," J. Res. Mark. Entrep., 2018.

[43] P. Soto-Acosta, S. Popa, and D. Palacios-Marqués, "Social web knowledge sharing and innovation performance in knowledge-intensive manufacturing SMEs," J. Technol. Transf., vol. 42, no. 2, pp. 425–440, Apr. 2017.

[44] L. Kuffo, C. Vaca, E. Izquierdo, and J. C. Bustamante, "Mining Worldwide Entrepreneurs Psycholinguistic Dimensions from Twitter," in 2018 International Conference on eDemocracy & eGovernment (ICEDEG), 2018, pp. 179–186.

[45] S. Shane, "The Importance of Angel Investing in Financing the Growth of Entrepreneurial Ventures," Q. J. Financ., vol. 02, no. 02, p. 1250009, Jun. 2012.

[46] J. T. Eckhardt, S. Shane, and F. Delmar, "Multistage Selection and the Financing of New Ventures," Manage. Sci., vol. 52, no. 2, pp. 220–232, Feb. 2006.

[47] M. Cheng, A. Sriramulu, S. Muralidhar, B. T. Loo, L. Huang, and P.-L. Loh, "Collection, exploration and analysis of crowdfunding social networks," in Proceedings of the Third International Workshop on Exploratory Search in Databases and the Web - Explore DB '16, 2016, pp. 25–30.

[48] S. Lugovic and W. Ahmed, "An Analysis of Twitter Usage Among Startups in Europe," pp. 299–308, 2015.

[49] F. Jin, A. Wu, and L. Hitt, "Social Is the New Financial: How Startup Social Media Activity Influen Funding Outcomes," Acad. Manag. Proceedings., p. 13329, 2017.

[50] D. Banerji and T. Reimer, "Startup founders and their LinkedIn connections: Are well-connected entrepreneurs more successful?," Comput. Human Behav., 2019.

[51] A. Papa, G. Santoro, L. Tirabeni, and F. Monge, "Social media as tool for facilitating knowledge creation and innovation in small and medium enterprises," Balt. J. Manag., vol. 13, no. 3, pp. 329–344, Jul. 2018.

[52] V. Scuotto, M. Del Giudice, and E. G. Carayannis, "The effect of social networking sites and absorptive capacity on SMES' innovation performance," Technol. Transf., vol. 42, no. 2, pp. 409–424, 2017.

[53] C. Riverola and F. M. On, "Entrepreneurs' Bricolage and Social Media," in 2018 IEEE International Conference, 2018.

[54] J. Park, C. Sung, I. Im, J. Y. Park, C. S. Sung, and I. Im, "Does Social Media Use Influence Entrepreneurial Opportunity? A Review of its Moderating Role," Sustainability, vol. 9, no. 9, p. 1593, Sep. 2017.

[55] K. Hafeez, P. Foroudi, B. Nguyen, S. Gupta, and F. Alghatas, "How do entrepreneurs learn and engage in an online community-of-practice? A case study approach," Behav. Inf. Technol., vol. 37, no. 7, pp. 714–735, 2018.

[56] S. De and S. Dehuri, "Machine Learning for Social Network Analysis: A Systematic Literature Review.," IUP J. Inf. Technol., vol. 8, no. 4, 2012.

[57] E. Cambria and B. White, "Jumping NLP Curves: A Review of Natural Language Processing Research [Review Article]," IEEE Comput. Intell. Mag., vol. 9, no. 2, pp. 48–57, May 2014.

[58] "Grounded theory methodology Learning objectives."

[59] L. Bain, Statistical analysis of reliability and life-testing models: theory and methods. Routledge, 2017.

[60] Joel Indrupati and Tara Henari, "Entrepreneurial success, using online social networking: evaluation," ducation, Bus. Soc., vol. 5, no. 1, pp. 47–62, 2012.

[61] D. J. Francis, "An introduction to structural equation models," J. Clin. Exp. Neuropsychol., vol. 10, no. 5, pp. 623–639, Oct. 1988.

[62] V. J. Garcia-Morales, R. Martín-Rojas, and M. E. Lardón-López, "Influence of social media technologies on organizational performance through knowledge and innovation," Balt. J. Manag., vol. 13, no. 3, pp. 345– 367, Jul. 2018.

[63] D. Cochrane and G. H. Orcutt, "Application of Least Squares Regression to Relationships Containing Auto-Correlated Error Terms," J. Am. Stat. Assoc., vol. 44, no. 245, pp. 32–61, Mar. 1949.

[64] B. MEYER, Researching Translation and Interpreting. Routledge, 2015.

[65] A. Roy, C. Dionne, M. Carson, L. Maxwell, and O. Sosa, "How Small and Medium-Sized Enterprises Perceived and Used Social Media.," in In ECSM 2017 4th European Conference on Social Media, 2017.

[66] S. Rybalko and T. Review, "Dialogic communication in 140 characters or less: How Fortune 500 companies engage stakeholders using Twitter," Public relations Rev., vol. 36, no. 4, pp. 336–341, 2010.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Towards Developing An Advanced Methodology For Image Enhancement Based On Z-Transform

Mona Abd El-Kareem[1] and Ibrahiem M. M. El-Emary[2]

[1]*Management Information System and Computer Science Department, Future Academy, Cairo-Egypt*
[2]*Information Technology Deanship King Abdulaziz University Jeddah, Kingdom of Saudi Arabia*

ABSTRACT

The objective of the current thesis is to find the best filter of the digital image in a fast way. Image restoration concerns the removal or reduction of degradations which have occurred during the acquisition of the image. Such degradations may include noise, which are errors in the pixel values position, or optical effects such as out of focus blurring, or blurring due to camera motion. We shall see that some restoration techniques can be performed very successfully using neighborhood operations, while others require the use of frequency domain processes. Image restoration remains one of the most important areas of image processing. All kinds of filters have been tested to select the one that gives the best filtered image quality. It looks from the image results that the average filter is better for removing the noise then median filter and the last wiener filter.

KEY WORDS: TRANSFORM, SALT AND PEPPER NOISE, GAUSSIAN NOISE, MEAN FILTER, MEDIAN FILTER

INTRODUCTION

All kinds of filters have been tested to select the one that gives the best filtered image quality. The z-transform is useful for the manipulation of discrete data sequences and has acquired a new significance in the formulation and analysis of discrete-time systems. It is used extensively today in the areas of applied mathematics, digital signal processing, control theory, population science, and economics. These discrete models are solved with difference equations in a manner that is analogous to solving continuous models with differential equations [7]. System analysis in frequency domain can also be more convenient as differentiation and integration operations are performed through multiplication and division by the frequency variable respectively. Furthermore the

ARTICLE INFORMATION:

**Corresponding Authors: Mona.abdelkareem@fa-hists.edu.eg, omary57@hotmail.com*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/9

transient and the steady state characteristics of a system can be predicted by analyzing the roots of the Laplace transform or the z-transform, the so-called poles and zeros of a system. A special feature of the z-transform is that for the signals and system of interest to us , all of the analysis will be in terms of ratios of polynomial. Working with these polynomials is relatively straight forward. Digital filtering is a widely used technique that is common in many fields of science and engineering. [10] Filters remove unwanted signals and noise from a desired signal. There are many different kinds of filters, including mean, median and wiener filters.

Aspects of Image Processing

Modern digital technology has made it possible to manipulate multi-dimensional signals with systems that range from simple digital circuits to advanced parallel computers. The goal of this manipulation can be divided into three categories:

- Image Processing (image in -> image out)
- Image Analysis (image in -> measurements out)
- Image Understanding (image in -> high-level description out)

An image may be considered to contain sub-images sometimes referred to as regions-of-interest, ROIs, or simply regions. This concept reflects the fact that images frequently contain collections of objects each of which can be the basis for a region. In a sophisticated image processing system it should be possible to apply specific image processing operations to selected regions. Thus one part of an image (region) might be processed to suppress motion blur while another part might be processed to improve color rendition. Sequence of image processing:

Most usually, image processing systems require that the images be available in digitized form, that is, arrays of finite length binary words. For digitization, the given Image is sampled on a discrete grid and each sample or pixel is quantized using a finite number of bits. The digitized image is processed by a computer. To display a digital image, it is first converted into analog signal, which is scanned onto a display.

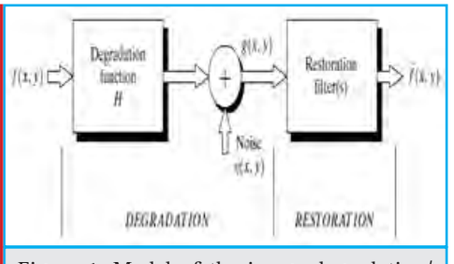


Figure 1. Model of the image degradation/ restoration process

Before going to processing an image, it is converted into a digital form. Digitization includes sampling of image and quantization of sampled values. After converting the image into bit information, processing is performed. This processing technique may be Image enhancement, Image restoration, and Image compression.38

Image Enhancement:

It refers to accentuation, or sharpening, of image features such as boundaries, or contrast to make a graphic display more useful for display & analysis. This process does not increase the inherent information content in data. It includes gray level & contrast manipulation, noise reduction, edge crispening and sharpening, filtering, interpolation and magnification, pseudo coloring, and so on.

Image Restoration:

It is concerned with filtering the observed image to minimize the effect of degradations. Effectiveness of image restoration depends on the extent and accuracy of the knowledge of degradation process as well as on filter design. Image restoration differs from image enhancement in that the latter is concerned with more extraction or accentuation of image features.

Image Compression:

It is concerned with minimizing the number of bits required to represent an image. Application of compression are in broadcast TV, remote sensing via satellite, military communication via aircraft, radar, teleconferencing, facsimile transmission, for educational & business documents, medical images that arise in computer tomography, magnetic resonance imaging and digital radiology, motion, pictures, satellite images, weather maps, geological surveys and so on.

Model of Image Degradation

In the spatial domain, we might have an image $f(x,y)$ and a spatial filter $h(x,y)$ for which convolution with the image results in some form of degradation. For example, if $h(x,y)$ consists of a single line of ones, the result of the convolution will be a motion blur in the direction of the line [8].

Thus we may write $g(x,y) = f(x,y) * h(x,y)$ for the degraded image, where the symbol * represents spatial filtering. However, this is not all. We must consider noise, which can be modeled as an additive function to the convolution. Thus if $n(x,y)$ represents random errors which may occur, we have as our degraded image:

$$g(x, y) = f(x, y) * h(x, y) + n(x, y)$$

We can perform the same operations in the frequency domain, where convolution is replaced by multiplication, and addition remains as addition, because of the linearity of the Fourier transform.

Thus $G(i,j) = F(i,j)\ H(i,j) + N(i,j)$ represents general image degradation, where of course *F, H* and *N* are the Fourier transforms of *f, h* and *n* respectively.

If we knew the values of *H* and *N* we could recover *F* by writing the above equation as

$$F(i, j) = (G(i, j) - N(i, j)\ / H(i, j)\cdot$$

However, as we shall see, this approach may not be practical. Even though we may have some statistical information about the noise, we will not know the value of $n(x,y)$ or $N(i,j)$ for all, or even any, values. As well, dividing by $H(i,j)$ will cause difficulties if there are values which are close to, or equal to, zero,(see the figure below).

Z-Transform

The structure and features of the given signal may be better understood by transforming the data into another domain. In general the Z-transform of any function written explicitly can be found for a set of frequencies in a certain domain at our choice. Applying any of the filters, we use the Z-transform for specified intervals. Then we take the inverse Z-transform to get the required filtered image. The results are promising and make you think of using different filters or different transform. We set the z-transform at some specified frequencies, which are connected the grid distance used in the image display. [2] System analysis in frequency domain can also be more convenient as differentiation and integration operations are performed through multiplication and division by the frequency variable respectively. [11] Furthermore the transient and the steady state characteristics of a system can be predicted by analyzing the roots of the Laplace transform or the z-transform, the so-called poles and zeros of a system. A special feature of the z-transform is that for the signals and system of interest to us. all of the analysis will be in terms of ratios of polynomial. Working with these polynomials is relatively straight forward. [9]

Noise in Digital Images

Digital images are prone to a variety of types of noise. Noise is the result of errors in the image acquisition process that result in pixel values that do not reflect the true intensities of the real scene. There are several ways that noise can be introduced into an image, depending on how the image is created. For example:

- If the image is scanned from a photograph made on film, the film grain is a source of noise. Noise can also be the result of damage to the film, or be introduced by the scanner itself.
- If the image is acquired directly in a digital format, the mechanism for gathering the data (such as a CCD detector) can introduce noise.

Amplifier Noise (Gaussian Noise)

The standard model of amplifier noise is additive, Gaussian, independent at each pixel and independent of the signal intensity. In color cameras where more amplification is used in the blue color channel than in the green or red channel, there can be more noise in the blue channel .Amplifier noise is a major part of the "read noise" of an image sensor, that is, of the constant noise level in dark areas of the image[3] [4].

Salt-and-Pepper Noise

An image containing salt-and-pepper noise will have dark pixels in bright regions and bright pixels in dark regions [4]. This type of noise can be caused by dead pixels, analog-to-digital converter errors, bit errors in transmission, etc. This can be eliminated in large part by using dark frame subtraction and by interpolating around dark/bright pixels.

Speckle Noise

Speckle noise is a granular noise that inherently exists in and degrades the quality of the active radar and synthetic aperture radar (SAR) images. Speckle noise in conventional radar results from random fluctuations in the return signal from an object that is no bigger than a single image-processing element. It increases the mean grey level of a local area. Speckle noise in SAR is generally more serious, causing difficulties for image interpretation. It is caused by coherent processing of backscattered signals from multiple distributed targets. In SAR oceanography [5], for example, speckle noise is caused by signals from elementary scatters, the gravity-capillary ripples, and manifests as a pedestal image, beneath the image of the sea waves.

Different Types of Filters

In this section we review the different types of filter.

MEAN FILTER

Can use linear filtering to remove certain types of noise. Certain filters, such as averaging or Gaussian filters, are appropriate for this purpose. For example, an averaging filter is useful for removing grain noise from a photograph. Because each pixel gets set to the average of the pixels in its neighborhood, local variations caused by grain are reduced. Conventionally linear filtering Algorithms were applied for image processing. The funda-

mental and the simplest of these algorithms is the Mean Filter as defined in [6].The Mean Filter is a linear filter which uses a mask over each pixel in the signal. Each of the components of the pixels which fall under the mask are averaged together to form a single pixel. This filter is also called as average filter. The Mean Filter is poor in edge preserving. The Mean filter is defined by:

$$meanfilter(x_1,....x_N) = \frac{1}{N}\sum_{i=1}^{N} x_i$$

where $(x_1,...,x_N)$ is the image pixel range. Generally linear filters are used for noise suppression.

MEDIAN FILTER

The Median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical preprocessing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because under certain conditions, it preserves edges whilst removing noise. The main idea of the median filter is to run through the signal entry by entry, replacing each entry with the median of neighboring entries. Note that if the window has an odd number of entries, then the median is simple to define: it is just the middle value after all the entries in the window are sorted numerically. For an even number of entries, there is more than one possible median. The median filter is a robust filter. Median filters are widely used as smoothers for image processing, as well as in signal processing and time series processing. A major advantage of the median filter over linear filters is that the median filter can eliminate the effect of input noise values with extremely large magnitudes. (In contrast, linear filters are sensitive to this type of noise - that is, the output may be degraded severely by even by a small fraction of anomalous noise values) [6]. the output y of the median filter at the moment t is calculated as the median of the input values corresponding to the moments adjacent to t:

$$y(t) = median(\ x(t - T/2)\ x(t - T_1 + 1),..., x(t),..., x(t + T/2))$$

wheret is the size of the window of the median filter. Besides the one-dimensional median filter described above, there are two-dimensional filters used in image processing .Normally images are represented in discrete form as two dimensional arrays of image elements, or "pixels" - i.e. sets of non-negative values B_{ij} ordered by two indexes –

i =1,...,N_y (rows) and j = 1,...,N_y (column).

where the elements B_{ij} are scalar values, there are methods for processing color images, where each pixel is represented by several values, e.g. by its "red", "green", "blue" values determining the color of the pixel.

Figure 1. Original image

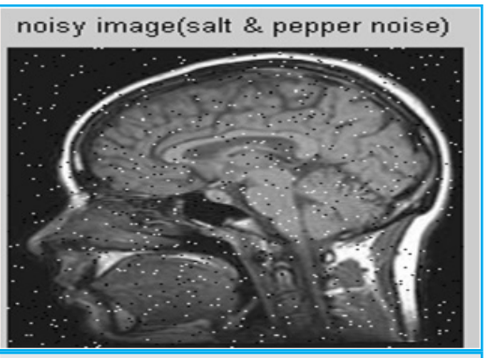


Figure 2. Adding salt & pepper noise with standard deviation (0.025)

WIENER FILTER

The goal of the Wiener filter is to filter out noise that has corrupted a signal. It is based on a statistical approach. Typical filters are designed for a desired frequency response. The Wiener filter approaches filtering from

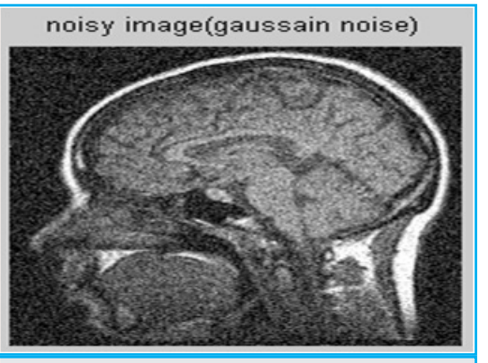


Figure 3. Adding Gaussian noise with standard deviation (0.025)

Figure 4. Adding speckle noise with standard deviation (0.025)

Figure 6. Removing noise by mean filter

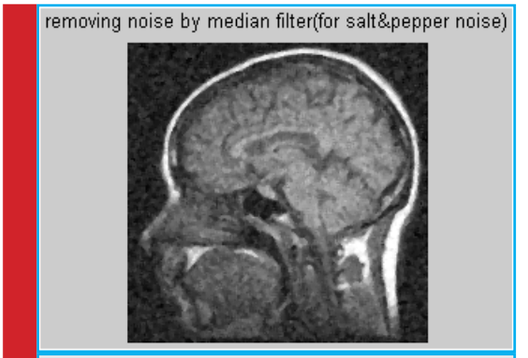


Figure 5. Removing noise by median filter

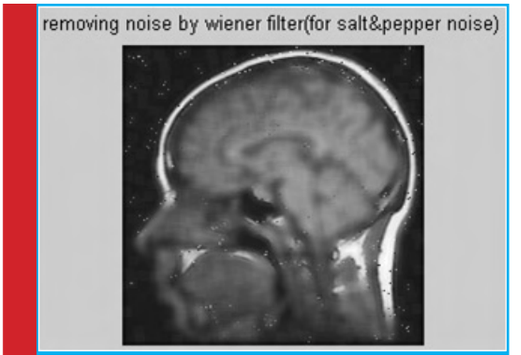


Figure 7. Removing noise by wiener filter

a different angle. One is assumed to have knowledge of the spectral properties of the original signal and the noise, and one seeks the LTI filter whose output would come as close to the original signal as possible [1].

Wiener filters are characterized by the following:

a. Assumption: signal and (additive) noise are stationary linear random processes with known spectral characteristics.
b. Requirement: the filter must be physically realizable, i.e. causal (this requirement can be dropped, resulting in a non-causal solution)
c. Performance criteria: minimum mean-square error

The Proposed Methodology of Image Enhancement

On our technique we do, first we choose brain computed tomography image then we add Noise to the Digital

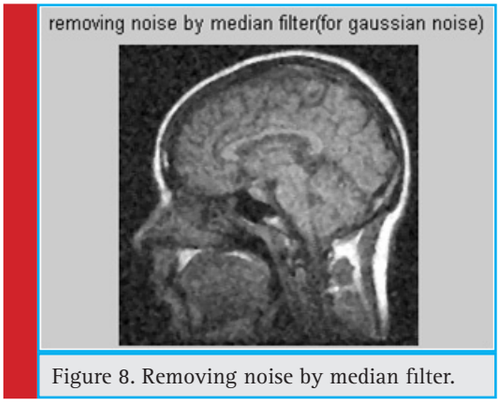


Figure 8. Removing noise by median filter.

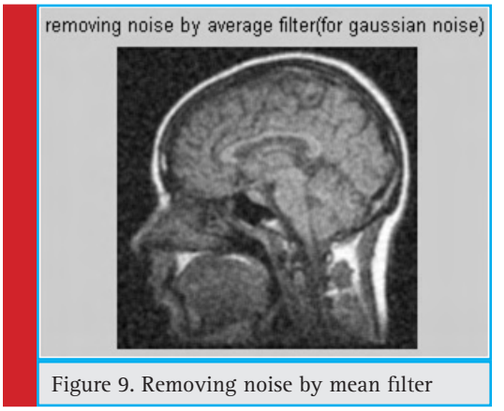


Figure 9. Removing noise by mean filter

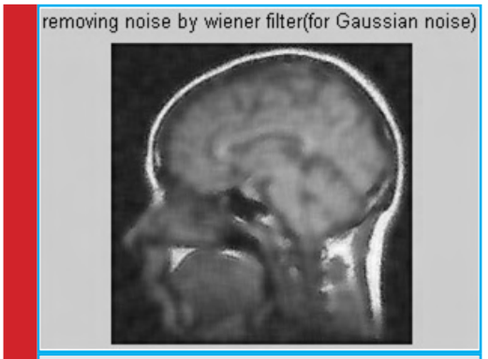


Figure 10. Removing noise by wiener filter

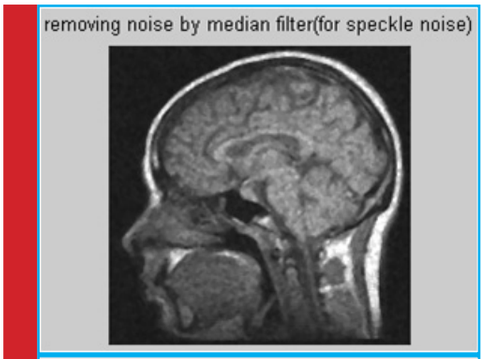


Figure 11. Removing noise by median filter.

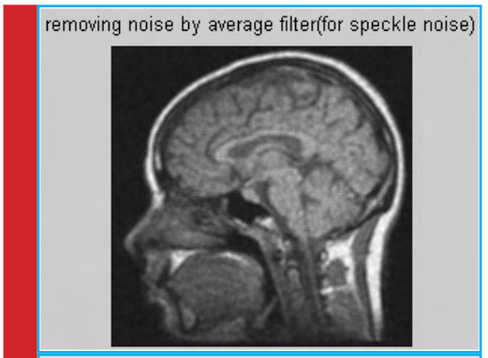


Figure 12. Removing noise by mean filter

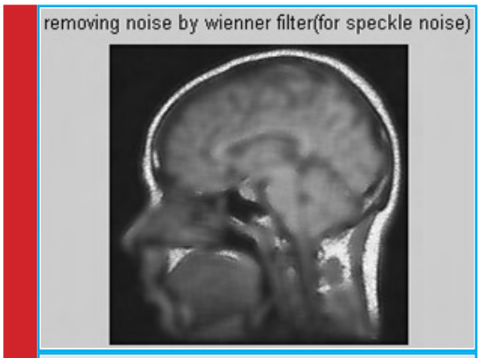


Figure 13. Removing noise by wiener filter

Images then Using Some Elementary Filters with standard deviation (0.025) To select the one that gives the best filtered image quality

Digital images are prone to a variety of types of noise. Noise is the result of errors in the image acquisition process that result in pixel values that do not reflect the true intensities of the real scene. There are several ways that noise can be introduced into an image, depending on how the image is created noise in an image can be cancelled indirectly by using the frequency domain , which can be first obtained by using the Z-transform of the original image at certain frequency then utilizing one of the filters to smooth out the frequency domain.

Simulated Output Results

The Original Image is brain ct image, adding three types of Noise (Gaussian noise, Speckle noise and Salt & Pepper noise). Adding the noise with standard deviation(0.025) and De-noised image using Mean filter, Median filter and Wiener filter and comparisons among them **9.** We used the brain ct Image (fig. 1) in "jpeg" format ,adding two noise (Gaussian and Salt & Pepper) in original image with standard deviation (0.025) (fig. to fig. 4) ,removing noise from all noisy images by all filters and conclude from the results (fig. 5 to fig.13) .

All kinds of filters have been tested to select the one that gives the best filtered image quality. It looks from the image results that the average filter is better for removing the noise then median filter and the last wiener filter. In the future work, this software work could be made to be hardware work which could be used on routine bases. Image could also be related to time where we can see the image in movie form.

REFERENCES

[1] Wavelet domain image de-noising by thresholding and Wiener filtering. Kazubek, M. Signal Processing Letters, IEEE, Volume: 10, Issue: 11, Nov. 2003 265 Vol.3.

[2] Mark A. WickertIntroduction to signal and system, ECE 2610 Lecture Notes Spring 2011

[3] J. Portilla, V. Strela, M. J. Wainnwright, and E. P. Simocelli-Adaptive Wiener denoising using a Gaussian scale mixture model in the wavelet domain Proc. 8th Int. Conf. Image Processing, 2001.

[4] Charles Boncelet (2005) Image Noise Models in Alan C. Bovik. Handbook of Image and Video Processing.

[5] Sedef Kent, Osman NuriOçan, and TolgaEnsari (2004). Speckle Reduction of Synthetic Aperture Radar Images Using Wavelet Filtering in astrium. EUSAR 2004 Proceed-

ings, 5th European Conference on Synthetic Aperture Radar, May 25–27, 2004, Ulm, Germany.

[6] James C. Church, Yixin Chen, and Stephen V. Rice Department of Computer and Information Science, University of Mississippi, A Spatial Median Filter forNoise Removal in Digital Images IEEE, page(s): 618-623, 2008.

[7] Alberto Bemporad, Automatic Control 1Z-transform University of Trento, Academic year 2010-2011.

[8] Mark A. WickertIntroduction to signal and system ECE 2610 Lecture Notes Spring 2011

[9] Fazarinc, ZvonkoZ-transform and its application to development of scientific simulation algorithms, Computer Applications in Engineering Education Volume 21, Issue 1, pp. 75-88, Mar 2013

[10] Alasdair McAndrew An Introduction to Digital Image Processing with MatlabNotes for SCM2511 Image Processing 1 Semester 1, 2004.

[11] Alberto Bemporad, Automatic Control 1Z-transform, University of Trento, Academic year 2010-2011

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Intelligent Energy Management Dedicated to Vehicle-To-Home Applications: A Realistic Autonomous Hybrid Power System Using a PEMFC

Nasri Sihem*[1], Ben Slama Sami[2], Zafar Bassam[2] and Cherif Adnen[1]

[1]*Analysis and Processing of Electric and Energetic Systems Unit Faculty of Sciences of Tunis EL MANAR II, PB.1060, Tunisia*

[2]*Information System Department King Abdulaziz University Jeddah, Saudi Arabia*

ABSTRACT

Vehicle-to-Home (V2H) has been identified as an interesting area of research because of its public services, which have incorporated new technologies and new devices for a better quality of life. The main goal of developing a smart home is to produce more efficient energy and achieve an optimal economy. To do this, hybrid electric autonomous systemswhich provide a required load demand are considered as an option to achieve effective energy production without interruption. In this context, a specific V2H simulation system integrating PEMFC technology (energy exchange membrane fuel cells), solar power and a Supercapacitor is described and developed. To balance between energy demand and supply, a unidirectional energy flow transfer is performed between the PEMFC hybrid electric vehicle and the home by providing the appropriate H2 amount. Indeed, the electric vehicle intervenes occasionally through its fuel reserve to boost the energy recovery processwhen the PEMFC andSupercapacitoroperation come across a problem.Therefore, an intelligent energy management approach (IEM) devoted for the V2H system is studied and evaluated. The proposed IEM serves for limiting energy consumption through the smart control of household electrical systems exploitation and equipment state in order to sustain the requirements. The obtained results are discussed and tested using the MATLAB / Simulink software. Indeed, given the Tunisian meteorological database andhome consumptionreports (on/ off appliances)extracted for 4 consecutive days, the proposed V2H technology provides an energy recovery rate of 17% and improves the system efficiency to 31%.

KEY WORDS: SUPERCAPACITOR; V2H; CONTROL; CONSUMPTION; PRODUCTION; RECOVERY

ARTICLE INFORMATION:

**Corresponding Author: nasri_sihem@live.fr*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/10

INTRODUCTION

The rapidly growing energy demand rates of the world, which are coupled with the environmental impacts of this energy consumption, have raised concerns in various communities. This fatal problem is considered as an attracting research issue [1-2]. In recent times, smart home and smart grid have become the most important solution proposed which are presented as being a set of existing and emerging appliances and technologies, standards-based and interoperable, working together to develop the existing power grid [3-4]. In addition to renewable energies (such as: solar energy, wind power), the role of vehicles in the supply of domestic energy is seen as an opportunity for effective investigation. Using newly introduced technologies, vehicles (especially electric vehicles (EVs)) can be used as potential sources of energy for the home [5-6].

Various projects on the smart home, have considered V2H a novelty in a sophisticated home energy system since the V2H has been described as an energy system in which the battery of an electric vehicle is used to provide electricity to the home [7]. The proposed V2H was intended to provide the energy consumption required during peak periods when demand is highest. In addition to renewable energy sources such as solar energy, wind turbines, etc., can also be considered as an energy source for vehicles to meet the energy demand for the home [8]. Otherwise, several methods and platforms have been studied and developed for the smart home, such as Intelligent Sensor Technologies, Home Network, and Smart Home Appliance [9].

However, the full potential of smart homes is still present, due to the complexity and diversity of systems, as well as repeated control strategies without the problem of optimal level. Intelligent home energy management was aimed at controlling the application and data acquisition, the production, transmission and the network electricity [10-11]. Indeed, this intelligent management has attracted more interest from the research community to apply a modern automation technology in the smart promises house.

In this article, we aim to present and develop a precise home vehicle design using a PEMFC hybrid power system. To provide the necessary power to the automation of the house during the peak period, an intelligent energy management (IEM) is proposed. The proposed energy management aims to:

- Synchronize between the domestic energy demand and the energy storage of the electric vehicle.
- Regularize the proposed residential load and surplus of an electric vehicle (EV).

In the next section, we present a brief review of the published articles, almost classified according to thematic areas. The paper is organized as follows: Section 2 is devoted to survey the related works and contributions; Section 3 presents the description of the system and its components. Aproposed Intelligent Energy Management (IEM) approach is developed and detailed in Section 4. Simulation results are shown and evaluated in Section 5. Finally, the conclusion is made in Section 6.

Literature Review and Important Contributions

Literature review

To clarify contributions of our work, a survey on reported research on Vehicle –to-home applications and home energy management in smart households is outlined and detailed. In the literature, several studies have presented different applications on V2H. The proposed configurations were examined to prove that the power supplied to the electrical load is sufficient depending on the application or the power of the load. To establish energy demand during peak periods, energy EV is used here as a backup power.

For example, the authors in [12-13] presented a (V2H) system using Plug-In Electric Vehicle (PHEV) which can be recharged by connecting to an external power supply. Indeed, the proposed system aims to provide the necessary power in case of lack of energy.

In order to maximize the backup time and optimize the proposed model, an efficient algorithm has been developed and discussed. Subsequently, the proposed V2H design was extended to domestic vehicles (Vs2Hs) that combined several homes, solar power systems and electric vehicles. To balance the demand and the supply of energy, a new Vs2Hs algorithm has been suggested. The obtained results prove the effectiveness of the Vs2Hs under different scenarios. The authors of [14-15] have proposed smart home energy management that optimally plans for appliances based on real-time electricity price forecasts. The results obtained prove the effectiveness of the proposed algorithm to cooperate between the load request and the load. In [5-6], the battery energy storage system (BESS) was programmed in a coordinated way and the household appliances with high solar penetrations. in [16-17], a chosen load engagement platform was proposed to minimize household operating costs.

The authors in [18-19-20] proposed a renewable hybrid power system for home supplying using V2H technology. The proposed system deals to explore the role of V2H technology in Home in meeting energy needs for a building nets zero energy consumption. To this end, an optimization analysis is first performed choose the best design options for energy efficient building in the economic and environmental constraints. Then, solar photovoltaic sources are used to provide the rest of the building energy demand and reduce dependence on the building grid.

Context and Problematic

The recourse to renewable energies exploitationbecomes a national and international challenge to limit the use of the fossil resources that provokes harmful effects to the environment. Moreover, because of its exhaustiveness, theseresources can no longer be trusted to meet the energy needs in an unlimited way. Thus, the renewable energies integration can help compensating the energy requirement and reach the proper sufficiency. So, nowadays, with the computer revolution and electrical systems evolution, the world more particularly, the country is being front the problem of electrification service development. In this context, home automation and smart management seemto be a promising solution for streamlining energy consumption and providing more comfortable services to the user. On this basis, the idea of developing a smart home electrification system via V2H technology has been emerged to ensure the critical house need through the vehicle fuel reserve. Compared with research and scientific works presented in the literature, our work aims to highlight the hydrogen use as a main factor to manage the energy recovery process instead of batteries.

Contributions

Compared to previous related work, the main contribution expected from this work is to develop an accurate smart home using a Vehicle–to-home technology with an intelligent approach energy management based on the following improvements:

- System components protection be facing the deep Supercapacitor discharge and heavy fuel consumption.
- Energy demand satisfaction whatever the conditions: confront fuel and energy lacks.

System design and description

The objective of this work is to present a house electrification system capable of ensuring the energy requirements of the lighted up appliances. The described system deals with two main duties:

- The energy storage when the production exceeds the demand.
- The energy recovery when an energy lack is occurred.

In this context, the study and the development of an energy recovery system is highlighted. The proposed system consists of a set of equipment as Fuel Cell and Supercapacitor used to compensate the energy when the demand exceeds the production. In addition, the system uses the hydrogen flow issued from an electric vehicle "V2H" in order to reward the critical energy need during the insufficiency moments and the lack of flows necessary for consumption (See Fig.1). Moreover, an Intelligent Energy Management "IEM" is presented in order to control the system operation to protect it against heavy H_2 fuel consumption and deep Supercapacitor discharge.

- **The energy production:** constitutes the energy issued from the photovoltaic module located at the house roof. the expression of the PV generated current is described as [21]:

$$I_{GEN} = I_{PV} = I_{ph} - I_s e^{\left(\frac{V+I_{PV}.R_s}{V_T}\right)} - \frac{V+I_{PV}.R_s}{R_{sh}} \quad (1)$$

- **The energy consumption:** is defined by the total installed appliances consumption. this energy may be used for lighting, heating, leisure,...

$$I_{DEM} = \sum_{i=0}^{n} I_{AP_i} \quad (2)$$

Fuel Cell Equipment: It is a generator which, in the presence of hydrogen, generates an electric current in order to assist in the load demand satisfaction. The hydrogen consumption is described according the Faraday law as [22]:

$$Q_C = \frac{N_{FC}.I_{FC}}{2.F.\eta_{FC_F}} \quad (3)$$

- **Supercapacitor equipment:** it is an electrical device that through its discharge can accomplish theenergy recovery process. So, to ensure its protection against the deep discharge, the Supercapacitor is controlled by its state of charge described by the following expression [23]:

$$SOC_{SC} = \left[\frac{I_{SC}}{I_{SC_{max}}}\right]^2 \quad (4)$$

- **H_2 Station:** It is equipment dedicated to the storage of the produced hydrogen flux. The storage process made under high pressure follows the law described by the equation below [24]:

$$P_{st} - P_{st_i} = \frac{Q^S.R.T_{st}}{M_{H_2}.V_{st}} \quad (5)$$

- **Electric Vehicle:** It is an electric vehicle based on fuel cell that requires hydrogen as fuel to be running.

Intelligent Energy management proposed system uses an intelligent management strategy based on a theoretical application of a V2H system.Indeed, the V2H technology relies on energy satisfaction from the electric cars.

The basic idea of IEM halts on the measurement of some control parameters as energy consumption, the generated solar roof electricity and the terms of use of the vehicle based of component state of charge control. Hence, a model is used to forecast and estimate the energy required and the expected consumption flows. To better understand the functioning of the presented management strategy, an algorithm represented by a Petri nets model followed by a control flow chart is given by Fig. 2.

$$\begin{cases} I_{V2H} = \dfrac{2.F\eta_{FC_F}}{N_{FC}} Q_{V2H} \\ I_{FC_{Out}} = I_{FC} + I_{V2H} \\ SOC_{H2} = Q^S / Q^S_{max} \end{cases} \quad (6)$$

The recovery rate by component can be used to inform about the equipment intervention ratio during the recovery process. Thus, it is described by the ratio between the number of activation periods per component and the total number of deficit periods.

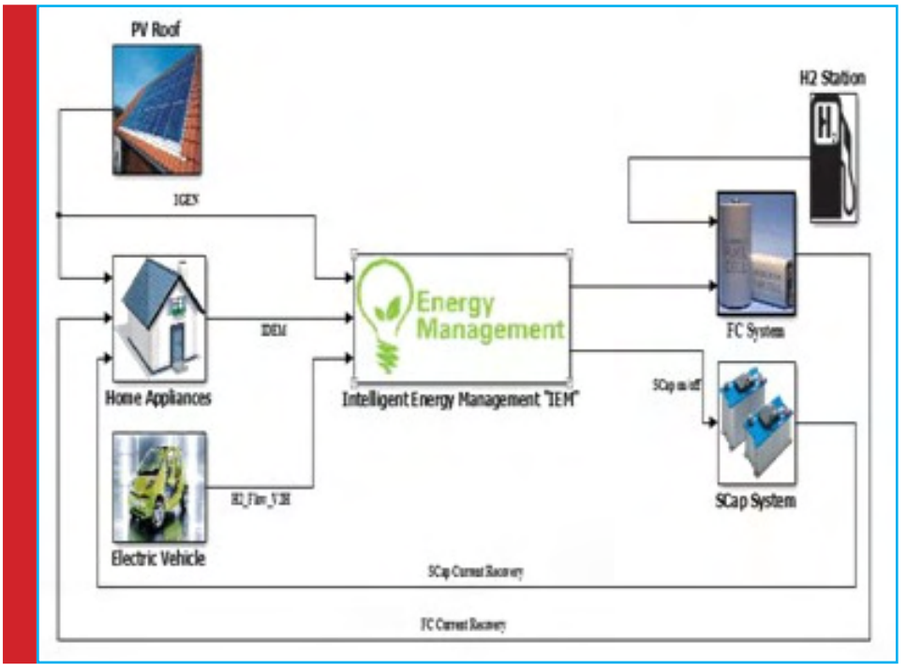
$$\tau_R = \frac{\sum_0^{P_{ACR}} P_{D_i}}{\sum_0^{n_{PD}} P_{D_j}} \quad (7)$$

Where, P_D represents the deficit period; while P_{ACR} defines the component activation period.

Finding and Results

To evaluate the system performance and to demonstrate its reliability to be against any unexpected events, numerous simulation tests have been made under Matlab/Simulink environment. Indeed, to accomplish the simulation process,experimental consumption profiles have been restored to describe the estimated electricity delivered to meet the required domestic appliances energy. Additionally, the present profile treats the house energy consumption for a 4 days period (96 hours). Thus, the Fig.3illustrates the energy production and consumption balance. As seen, the system is located under six different deficit periodsthat by referring to them, the system reactionwill be analyzed and studied.

For the first deficit time, it is impossible to start up the fuel cell to cover the energy demand due to the hydrogen lack (SOC_{H2}=0) then the condition T_{D2} is not validated. Since the condition T_{D3} is crossed, the system uses SCap to compensate the need. During the second, third and fourth deficit periods, the fuel cell is activated to satisfy the requirements. Thus, the system proceeds to state S_{D2}. However in the fifth period, the system enters under state S_{D3}that activates the SCap after the validation of the condition T_{D5}. In the last period, it seems that the fuel cell and the SCap are located under their critical states due tothe full hydrogen consumption and



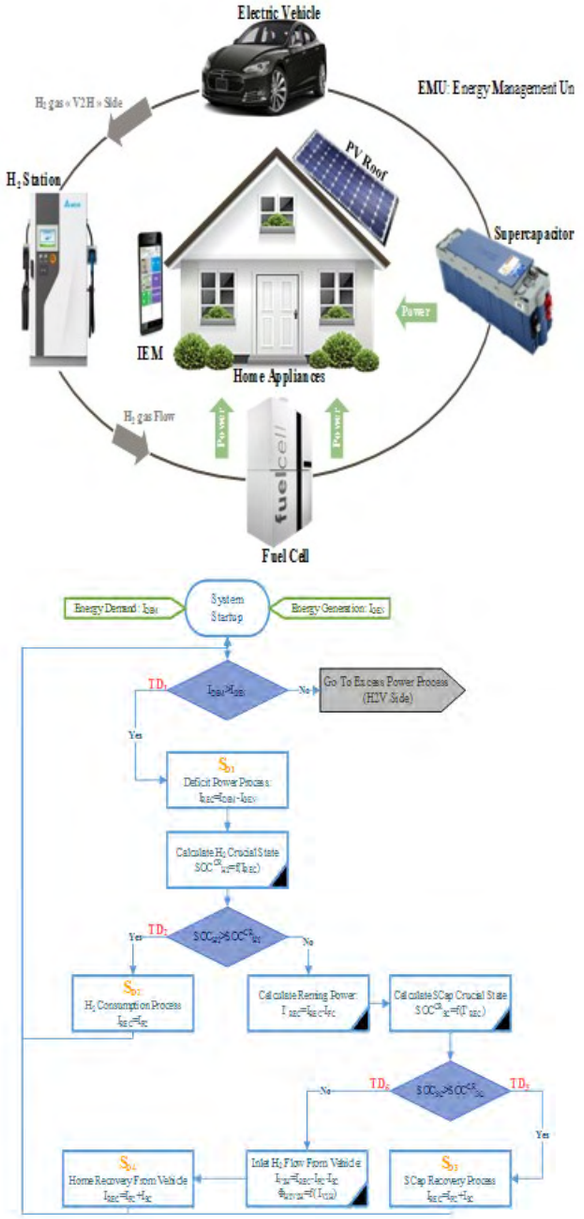


Figure 1. V2H System Design: (a) General Design; (b) Matlab/ Simulink Prototype

SCap discharge. Thus, the system requests the vehicle assistance through its hydrogen reserve to complete the recovery process: state S_{D4}.

The given Fig. 4 represents the generated currents during deficit energy cases while the Fig. 5 summarizes the transition between states in these periods. It is found that the fuel cell generates a recovery current as long as the quantity of hydrogen in the station appears sufficient to be converted into a load requirement or when the quantity is provided by the vehicle.

Moreover, the Fig. 6 shows the relative hydrogen quantities estimated to be consumed (Q^{REC}), the possible consumption amount (Q^{C}) as well as the quantity required to be delivered by the V2H (Q_{V2H}) system respectively. According to the result found, it is well noticed that the system complains of a critical hydrogen need for

Figure 2. State Operation Conditions

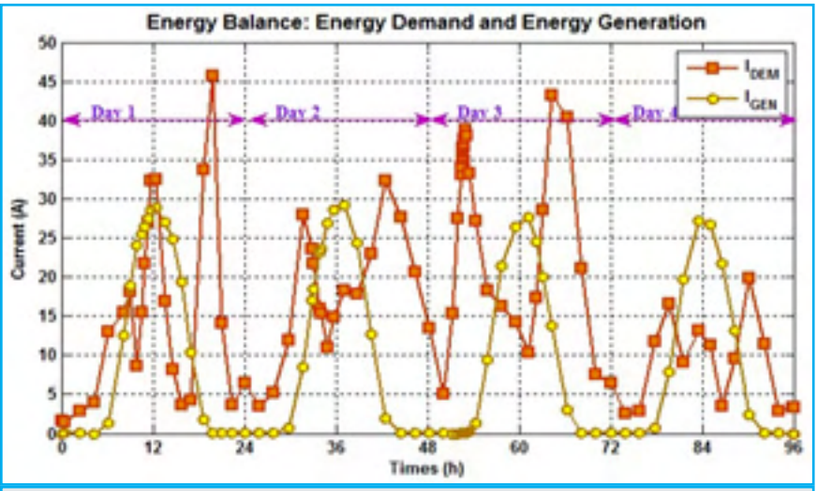


Figure 3. Energy Balance between Demand and Generation

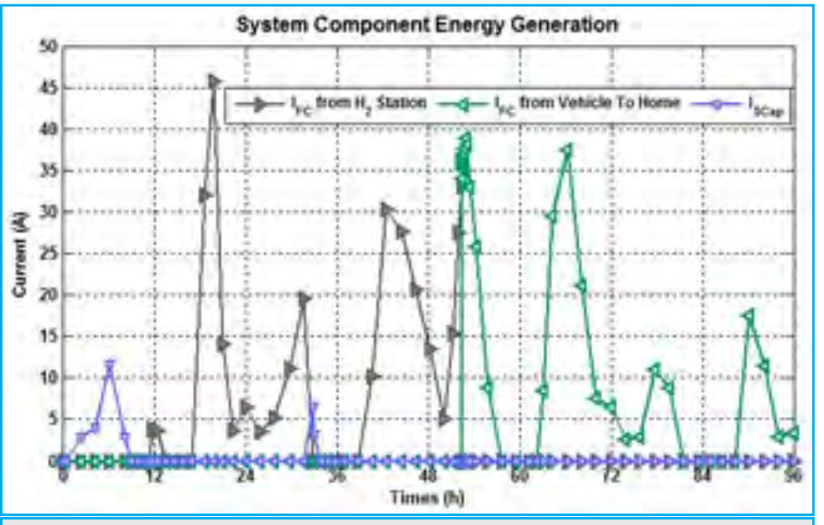


Figure 4. Energy Recovery Generation

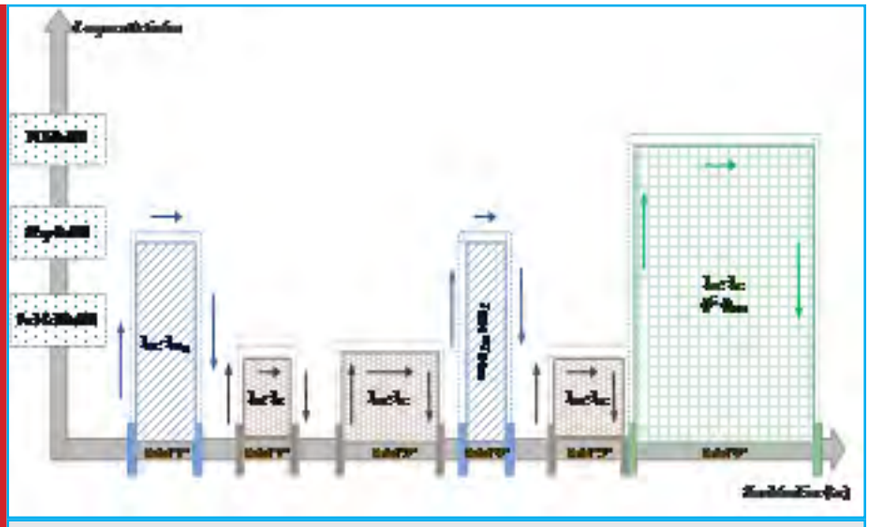


Figure 5. Component Activation versus Simulation Time

the last deficit period during which neither the SCap nor the fuel cell can intervene since SOC_{SC}=0 and SOC_{H2}=0 (see Fig. 7). The recovery rate per component during the simulation test is given by Fig.8. As shown, the fuel cell is ranked first among the participating components by 50% followed by the SCap with 33% while the V2H system possesses the lowest recovery rate of 17%.

Finally, we have studied the system mean efficiency whose obtained result is depicted in Fig.9. Indeed, the system reaches a 31% as overall efficiency value. However, the SCap outperforms the fuel cell efficiency by 78% versus 42%.

The table above summarizes the obtained performance of the system under study as the average of energy generation and consumption as well as the energy recovery rate.

CONCLUSION

In this paper, a model of energy recovery system based on V2H technology is proposed and detailed. This system permits to promote energy supply during high consumption periods in which the defeat of PEMFC

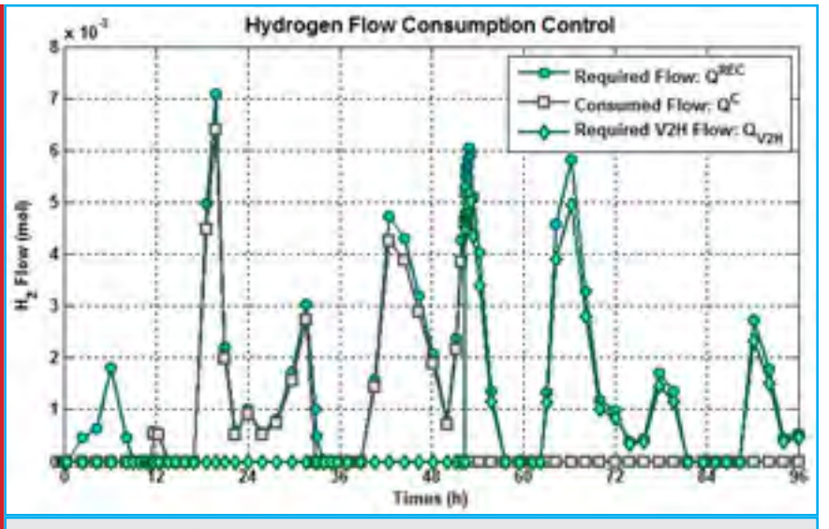


Figure 6. System Flows Consumption

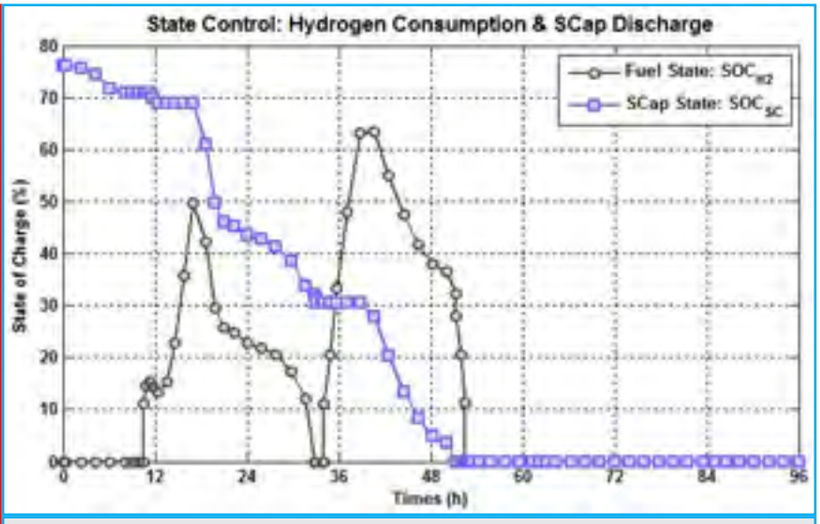


Figure 7. System Control: Components States of Charge

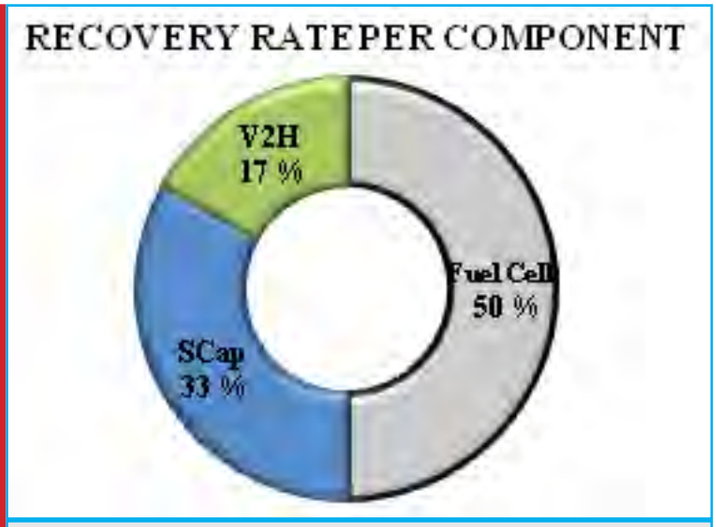


Figure 8. Energy Recovery Rate Per Component

Table 1. The massive energy consumption and the high electricity demand have led to investigate optimal energy management methods to organize consumption activities and to strike a balance between production and demand. In this context, the State Operation Conditions

Actual State	Transition	Next State	Energy Flows
Startup	T_{D1}:I_{DEM}>I_{GEN}	S_{D1}: Deficit Process	I_{REC}=I_{DEM}-I_{GEN}
S_{D1}	T_{D2}:SOC_{H2}> SOC^{CR}_{H2}	S_{D2}: FC Recovery	I_{FC}=I_{REC}
	T_{D3}:SOC_{H2}=0	S_{D3}: SCap Recovery	I_{SC}=I_{REC}
	T_{D2}:SOC_{SC}=0	S_{D4}: V2H Recovery	Q_{V2H}=Q^{CR}
S_{D2}	T_{D5}:SOC_{H2}<SOC^{CR}_{H2}	S_{D3}: SCap Recovery	I_{REC}=I_{FC}+I_{SC}
S_{D3}	T_{D6}:SOC_{SC}<SOC^{CR}_{SC}	S_{D4}: V2H Recovery	I_{REC}=I_{FCG}+I_{SC}

Table 2. Achieved system performances

	Energy Generation (A)	Energy Demand (A)	Hydrogen Consumption (mol)	SC discharging (A)	Deficit Rate (%)	Recovery Rate (%)	Vehicle Recovery Rate (%)
Day 1	6.25	9.99	1.01e-04	2.76	37.36	91.6	8.4
Day 2	8.23	17.59	8.42e-04	0.46	53.20	62.88	37.12
Day 3	10.25	19.13	0.0014	0	46.37	100	0
Day 4	8.12	8.95	7.2984e-04	0	9.3	100	0

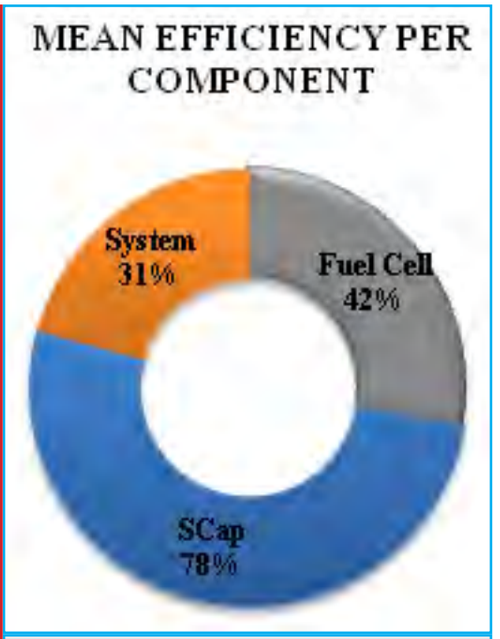


Figure 9. Energy Recovery Rate Per Component

and SCap is confronted to boost the energy recovery process.Furthermore, the proposed system has resorted to hydrogen use to involve the energy supply and to improve its performances in term of effectiveness and the reliability. Thus, to manage the energetic flows and to ensure the power distribution, an intelligent energy management approach is presented and described. Then, a Matlab/ Simulink prototype of the proposed system is made to test its performances. So, the obtained results show the ability of the system to deal with the changes and their impact on the equipment's operation.As a future work, we tend to develop the overall system with the energy storage part (excess of power case) based on vehicle charging by produced hydrogen from the house (H2V).

REFERENCES

[1] E. Gupta, "Global warming and electricity demand in the rapidly growing city of Delhi: A semi-parametric variable coefficient approach", Energy Economics, vol. 34, no. 5, pp. 1407-1421, 2012.

[2] B. CELIK, R. Roche, D. Bouquain and A. Miraoui, "Decentralized neighborhood energy management with coordinated smart home energy sharing", IEEE Transactions on Smart Grid, pp. 1-1, 2017

[3] L. Wang, A. Kusiak and A. Dounis, "Guest Editorial Special Section on Intelligent Buildings and Home Energy Management in a Smart Grid Environment", IEEE Transactions on Smart Grid, vol. 3, no. 4, pp. 2119-2120, 2012.

[4] W. Zhao, L. Ding, P. Cooper and P. Perez, "Smart Home Electricity Management in the Context of Local Power Resources and Smart Grid", Journal of Clean Energy Technologies, pp. 73-79, 2014.

[5] Q. Zhang and S. Zhang, "Smart Home Energy Management with Electric Vehicles Considering Battery Degradation", Advanced Materials Research, vol. 860-863, pp. 1085-1091, 2013.

[6] N. Nezamoddini and Y. Wang, "Risk management and participation planning of electric vehicles in smart grids for demand response", Energy, vol. 116, pp. 836-850, 2016.

[7] A. Hajizadeh and M. Kikhavani, "Coordination of bidirectional charging for plug-in electric vehicles in smart distribution systems", Electrical Engineering, 2017.

[8] L. Kiat and N. Barsoum, "Smart Home Meter Measurement and Appliance Control", International Journal of Innovative Research and Development, vol. 6, no. 7, 2017.

[9] E. Shirazi, A. Zakariazadeh and S. Jadid, "Optimal joint scheduling of electrical and thermal appliances in a smart home environment", Energy Conversion and Management, vol. 106, pp. 181-193, 2015.

[10] J. Kim, "HEMS (home energy management system) base on the IoT smart home", Contemporary Engineering Sciences, vol. 9, pp. 21-28, 2016.

[11] D. Dinh, J. Kim and T. Kim, "Hand Gesture Recognition and Interface via a Depth Imaging Sensor for Smart Home Appliances", Energy Procedia, vol. 62, pp. 576-582, 2014.

[12] M. Tushar, C. Assi, M. Maier and M. Uddin, "Smart Microgrids: Optimal Joint Scheduling for Electric Vehicles and Home Appliances", IEEE Transactions on Smart Grid, vol. 5, no. 1, pp. 239-250, 2014.

[13] D. Setlhaolo and X. Xia, "Optimal scheduling of household appliances with a battery storage system and coordination", Energy and Buildings, vol. 94, pp. 61-70, 2015.

[14] Y. Yang, W. Zhang, J. Jiang, M. Huang and L. Niu, "Optimal Scheduling of a Battery Energy Storage System with Electric Vehicles' Auxiliary for a Distribution Network with Renewable Energy Integration", Energies, vol. 8, no. 10, pp. 10718-10735, 2015.

[15] Q. Chen and Y. Ma, "The Research on Cloud Platform Considered Privacy Household Load Data Processing", Advanced Materials Research, vol. 1049-1050, pp. 1929-1933, 2014.

[16] X. Wu, X. Hu, Y. Teng, S. Qian and R. Cheng, "Optimal integration of a hybrid solar-battery power source into smart home nanogrid with plug-in electric vehicle", Journal of Power Sources, vol. 363, pp. 277-283, 2017.

[17] M. Alirezaei, M. Noori and O. Tatari, "Getting to net zero energy building: Investigating the role of vehicle to home technology", Energy and Buildings, vol. 130, pp. 465-476, 2016.

[18] W. Zhao, L. Ding, P. Cooper and P. Perez, "Smart Home Electricity Management in the Context of Local Power Resources and Smart Grid", Journal of Clean Energy Technologies, pp. 73-79, 2014.

[19] H. Shin and R. Baldick, "Plug-In Electric Vehicle to Home (V2H) Operation Under a Grid Outage", IEEE Transactions on Smart Grid, vol. 8, no. 4, pp. 2032-2041, 2017.

[20] L. Jian, Y. Zheng, X. Xiao and C. Chan, "Optimal scheduling for vehicle-to-grid operation with stochastic connection of plug-in electric vehicles to smart grid", Applied Energy, vol. 146, pp. 150-161, 2015.

[21] C. H Li, X.J Zhu, G.Y Cao, S. Sui and M.R Hu, "Dynamic modeling and sizing optimization of stand-alone photovoltaic power systems using hybrid energy storage technology" Renewable Energy Journal, vol.34,pp.815-826, 2009.

[22] Y. Ates, O. Erdinc, M. Uzunoglu and B. Vural, ''Energy management of an FC/UC hybrid vehicular power system using a combined neural network-wavelet transform based strategy'', International Journal of Hydrogen Energy, Vol. 35, pp. 774-783, 2010.

[23] M. Hadartz and M. Julander, ''Battery-Supercapacitor Energy Storage'', Master of Science THPS is in Electrical Engineering Department of Energy and Environment, Division of Electric Power Engineering Chalmers University Of Technology , Göteborg, Sweden, 2008.

[24] T. Lajnef, S. Abid, and A. Ammous, ''Modeling, Control, and Simulation of a Solar Hydrogen/Fuel Cell Hybrid Energy System for Grid-Connected Applications'', Hindawi Publishing Corporation Advances in Power Electronics, 9 pages, 2013.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Implementation of Video Codecs Over IPTV Using Opnet

E. Sabry[1] and R. Ramadan[2]*

[1]*Department of Electronics and Electrical Communication, Higher Institute of Engineering, El Shorouk Academy, Cairo, Egypt*
[2]*Cairo University and Hail University, Cairo, Egypt*

ABSTRACT

Telecommunication union launched the so-called (IPTV) as a TV platform provides a certain level of Quality of Service (QoS) and Quality of Experience (QoE.(Based on our experience and up to our knowledge, there is no real implementation to IPTV on one of the famous simulators such as OPNET. This paper is a step forward towards explaining the main components of IPTV to be implemented on OPNET. In this paper, we introduce a detailed study for Internet Protocol Television (IPTV) as a new Internet video entertainment platform and for the benefit of the researchers in this field, we set some of the performance measures. In addition, we propose a two-stage compression technique for enhancing the performance of IPTV. Moreover, we conduct a network performance evaluation of uncompressed video delivery of different data rates in small and large-scale network nodes.

KEY WORDS: IPTV; OPNET; PERFORMANCE; QOSQOE

INTRODUCTION

Internet Protocol Television (IPTV) [4] is launched as a new television platform, bounded to appeasement for user's requirements and choices of great and striking services in terms of offered quality and continuous rejuvenation. IPTV is part of a new breed of services systems providing digital TV access over IP packet-switched transport medium facilitating video entertainment and user's provision experience offering multimedia life or demanded services according to user's request. IPTV services are delivered over secure, end- to- end operator managed with desired Quality of Service (QoS) and Quality of Experience (QoE) delivered over Internet Protocol (IP) using set-top box STB for channel access.

Indeed, IPTV delivery is sensitive to packet delay, loss, right order, and time packet arrival affecting the quality of received service. In addition, IPTV last mile speed/bandwidth limits the delivery of the right number of frames per second FPS to deliver moving pictures. In fact, for Standard Definition (SDTV) delivery, it is recommended to have link speed of 4 Mbps per channel

ARTICLE INFORMATION:

**Corresponding Author: rabie@rabieramadan.org*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/11

while for High Definition (HDTV), it is recommended to have link speed 20 Mbps per channel. Consequently, the quality of delivered service will be reduced and the number of simultaneous TV channel streams will be limited, typically, it reaches from one to three channels per link. However, this could be inadmissible from the perspective of user's side in terms of QoS and QoE and from the perspective of service providers in terms of efficiency of the available link bandwidth. In reality, broadband speeds improvement and advances in AV compression techniques is the avenue for IPTV technology.

Nowadays, service providers encounter hardly satisfied users with highly progressive video services demanding and other entertainment services as three-dimensional (3-D) movies, games, and high-quality video. Recently ultra-high-definition UHD television (super Hi-vision, ultra HD television, or UHDTV) is introduced involving two digital video formats of 4K UHD (2160p) and 8K UHD (4320p) [15]. These services are approved by International Telecommunication Union (ITU).

In addition, Consumer Electronics Association selects Ultra HD term as an umbrella term after extensive consumer research. They announced, in October 2012, that Ultra HD would be used for the display with aspect ratio 16:9 with a minimum resolution of 3840×2160 pixels. Introducing defiance for television service providers, they recommend strong compression revolution, as it is considered as enabling technology to bridge the gap between the required huge amount of video data and the limited hardware capability.

Typically, ISO in combination with IEC performed MPEG [14] as a set of AV compression standards for the development of new video coding recommendation and international standard. In 2013, ITU succeeded to pass High-Efficiency Video Coding - (HEVC) or H.265 as a new video coding standard built on the ITU-T H.264 / MPEG-4 AVC standards. H.265 opened a future window for video transmission using half of the bandwidth compared to its predecessor H.264. HEVC is developed to have the potential of better performance delivery than earlier standards. It can generate more small size videos compared to its predecessor H.264 generating the same video quality. It has the same basic structure as previous standards as MPEG-2 and H.264 [1][10]. However, it contains many incremental improvements as more picture partitioning flexibility from large to small multiple units, greater flexibility in prediction modes, transformed block sizes, more sophisticated interpolation, and deblocking filters. In addition, it is more sophisticated in prediction, motion vectors and signaling of modes. Also, it supports efficient parallel processing.

In May 2014, ITU JCT-VC released a comparison between HEVC Main profile and H.264/MPEG-4 AVC High profile. The comparison is based on subjective video performance using mean opinion score MOS metric examining a range of resolutions. Their results show that there is 59% average bit rate reduction for HEVC and concluded that the average bit rate reduction for HEVC was 52% for 480p, 56% for 720p, 62% for 1080p, and 64% for 4K UHD.

VP9 [16] is the latest royalty-free video codec format developed by Google. The development of VP9 started in the third quarter of 2011. VP9 reduces the bit rate by 50% compared to its predecessor VP8 while maintaining the same video quality. It is developed with the aim to have better compression efficiency than HEVC. At the same time, VP9 has the same basic structure as VP8; however, it has many design improvements compared to VP8 as supporting the usage of superblocks (64x64 pixels) with quad tree coding structure. Currently, several researchers are interested in the performance comparison between those mentioned video codecs. According to some experimental results (Draft version 2 of HEVC, 2014), the coding efficiency of VP9 was shown to be inferior to both H.264/MPEG-AVC and H.265/MPEG-HEVC with an average bit-rate overhead at the same objective quality of 8.4% and 79.4%, respectively.

Network simulation provides a detailed way to model network behavior through calculations of continuous interactions between modeling devices in their operational environment. Discrete event simulation (DES) is a typical network simulation method that is used in large-scale simulation studies providing more accurate and realistic way. However, DES requires huge computing power and the process could be time-consuming in large-scale simulation studies. OPNET simulator is capable of simulating in both explicit DES and hybrid simulation modes and supports other simulation features like co-simulation, parallel simulation, high-level architecture, and system-in-the-loop interactive simulation. It introduces a huge library of models that simulate most of the existing hardware devices and provide today's most cutting-edge communication protocols.

The rest of the paper is organized as follows: Section (2) introduces the related work showing the recent relevant IPTV and video compression research papers. Section (3) illustrates the implementation of IPTV networks in small and large nodes number. Section (4) discusses the introduced two-stage compression; section (5) illustrates IPTV network performance characterization; the paper concludes in section (6).

RELATED WORK

Video coding is a huge constant changing field introducing several advances in video compression technology. It is a perfect research field for new ideas and con-

cepts. Hence, researcherstried to evaluate codecs as to acquainted design improvements to find out the most suitable one for offered applications and services. In [9], authors introduce the comparison between H.264/MPEG-AVC, H.265/MPEG-HEVC and Google developed VP9 video codecs encoders. The provided comparison is associated with experimental results using similar encoding configurations for the three examined encoders assuring that H.265/MPEG-HEVC provides significant average bit-rate savings of 43.3% and 39.3% for VP9 and H.264/MPEG-AVC, respectively.

In addition, they inform that at the recommended quality VP9 encoder produces about 8.4% average bit-rate overhead as compared to H.264/MPEGAVC encoder. Results also assure that VP9 encoders are 100 times higher encoding time more than those measured for the x264 encoder. However, in case of comparison to the full-fledged H.265/MPEGHEVC reference software encoder implementation, the VP9 encoding time on average is lower by a factor of 7.35%.

Authors of [2] discuss the most of the existence of alter-native UHDTV encoding mechanisms to satisfy market requirements for UHD content transmission and UHDTVs televisions demand increase. The authors' discuss the recently introduced VP9 and H.265 video encoding scheme from the perspective of compression efficiency of such encoders aiming to compress video sequences beyond HDTV resolution. They use the most popular and widely spread encoder H.264/AVC to serve as a comparison baseline, showing the actual differences between encoding algorithms in terms of perceived quality. The paper indicates that the comparison of coding efficiency in terms of subjective scores between VP9 and AVC results slightly in favor of AVC (5.1%) and slightly in favor on VP9 (1.59%) in terms of PSNR.

In [13], the authors ensure the importance of the emergence of more efficient next-generation video coding standard that isin high demand at the moment. There seem to be two main contenders for the position of the next state-of-the-art video compression standard: H.265/HEVC and Google VP9. In addition, the authors take the comparison of such introduced codecs from the subjective perspective considering codec's compression efficiency. Tacitly, they determine compression efficiency by Intra compression, introducing adetailed overview of intra compression data-flow in HEVC and VP9. They indicate that both VP9 and HEVC compression standards provide higher compression efficiency compared to the current industrial video compression standard AVC. They conclude that HEVC provides better compression rates than VP9.

In [7], the authors illustrate that Motion Estimation (ME) is considered as the essential part of almost all video coding standards and thenewly emerged High-Efficiency Video Coding (H.265/HEVC). HEVC achieves better performance in compression and efficiency in coding for beyond HD and UHD videos. They illustrate that the main drawback of HEVC is its computation complexity arises from Motion Estimation (ME). Actually,ME consumes more than half of time to encode. Therefore, the authors proposed the implementation of New Combined Three Step Search pattern for ME algorithm to reduce the complexity of encoding. Their results are compared with the existing patterns and the simulation results show that the average time saving was about 50.07%aand slight improvements in quality.

In [11], the authors illustrate the importance of video encoding with the emergence of H.265/HEVC video coding standard as well as 3D video coding for multimedia communications. They provide a comparison between H.265/HEVC and H.264/AVC in terms of video traffic and statistical multiplexing characteristics. They also examined the H.265/HEVC traffic variability for long videos. In addition, they investigated the video traffic characteristics and scalable video encoded statistical multiplexing with the H.264/AVC SVC extension as well as 3D video encoded with the H.264/AVC MVC extension.

Within the recapitulation of previously mentioned results, HEVC is dominant in comparison to other alternatives within wide bit-rates ranges from very low to high bit-rates. Indeed, all previous valuable efforts and communicant codecs comparison between HEVC and/or VP9 with H.264are taken only from the subjective point of view. Comparison judgment lacks actual system applications as to assess application performance suitability in case of video delivery in these codecs format. Nevertheless, the intake comparison lacks actual examination of assessing the impact of different codecs data rates on actual application in both objective and subjective merits. This paper tries to narrow this gap.

IPTV Network Small and Large Scale Configurations over Opnet

In this section, different components of IPTV that will be implemented using OPNET will be detailed.

IPTV main building elements

Generally, IPTV network contains four main architectural elements that are common to any vendor. A graphical view of a networking architecture used to deliver streamed IPTV channel illustrated in Figure 1.

– *IPTV Head end:* This is the point at which most IPTV channels content is captured and formatted from different broad casters to be distributed over the IP network. Typically, the head end ingests national feeds of linear programming

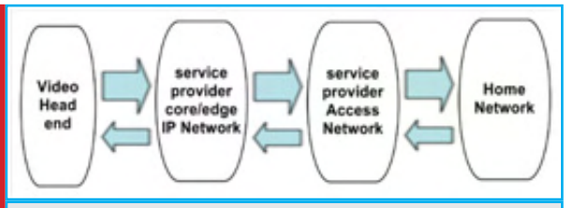


Figure 1. Two-way nature of an IPTV network.

via satellite or terrestrial fiber-based network. It may be made up of several content servers; each is responsible for the certain type of data preparation and services for the full management of massive offered IPTV services. Broadcasting TV streaming servers are responsible for streaming live IPTV content, and IP Video on Demand (VoD) application server is responsible for data storing and caching services. On the other hand, IPTV head end middleware and application servers are responsible for provisioning management of new subscribers, billing, and overall video assets management. In addition, network time server is responsible for internal clocking systems to allow synchronization between network components.

– *Service Provider Core/Edge Network:* This is the point at which previously prepared data representing the channel line-up could be transported over the service provider's IP network. Actually, this network could be a mix of a well-engineered existing IP network and other purposed built IP networks for video transport. At the network edge, the IP network is connected to the access network. However, each of these networks is uniqueto the service provider and usually includes equipment from multiple vendors.
– *Access Network:* This could be considered as the service provider link to the individual household user,referred to what is called "the last mile". It is the broadband connection between theservice provider and household that could be various technologies based as DSL (digital subscriber line) or fiber PON(passive optical networking) technology. However, IPTV networks use variants ofasymmetrical DSL (ADSL) and very-high-speed DSL (VDSL) to run an IPTV service to the household. In this case, the service provider places aDSL modem at the customer premises to deliver an Ethernet connectionto the home network [8].
– *Home Network:*It is network responsible for IPTV service distribution throughout the home; manydifferent types of home networks exist. However, IPTV requires a very robust high bandwidth network that can only be accomplished today using wireline technology. This is the endpointto which the television set is connected via aset-top box(STB) [3][6].

IPTV Content Flow

IPTV Content flow is defined as the media transfer from one functional area to another including media capturing, compression, packetization, transmission, packet reception, decompression, and decoding of the received back media signal into its original form.

Figure 2 illustrates a graphical overview showing main IPTV content flow block diagram. A head-end takes each individual channel and encodes it into a digital video format like H.264/AVC, which remains the most prevalent encoding standard for digital video on a worldwide basis.

After encoding, data is packetized through dividing data files or data blocks into fixed size data blocks of compressed packets. Each channel is addressed and encapsulated into IP to be sent out over the network. These channels are typically IP multicast streams. However, certain vendors make use of IP unicast streams as well. IP multicast has several perceived advantages in which it enables the service provider to propagate one IP stream per broadcast channel from the video head end

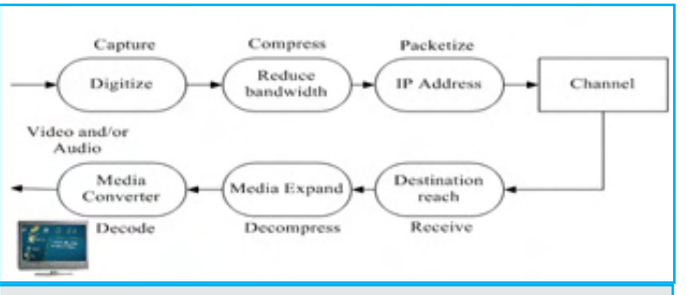


Figure 2. Simplified IPTV flow content.

Figure 3. Small-scale IPTV network.

to the service provider access network. This is beneficial when multiple users want to tune in to the same broadcast channel at the same time (e.g., thousands of viewers tuning in to a sporting event). Hence, compression performs the key technology as to make IPTV in reality. Compression is the reduction process for the required storage space of digital information by taking advantage of deficiencies in both human and aural systems [6].

IPTV architecture over OPNET

This section is dedicated to the IPTV architecture over OPNET. This section is written to be a reference for any farther implementation to IPTV on OPNET. The architecture has the following components.

– *IPTV Hardware:* Form previously mentioned architecture and content flow, common nodes are recommended for IPTV network implementation via any network simulator. In two different project editors, IPTV network is created with a small number of network nodes as shown in Figure 3 and with a large number of network nodes as shown in Figure 4. The networks have been created using the same modeled links speed/bandwidth, modeled nodes, and tested using the same machine.

Within both project editors, IPTV_Headend_Video node acts as IPTV video content source node within all created scenarios for all types of imported traffic. DSLAM and level3 act as interface nodes to the source node as in Figure 3 and in Figure 4 networks, respectively.

Tacitly Rendezvous Point (RP) router node presented in both project editors acts as multicasting node, which could be a router or an edge node. Multicast domain packets from the upstream source and joined messages from the downstream routers are considered as "rendezvous". The most important issue that must be taken into consideration is, in case of RP configuration, all other network's routers do not need to know the source address of every multicast group. However, RP must be declared at each router, where the declaration is performed through their knowledge of RP address. RP addressing is performed through IP addressing of any active RP interface. The rest of the architecture nodes in Figure 3 and Figure 4 are switches and TV sets.

– *IPTV Protocols:* IPTV protocols are configured to provide tightly management, routing, and controlling for video packets delivery over the network. From the perspective of routing, configured routing protocol differs as if network nodes are localized within the same network partition or whether the network is managed by the same Autonomous System AS (intra-AS routing protocols) or between ASs (inter-AS routing protocols). In both networks all nodes are assumed to be localized within the same partition; hence routing information protocol RIP and/or open shortest path first OSPF could be configured. Using OPNET simulator, various routing protocols could be easily configured for modeling several technologies. For traffic delivery as mentioned previously IPTV could be unicasted or multi casted; however, IP multicasting is widely used.

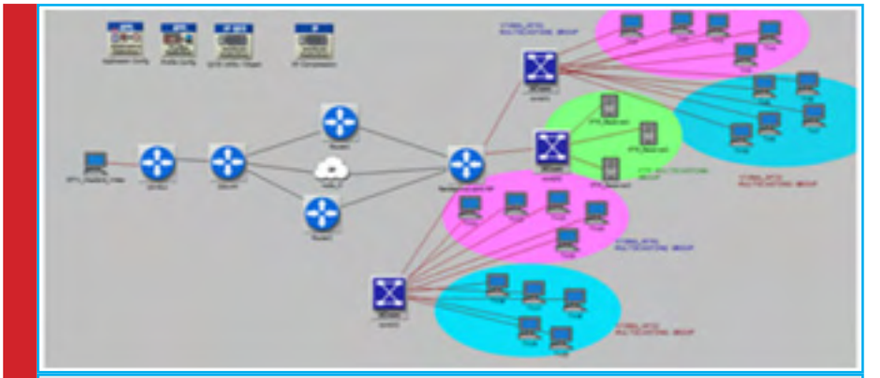


Figure 4. Large-scale IPTV network.

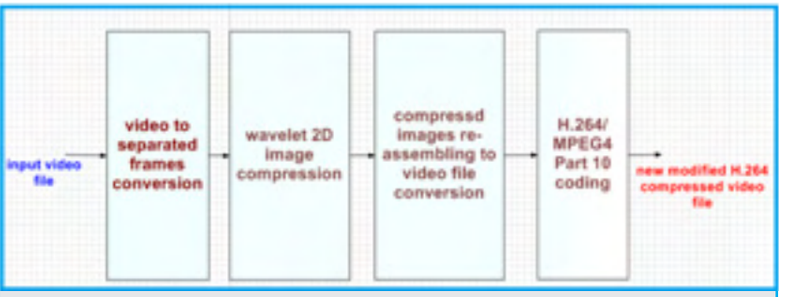


Figure 5. Two stage compression block diagram.

OPNET modeler supports IP multicast including Internet group management protocol IGMP and Protocol Independent Multicast-Sparse Mode (PIM-SM). IGMP used by hosts and adjacent routers to establish multicast group memberships. A TV set transmits IGMP-join/leave messages to notify the upstream equipment by LEAVEing one group and Joining another channel. PIM-SIM is multicasting routing protocol that explicitly builds shared trees rooted at an RP per group and optionally creates shortest-path trees per source. Multicasting protocols are configured to handle data controlling and management [5][12].

Two-Stage Compression

Typically there is no fixed meaning for low latency achievement, it is anapplication dependent. However, it is a design goal for any system especially in real-time interaction with video content. It is counted from the instant time a frame is captured to the instant time the frame is displayed. Accounted delays for video frame trip includes processing time delay arises from making the pixels captured by a camera in combination with required transmitting time for compressed video stream defining what is called end-to-end ETE delay.

However, the biggest contribution for video latency is the processing stages requiring temporal data storage. Moreover, tradeoffs arise between low latency achievement and the optimum balance of hardware, processing speed, transmission speed, and video quality. Hence, system video engineers tend to measure latency in terms of video data buffering. Therefore, any temporary storage of video data (uncompressed or compressed) increases latency, so reducing buffering is a good primary goal.

Indeed, new introduced HEVC achieves about 50% lower storage capacity than its predecessor H.264. This section endeavors to bring H.264 closer from the perspective of compression ability to H.265 without much loss. The suggested procedure is to increase the compression ratio for the H.264 coded video file is illustrated in Figure 5. The uncompressed video file passes through two level compression stages achieving more buffering reduction and investigating Human Visual System (HVS) perception.

Figure 5 illustrates that the input video file pictures are firstly divided into separated frames, and then switched to the first compression stage. The next question is what about video quality, and which compression type could be used? Wavelet 2D video compression is used as the first compression stage. Wavelet transform decomposes a signal into a set of basic functions called wavelets that maps a time and spatial function into a 2-D function.

Generally, Wavelets are a time domain windowing function; the simplest of which is a rectangular window that has a unit value over a time interval and zeroes elsewhere. Wavelets have zero DC value and good time localization. Also,they decay rapidly toward zero with time; hence, wavelets are usually bandpass signals. Wavelet compression produces no blocking artifacts and can use very small wavelets to isolate very fine details in a signal; while very large wavelets can identify coarse details. These characteristics of the wavelet compression allow getting the best compression ratio while maintaining the quality of the images. Therefore, wavelets provide high compression ratio, better image quality without much loss. So, first compression stage is performed by 2D- Discrete Wavelet Transform DWT using OPNET.

Haar Wavelet Transform (HWT) is deployed taking the motivations behind it as it achieves the best performance in terms of computational time, high computational speed, simplicity, efficient compression method, and efficient memory since it can be calculated in place without a temporary array. According to the chosen energy level of each frame, the signal is analyzed into four levels with assigning of about 99.23% of retained energy threshold using balance sparsity-norm as to try to preserve quality then thecompression is performed. Then all compressed frames are reassembled to form a video file that passes through the second compression stage using the well-known H.264 standard.

To verify our proposal in this section, we implemented the two-stage compression based H.264 using MATLAB.

This module will be later implemented in OPNET for comparison purposes.

Two video test sequences undergo theexperimental test; the first video is of size 934MB,07:06 minuteslength, 30 frames/sec, and .avi extension. Using H.264, the produced compressed with 77.5% compressions and a length of 210MB. The same video is divided into12802 images and compressed using the prescribed modified H.264 format and the H.264. The resultingvideo isof size 45MB and length 07:06 minutes achieving 95.2% with respect to original video and of 78.6% with respect to compressed H.264.

The second used video is of size 704MB of .mov extension, length 12:14 minutes, and 24 frames/sec. In this video, H.264 achieves a compressed video of length 81MB achieving 88.5% compressed video with respect to original video. This video is divided into17620 images which compressed using the prescribed method resulting video of size 56.9MB and length 12:14 minutes in H.264 format achieving 92% with respect to original video and of 70.24% with respect to original video.

In addition, quality of the compressed videos is slightly changed. This could be realized by comparing Figures 6, 7, and 8. Figure 6 shows the original image frame, Figure 7 shows the first level compressed image frame, and Figure 8 shows new modified recovered H.264 image frame. Therefore, this suggested wiseincreases video file compression ratio approximately about 70% as compared to the well-known H.264 with the expense of slightly video quality change associated with minor computational processing, we are aiming to have better network performance from the perspective of objective merit enhancing the QoS.

Figure 6. Original image.

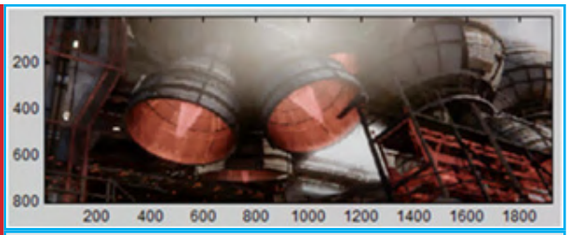


Figure 7. First level compressed image.

IPTV Network Performance Measures

According to IP downstream bit rate and video indigence numeration, IPTV could be considered as a key component to service provider growth. Hence, with such significant financial rewards, service providers take IPTV QoE very seriously. QoE denotes to how well the offered video service will satisfy users' expectations. Indeed, experienced IPTV quality by subscribers must be equal to or better than today's cable and satellite TV services or in turn service providers will run the risk of significant subscriber churn and the resulting loss in revenue. QoE consists of subjective and objective quality merits. The overall objective effect on IPTV service arises from network performance defining what is called QoS.

IPTV traffic will share network links from the same multi-play subscriber or from other subscribers sharing an uplink from an aggregation device. All IPTV services will contend for finite network bandwidth and equipment resources; shortly, there is an existence of a correlation between objective and subjective merits. Hence, quality of received service could be expected according to network performance collected QoS parameters. In addition, in terms of IPTV, Media Delivery Index (MDI) define measurements set for monitoring and troubleshooting networks carrying any IPTV traffic. MDI defines two merits which are media Delay Factor (DF) and Media Loss Rate (MLR), identifying required buffer size or inter-arrival time of IP packets and counting the number of lost MPEG packets number per second, respectively. Both DF and MLR are translated directly into networking terms: jitter and loss. Regarding the Internet services, QoS parameters usually defined as the following:

- *Packet End-to-End (ETE) delay (sec):* Defines the average time required to send a video application packet to a destination node application layer including network node processing delay, queuing delay, the packet transmission time between two network elements, and the propagation delay within network link. If ETE delay is less than 1 sec, so it is considered the worst QoS toward end-user QoE. Moreover, the acceptable delay should be less than 200ms. If the maximum delay equals to 250ms, the received video will be tolerable. Therefore, the conclusion is that the delay is not acceptable if it is greater than 400ms.
- *Packet jitter (sec):* Measures the differences between two consecutive packets End to End delays. The average jitter could be considered acceptable if less than 60ms and could be considered ideal value if it is fewer than10ms.
- *Throughput (bps):* Counts the average number of the successfully received bits by the receiver

Figure 8. New modified H.264 recovered image.

node per second. The minimum acceptable video transmission rate is of range 10Kbps and 5Mbps.

– *Packet delay variation (PDV):* Illustrates the differences between ETE that video packets will experience in OPNET collects PDV statistic at two levels which are Global PDV recording collected from all network's nodes and/or Node PDV recording data received by the specific node.
– *Point-to-Point (P2P) Queuing delay (sec):* Measures instantaneous packet waiting times in the transmitter channel's queue that are counted from packet entering time at transmitter channel queue to the time the last packet's bit is transmitted.

Case Study: Network Performance Evaluation Subjected to Uncompressed Video Delivery of Different Data Rates in Small and Large-Scale Network Nodes

The main purpose of this case study is to compare the network performance in two different scales subjected to different data rates. Hence, this experiment could identify the most dominant factor affecting the IPTV system performance. Using the same network setup in Figures 3 and 4 with the modification of defined video applications frame ratings to the following:

1. Video Conferencing (AF41) frame inter arrival time is reduced to 15FPS,
2. Video Conferencing (AF32) frame inter arrival time is reduced to 10 FPS.
3. The rest of other network configurations remain unchanged.

The experiment is a comparison-based between network performance in terms of ETE delay (sec), PDV, traffic received (bytes/sec), P2P throughput (bps), and P2P utilization QoS terms.

Figure 10 illustrates the global PDV collected from all network nodes within two created networks of small and large node numbers subjected to different data rates video channels delivery. The Figure shows that in case of video channel delivery at a high data rate in both networks, video packets experience higher PDV more than that of low data rates. However, PDV shows picks through the small-scale network while it is extremely constant with time over large scale network.

Figure 10 also depicts that the video channels of high frame rates over a small-scale network have higher PDV than of that over the large-scale network by approximately 0.0034. On the other hand, videos of low frame rates over small network experience higher PDV than of that over the large-scale network by approximately 0.0005. That means, either for high or low data rates video packets over the small-scale network are more

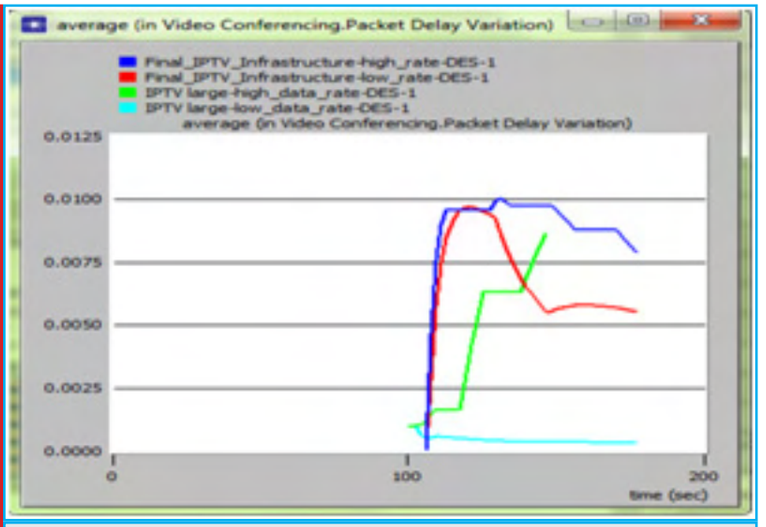


Figure 10. Global collected PDV in case of high and low data rate video channels delivery over small and large network nodes number.

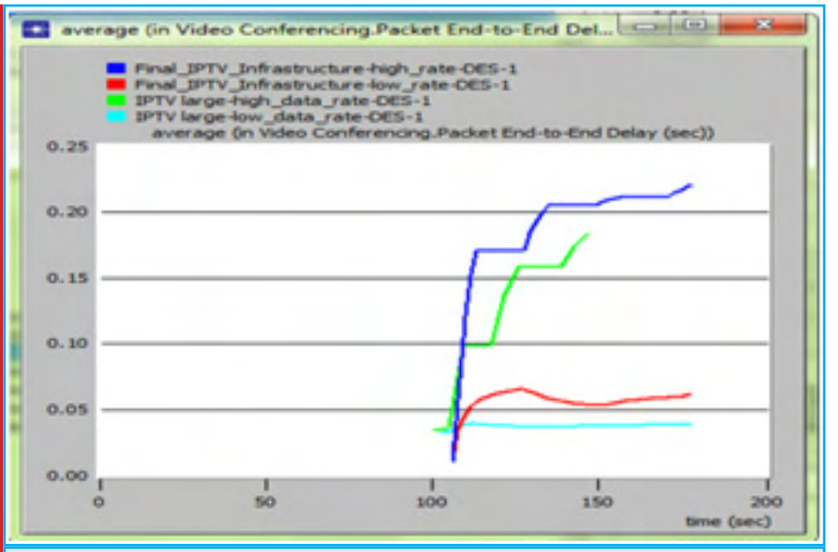


Figure 11. Global ETE delay (sec) in case of high and low data rate video channels delivery over small and large network nodes number.

vulnerable to be a receipt in out of order than of their corresponding over the large-scale network.

Figure 11 illustrates the global ETE delay (sec) collected from all network nodes within two created networks of a small and large number of nodes subjected to different data rates. The Figure illustrates that those video channels of high data rate over both networks have higher ETE delay than their corresponding to low data rates over the same network. The figure comprises also of video channels of high data rate showing higher picks than their corresponding to low data rates. However, increasing the number of nodes seems to reduce ETE delay in high data rates channels over the small-scale network by approximately 75ms, and almost about 25ms for those of low data rates. Hence, we conclude that increasing of a number of nodes (routers and switches) reduces both PDV and ETE delay (sec) for video channels at different data rates.

Since it could be easy to expect achieved the quality of received video channels as there is a correlation between subjective and objective merits. So evaluating achieved ETE delay included in Figure 10 with acceptable values mentioned in section (5), which infers that video channels that experience delay setting in the range of 100ms$\pm$ {1, 2, 3, 4} will have a lower impact on user's perception quality. While those experience ETE delay beyond 100ms $\pm$ 16ms, users will have very annoying received quality. Moreover, it involves that maximum ETE delay must not exceed 200ms.

Figure 10 involves that video channels of high and low data rate over the small-scale network will experience maximum ETE delay of 220ms and 60ms respectively. While those over the large-scale network will experience maximum ETE delay of 200ms and 40ms respectively. Hence, users receiving video packets of low data rate are expecting to acquire better video quality than those of high data rate over both networks. Users expecting video channels of high data rate over the large-scale network will have better video quality than those over small-scale network. The same dialectics will be assured from collected PDV involved in Figure 11 as high data rate video channels packets are more vulnerable.

Practically, telecommunication field became a highly competitive field with the advances in compression and IP technologies as to satisfy great consumer's choices. According to previous experimental results, data rates are considered the basic engine affecting the quality of the service provided. Hence, compression techniques is a must to satisfy providers recommendations in serving a huge number of customers and to increase the number of transmitted channels over limited bandwidth. The contents size are reduced via such compression techniques with the removal of the strong correlation existed between resemblance neighboring frames.

CONCLUSION

Telecommunication field is a highly competitive field; IPTV system is new TV platform that is drawing admission because of its superb and emphatic features acquainted in terms of QoE and QoS. This paper provides network assessment for IPTV technology common management and control protocols in their operational mode at different data rates over different networks scales.

The provided assessment examines the most important dominant key technology which has a great impact on achieved network performance affecting both QoS and QoE. The paper also proposed two-stage compression techniques for better network performance. The results of the two-stage compression techniques are promising. In addition, the paper set the base for IPTV implementation in OPNET.

REFERENCES

[1] Draft version 2 of HEVC, 2014, High-Efficiency Video Coding (HEVC) Range Extensions text specification: Draft 7, JCT-VC document JCTVC-Q1005, 17th JCT-VC meeting, Valencia, and Spain.

[2] Grois, Dan & Mulayoff, 2013, Performance Comparison of H.265/MPEG-HEVC, VP9, and H.264/MPEG-AVC Encoders, at 30th Picture Coding Symposium, San José, CA, USA, Dec 8-11, © IEEE.

[3] Harte, Lawrence,2008, IPTV Testing: Service Quality Monitoring, Analysis, and Diagnostics for IP Television Systems and Services, New York, USA.

[4] Held, Gilbert, 2007, Understanding IPTV, New York, USA.

[5] LU, Zheng, & Yang, Hongji, 2012, Unlocking the Power of OPNET Modeler, New York, USA.

[6] O'Driscoll, Gerard, 2008, next-generation IPTV services and technologies, New Jersey, USA.

[7] P, Davis &Marikkannan , Sangeetha, April 2014, Implementation of Motion Estimation Algorithm for H.265/HEVC, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3.

[8] Rahman, Md. Lushanur & Lipu, Molla Shahadat Hossain, 2010, IPTV Technology over Broadband Access Network and Traffic Measurement Analysis over the Network", in International Conference on Information, Networking and Automation (ICINA), paper V2-303.

[9] Rerabek, Martin & Ebrahimi, Touradj, 2014, Comparison of compression efficiency between HEVC/H.265 and VP9 based on subjective assessments", Multimedia Signal Processing Group (MMSPG), Ecole Polytechnique F´ed´erale de Lausanne (EPFL), Lausanne, Switzerland.

[10] Schierl, Ta, Hannuksela, M b, Wang, Y. K c, & Wenger S*, 2012, System layer integration of high-efficiency video coding, IEEE Transactions on Circuits and Systems for Video Technology, vol. 22, no.12, pp. 1871–1884.

[11] Seeling, Patrick & Reisslein, Martin, 2014, Review Article Video Traffic Characteristics of Modern Encoding Standards: H.264/AVC with SVC and MVC Extensions and H.265/HEV', Hindawi Publishing Corporation Scientific World Journal, Article ID 189481, 16 pages.

[12] Sethi, Adarshpal S & Hnatyshin, Vasil Y,2013, the Practical OPNET® User Guide for Computer Network Simulation, New York, USA.

[13] Sharabayk, Maxim P a, Sharabayko, Maxim P b, Ponomarev, Oleg G c. & Chernyak, Roman I, 2013, Intra Compression Efficiency in VP9 and HEVC.

[14] Wiki MPEG, 2015 [Online] Available at: http://en.wikipedia.org/wiki/Moving_Picture_Experts_Group

[15] Wiki UHD, 2015, [Online]Available at:https://en.wikipedia.org/wiki/Ultra-high-definition_television

[16] Wikipedia, 2015 [Online] Available at: https://en.wikipedia.org/wiki/VP9

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

The Impact of Integration of Supply Chain Management in Strategic Flexibility: Applied Study on Al-Hjrah Company in Asfan - Saudi Arabia

Abdulnaser S. H. Al-Msloum
University of Jeddah Alkamil Branch, Jeddah, Saudi Arabia

ABSTRACT

This article tries to identify the impact of supply chain integration in strategic flexibility as well as check the impact of supply chain integration (internal integration, external integration, strategic integration) in strategic flexibility. The results of the research indicated that the majority of employees of the Al-Hjrah company deal with two suppliers and less, as evidenced by the length of the deal between companies and suppliers, which gives the impression of an intimate relationship between companies and suppliers, which promote a sense of trust and joint action to achieve the interests of all parties. In addition to the presence of an insignificant proportion of other companies rely on more than three suppliers in the procurement process, despite the development of suppliers and their absorption of the needs of companies in a timely manner, it can be said that the Al-Hjrah company has a greater bargaining power. The researcher believes that the reason for this can be explained by the desire of the managers of the company to take advantage of the benefits of strategic flexibility between suppliers. In this work, we recommend establishing long-term relationships with customers through direct contracts with customers, collection of customer data, and use in designing and delivering products that meet their requirements. Internal integration requires a state of cooperation and effective coordination between the internal divisions (such as marketing, research and development, production, procurement and storage), ensuring the flexibility of the strategy to deliver products and services as one of the competitive tools. Improving the supply chain response to the market and any changes to the market by restructuring the company and streamlining business processes, because the supply chain response is the responsibility of all supply chain partners.

KEY WORDS: SUPPLY CHAIN, INTERNAL INTEGRATION, EXTERNAL INTEGRATION, STRATEGIC INTEGRATION, FLEXIBILITY, ABILITY, RESOURCES AND QUALITY

ARTICLE INFORMATION:

**Corresponding Author: asalem2@uj.edu.sa*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/12

INTRODUCTION

The concept of supply chain management is an interrelated concept with many new knowledge areas, which means that it takes a gradual step in evolution. There is no specific definition of supply chain management in management literature. The concept of supply chain management involves two separate paths: the second relates to management and logistics.

They are defined as entities placed and covered in the design of the new product and service, the management of raw materials and their conversion into semi-finished products and delivery to the final customer. The impact of supply chain integration is a key factor for organizations' success and achievement of their goals, especially profitability. The effectiveness of supply chain management and integration improves the performance of the company and creates a competitive advantage.

Under global competition, the company has sought to adjust its strategies and look to customer satisfaction for its survival and sustainability, which requires them to improve the delivery of products and services to customers and achieve the desired performance. It is not enough for the company to conduct continuous surveys of all the environmental factors affecting its performance and competitiveness, but rather to develop the ability to respond to them by enhancing their strategic flexibility and developing their resources and capabilities so that they can exploit the opportunities optimally and avoid potential threats and risks [1].

In view of the above and given the fluctuations in the competitive environment faced by a representative of learning, competitive advantage and high strategic flexibility, it is necessary to understand the impact of supply chain integration on the flexibility and strategy of the Al-Hjrah company. If the integration and response of the supply chain has become prominent in recent years at both theoretical and practical levels, many literature has also shown great interest in the role of supply chain integration and response in improving the company's performance, through the integration of internal and external company functions and effectively connect with suppliers Supply chain [2].

Given the extent to which the Al-Hjrah company, regardless of its size, knows what activity it is doing today and is supposed to have the ability to choose from available alternatives, it is moving towards a future full of events and threats. Some managers have pointed out that the failure of many companies is due to their inability to adapt to the environment and lack specific strategies and strategic flexibility to achieve a competitive advantage [5]. the current study tries to identify the impact of supply chain integration through the supply chain response to the operational performance of the AL-Hjrah company. The problem of the study can be expressed by answering the following question: The impact of the integration of supply chain management into the strategic flexibility of the AL-Hjrah company.

The importance of the study stems from the vital role played by the supply chain internally and externally at the strategic level to reach the target performance and increase the company's growth of competitive advantages compared to competitors operating in the Saudi environment.

The importance of the study is also from the scarcity of studies on the subject of supply chain integration in strategic flexibility and based on the element of modernity in the proposals on strategic flexibility and strategic learning, being one of the subjects addressed by the researchers and focusing on each individual variable, or with different variables. In light of the rapid environmental changes in the Saudi environment [3], the companies in the study should keep abreast of these changes and developments through the rapid and continuous response to customer demands and contribute to the provision of modern services. This article aims to achieve the following objectives: -

- Identify the impact of supply chain integration (internal integration, external integration, strategic integration) in strategic flexibility.
- Discover the impact of internal integration in strategic flexibility.
- To clarify the impact of external integration on strategic flexibility.
- Understand the impact of strategic integration on strategic flexibility

The main hypothesis: There is no statistically significant effect at the level of significance (α = 00.05) for the integration of supply chain management in the strategic flexibility of the Al-Hjrah company.

- The **First Hypothesis:** There is no significant statistical significance at the level of (0.05) for the internal integration in the strategic flexibility of the Al-Hjrah company.
- **The second hypothesis:** There is no significant statistical significance at the level of significance (0.05) for external integration in the performance of strategic flexibility in the Al-Hjrah company.
- **The third hypothesis:** There is no significant statistical significance at the level of significance (0.05) for the strategic integration in performance and flexibility in the Al-Hjrah company.

Literature Review

The present study examined the impact of the integration of supply chain tools on the strategic flexibility

of the company in Asfan city- Saudi Arabia. It aims to identify the impact of supply chain integration (internal integration, external integration and strategic integration) on the operational performance of the Al-Hjrah company. Supply on organizational performance and the role of environmental disorders and identify the impact of supply chain management on the performance of the regulator and identify the strategic flexibility on the performance of Jordanian industrial companies operating in the international market and its appreciation of the competitive advantage of companies and the role of intermediary Strategic flexibility in the relationship between strategic learning and competitive advantage. Some of the previous studies agree with the current study in the use of analytical descriptive approach that fits some previous studies and differ in the sample of the current study with studies because each study has a specific sample according to the required study.

In [6], the article was conducted in Jordan on (418) medium sized industrial organizations through a sample size (200) samples. The results showed that there is a statistically significant relation to the form of mutual relationship between companies and suppliers in performance The supply chain, with its three dimensions (information exchange, post-sale service, supply elasticity of middle Jordanian industrial companies). The study recommended that the research companies raise the level of cooperation relations based on mutual administrative support between the parties to the relationship through cooperation based on time Areas of creativity and innovation, both to form relationships or future products and services.

The work [7] is an Empirical Study on Food Industries Companies in Jordan". The aim of this study was to investigate the impact of supply chain integration on the organizational performance and the role of environmental disorders.

An applied study on the food industry companies in Amman, Jordan. The study population may be from (833) companies. The results of this study showed that the level of the supply chain structure in the companies from the point of view of the study sample was high, and there is a statistically significant effect of the participation of suppliers on the performance of companies at the level of (α0.05). A statistically significant effect of supply chain integration was found on the performance of companies at the level of α (0.05). A statistically significant effect of the structure of the supply chain on the performance of companies was found at the level of α (0.05).

The study recommended that attention should be given to upgrading production lines in the companies in question and using more automated production techniques by increasing allocations related to R & D activity in order to achieve a real decrease in operational costs and keep abreast of technological developments.

The article [2] is A Field Study in the Industrial Companies Listed on the Kuwait Stock Exchange". The study aimed at studying the industrial companies listed on the Kuwait Stock Exchange to identify the impact of supply chain management on the performance of the regulator. The study population consists of (27) companies. The sample of the study was (108) questionnaire. The results of the study showed that the impact of supply chain management on the performance of companies, from the perspective of managers in higher departments. This effect was of a high level. The effect of the relationship with the brokers and distributors came first, followed by the effect of the relationship with customers in the second place, and finally the effect of the relationship came from the suppliers.

In terms of the impact of the relationship with suppliers on improving the performance of companies, the results of the study indicate that there is an impact of the relationship with suppliers on the performance of companies, from the Committee of Directors in the higher departments. The study recommended that companies adopt a strategic approach to supply chain management, based on long-term relationship with suppliers, effective communication and partnership with suppliers, because efficient supply chain management is key to the long-term success of the organization.

A study [4] of the views of a sample of managers in a number of private commercial banks in Iraq. The objective of this study was to determine the effect of strategic flexibility on banking performance. To achieve this, strategic flexibility was adopted by its dimensions (initial maneuvers, investment maneuvers, preventive maneuvers and corrective maneuvers) as an independent variable, while banking performance was adopted by its dimensions (financial perspective, customer perspective, The study was conducted in the private commercial banking sector and included a sample of (5) banks and the number of sample (100) employees occupying advanced administrative positions.

The study concluded with a set of recommendations and was among the most important recommendations are to enter the Arab and foreign markets through the opening of independent branches or the acquisition of a percentage of the shares of the banks mentioned. And the need to obtain physical, human and technological resources, and to build the necessary capacities and expertise to provide banking services that provide the customer with high value in terms of quality and cost of the mentioned services.

In [10] the study aimed to demonstrate the impact of strategic learning on the competitive advantage of Jordanian insurance companies and the role of strategic

flexibility in the relationship between strategic learning and competitive advantage. The survey method was used. All Jordanian insurance companies located within the capital Amman were targeted. Both regression analysis and path analysis were used to test hypotheses. The study concluded that there is a significant impact of strategic learning (strategic knowledge generation, strategic knowledge distribution, strategic knowledge interpretation, implementation of strategic knowledge).

In the light of the results, the study recommends the importance of taking advantage of the knowledge related to the external environment, By directing the activities of those companies towards identifying the resources and capacities to be developed and built so that they can respond effectively to their environment requirements and achieve competitive advantage.

The Research Methdology

The present study aimed to demonstrate the impact of the integration of supply chain management in the strategic flexibility of the company in the city of Asfan. The method and procedures include the research methodology, the study society and sample, the demographic variables of the research sample, the research tools and sources of information, Examine the validity and stability of the study instrument.

The current research is an analytical descriptive research to determine the nature of the contents of supply chain management in strategic flexibility, and to determine the impact of supply chain management in achieving strategic flexibility in the company of AL-Hjrah in Asfan. The research community is one of the employees of the AL-Hjrah Company in Asfan. To determine the analysis unit, the 80 employees and employees of the Company's departments were identified. A random sample of (40) samples was distributed. To achieve the objectives of the search lost the research was based on two basic sources of information gathering.

Secondary sources: The researcher aimed at addressing the theoretical framework of the research to the secondary data sources, which are represented in the relevant Arab and foreign books and references, and the previous researches and studies that dealt with the subject of research, research and reading in different internet sites.

Know the basics and sound scientific methods in the book of studies, as well as take a visual perception of the latest developments in the current research topics.

Primary sources: To address the analytical aspects of the research topic, the primary data collection was used through the questionnaire developed by the researcher as a research tool, which included a number of statements that reflected the research objectives and questions that the respondents answered. The five *LIKERT* scale was used, Each answer took relative importance. For the purposes of the analysis, the statistical program SPSS was used. The questionnaire included three parts:

The first part is the demographic characteristics of the sample members through (4) variables (age, scientific qualification, number of years of experience, and career status).

Part II: Ensuring the integration of the supply chain across three main dimensions (internal integration, external integration, and strategic integration). And was adopted in the development of paragraphs and was (12) paragraph.

Part 3: The strategic flexibility was determined through three main dimensions (capacity flexibility, resource flexibility, quality) and was adopted in the development of paragraphs (12).

In order to answer the questions of the study and test hypotheses, the researcher used the statistical package for social sciences SPSS. Through previous statistical programs, the researcher applied the following methods:

- Frequency and percentage in order to determine the measurement indicators adopted in the research and analysis of the characteristics of the sampling and analysis unit demographically.
- The computational medium means the level of response of sample members to the sampling and analysis of their variables.
- Standard deviation to measure the degree of divergence of responses of members of the research and analysis sample from the arithmetic mean.
- *KORNBACH ALPHA* coefficient to measure the stability of the study tool (the questionnaire) and the degree of internal consistency and the degree of credibility of the answers to the paragraphs of the questionnaire.
- Test t for one sample in order to verify the question of the subjects of the prepared questionnaire compared to the speculative mean.
- The coefficient of variance amplitude and the permissible variation test to ensure that there is no link between independent variables.
- Multi-gradient regression analysis to verify the effect of a set of independent variables on a single dependent variable.

Numerical Results

The results of the statistical analysis showed a statistically significant impact of strategic integration in achieving the flexibility and quality of the AL-Hjrah company. (0.072), i.e, the value of (0.072) of the changes in the flexibility and quality of the AL-Hjrah company in Asfan due to the change in strategic integration. The value of the effect of β (0.299) (0.299) for strategic inte-

gration. The significance of this effect confirms the calculated value of F (12.077), which is a function at (0.05).

Supply chain management proves that it is the management of design, planning, implementation, monitoring and follow-up of all activities to provide the end consumer needs of goods and services from sources to point of consumption. In time, place, shape and quality. Many people as well as business management professionals do not know the difference between managing supply chains from a hand and managing logistics from the other side.

In order for us to know the difference, we first review the definition of the organization of Supply Chain Management (CSCMP) for both terms.

Managed by supply chains as defined by Supply Chain Management Organization (CSCMP), it includes planning and managing all activities related to sourcing, procurement and logistics activities. It also includes coordination and cooperation between all parties involved in the supply chain from suppliers, intermediaries, service providers and customers.

The core management of supply chains is to create the integration of demand and supply through the coordination of companies to create a model for high-performance business management. As for the definition of logistics management, it is part of the management of supply chains that carry out planning, implementation and control operations for efficient and effective forward and back flows and storage of goods, services and information from source to point of consumption in order to meet customer requirements.

Logistics management includes inbound and outbound transport management, fleet management, warehousing, cargo handling, delivery orders, network design, logistics flow, inventory management, and follow-up of logistics providers outside the organization. It also includes the process of sourcing, procurement, planning, production schedule, packaging, Customers.

Logistics management includes all levels of planning and implementation (strategic-operational-tactical). The Logistics Department is an integrative department where it coordinates marketing, sales, manufacturing, financial management and IT management. Based on the above two definitions, it is clear that logistics management is part of the management of supply chains and is not merely a term synonymous with supply chains as a modern term that transcends the integration of logistics services with other activities within the organization into integration with other legal entities in the field of flow of goods and services. In other words, while logistics management is concerned with the establishment of a flow plan for the specific goods and services of a particular organization, the management of supply chains, in addition to linking and coordinating logistics operations in more than one facility within the supply chain.

This confirms the validity of the acceptance of the third main hypothesis in part and therefore rejects the hypothesis the third nihilism is partially accepted, and the alternative hypothesis is accepted: There is a statistically significant strategic integration in performance, flexibility and quality in the AL-Hjrah company at the level effect ($\alpha \leq 0.05$). The main results of this article clarify the following important notes: -

- Research results show that the integration of supply chain management affects the supply chain response in strategic flexibility.
- The research findings indicated that the integration of supply chain management affects operational performance and strategic flexibility.
- The results of the research found that the integration response of supply chain managers affect strategic flexibility.
- The results of the study showed that supply chain responses do not mediate the impact of supply chain integration in strategic flexibility.
- The results of the research indicate that the majority of employees in the AL-Hjrah company deal with two suppliers and less, as evidenced by the length of the period of dealing between companies and suppliers, which gives the impression of an intimate relationship between companies and suppliers are spreading a spirit of trust and joint action to achieve the interests of all parties.
- In addition to the presence of an insignificant proportion of other companies rely on more than three suppliers in the procurement process, despite the development of suppliers and their absorption of the needs of companies in a timely manner, it can be said that the AL-Hjrah company has a greater bargaining power.
- The researcher believes that the reason for this can be explained by the desire of the managers of the company to take advantage of the benefits of strategic flexibility between suppliers.
- The results of the research indicated that there is an impact of external integration in operational performance and strategic flexibility. This is because the company establishes a partnership and cooperation relationship with the suppliers to ensure the production requirements in a timely manner so that it can meet its commitments to its customers on time. Facilitate the process of joint exchange of information on products and processes and scheduling of production, which helps to develop production plans and production of required goods without delay, and improve the delivery time of

products. This means that external integration is a key to the company's success to create a balance between raw material movement, manufacturing processes and distribution activity.

- The results show that strategic integration affects operational performance. This indicates a state of alignment between the strategic direction of the supply chain and the general strategy of the company. This alignment enables the company to respond to changes in demand in terms of quantity and quality without the need for surplus in stock. The company also learns to develop strategic partnership programs with key suppliers in favor of the supply chain, and to involve them in the strategic planning process and in the development of products and services provided.

Supply Chain & Logistic Services in Big Data Era

As the company's interaction with the environment is a prerequisite for its survival and existence, and the response to environmental variables and adaptation, it is imperative that the management of the companies undertake the strategic planning of the supply chain to suit these changes. It is known that supply chain management begins with the design of a product or service and ends at a time when it is sold, consumed and consumed by the consumer. Including product design, needs management, forecasting, planning, production, distribution, delivery and after-sales service. On this basis, the present study seeks to demonstrate the impact of supply chain capabilities in achieving competitive advantage

Recent developments in technology have transformed our way of life and business. The logistics and supply chain sectors have tremendous transformational power. Emerging technologies such as mobile applications, mega data, Internet stuff, and artificial intelligence offer many new opportunities to conceptualize logistics operations and supply chains. This has helped logistics and supply chains reduce inventory costs, reduce working capital, reduce storage space and improve market access.

The mobile application technology has enabled logistics organizations to carry out their operations remotely without being confined to the workplace. Logistics managers and fleet owners can track their shipments on the map in real time from their location. Using geo fencing technology, customers and fleet owners can receive regular and periodic vehicle and vehicle arrival alerts.

Big data, advanced analytics and Internet technology are a huge revolution in logistics industries; they can monitor, track and store vital information from each truck, including its route, fuel consumption rate, downtime, container temperature, etc. By taking advantage of this data, they can make intelligent decisions and control many of these parameters at the central location. In addition, the artificial intelligence world allows logistics industries to solve complex problems of driver distribution, vehicle location data, and vehicle allocation. Automated learning techniques help to match supply and demand in real time with effective utilization of available resources.

The logistics technology companies such as Trukkin utilize the above-mentioned techniques to improve efficiencies, transparency and facilitate logistics support in the Middle East. Trukkin has launched web portals and mobile applications for customers / shipping companies, drivers, and fleet owners. Logistics companies in the Middle East can now take advantage of available solutions to improve efficiencies and reduce costs. Trukkin continues to invest in other technologies such as advanced analytics, large data, Internet stuff, and artificial intelligence to help transform logistics and logistics services. Watch out for everything new.

CONCLUSION AND RECOMMENDATIONS

The results of the study showed that the integration of the supply chain (internal acceptance, external integration and strategic integration) in the supply chain response is due to the fact that the company's involvement of suppliers and customers in its plans leads to a faster response of the supply chain and integration eliminates technical barriers between the company and suppliers Create a state of cooperation to meet market needs, help resolve internal conflicts quickly and ensure an efficient flow of information, inaccurate information leads to erroneous forecasting of market demand, and thus inefficiently allocating resources resulting in delayed delays in time Products. We recommend the following important points:-

- To establish long-term relationships with customers, through direct contracts with customers, collection of customer data, and use in designing and delivering products that meet their requirements.
- Internal integration requires a state of cooperation and effective coordination between the internal divisions (such as marketing, research, development, production, procurement and storage), ensuring the flexibility of the strategy to deliver products and services as one of the competitive tools.
- Improve the supply chain response to the market and any changes to the market by restructuring the company and streamlining business processes, because the supply chain response is the responsibility of all supply chain partners.
- The integration of the external supply chain in the company is linked to the level of interest that these

companies maintain to maintain strong relationships with suppliers and customers. Confidence, honesty, commitment and interest in each party should be the logo of those relationships to maintain a good level of external integration of the supply chain.

- Since the results of the research showed that the impact of supply chain integration is on the strategic flexibility of supply chain management, based on long-term relationships with suppliers, effective communication and partnership with suppliers, allowing for long-term agreements characterized by stability, firmness and strategic flexibility against changes The future.
- It has been shown that mutual trust and cooperation on various issues, such as cooperation in finding solutions to problems, are the basis for reaching a partnership. It also says that the integration of the strategic supply chain is key to the company's long-term success.
- Take advantage of information technology, for example electronic data interchange and documentation techniques, where it can help increase the speed of EDI and thus improve the level of supply chain integration.
- Other studies that take into account market orientation as an intermediary variable that mediate the impact of supply chain integration on performance and strategic flexibility.
- Other studies include the impact of supply chain integration in competitive and strategic advantage.
- Conducting the study on other sectors such as services sector.

The need for supply chains has arisen because of the cost constraint that enables us to take advantage of external opportunities as a result of the relationship between the company and its customers and between the company and the suppliers. The supply chain management relates to managing the flow of information, materials, services and money through any activity In a way that maximizes the effectiveness of operations. It is also about introducing new tools, changing or modifying known methods. Efficiency is efficiency and success.

REFERENCES

[1] Idris, Wael Mohammed Subhi Idris, Ghalebi, Tahir Mohsen Mansour (2003), "Testing the Effect of Strategic Flexibility as a Mediator on the Relationship of Environmental Uncertainty to Strategic Decision Making: A Pilot Study in Jordanian Human Medicines Manufacturers", Arab Journal of Management, Volume 33, Number (1).

[2] Barazi, Turki Dahman (2012), The Impact of Supply Chain Management on the Organization's Performance, Unpublished Master Thesis, Middle East University Amman: Jordan.

[3] Abdel Rahman (2013), Strategic Flexibility as a Changing and Adaptive Impact of Pilot Pilot Guidance on Progressive Technological Innovation: A Pilot Study on Royal Jordanian Airlines University of the Gulf, Kingdom of Bahrain, Volume (5), Issue (3).

[4] Hamad, Zeina Mustafa (2013), The Impact of Supply Chain Integration on Organizational Performance and the Role of Environmental Disorder: An Empirical Study on Food Industries Companies in Jordan, Master Thesis, Business School, Middle East University, Jordan, p. 89.

[5] Zoubi, Hassan Ali (2005), Strategic Information Systems Strategic Approach, First Edition, Dar Wael Publishing and Distribution, Jordan.

[6] Al-Shamsain, Salem (2013), The Impact of Strategic Intelligence on Enhancing Strategic Flexibility: An Empirical Study on Jordan Phosphate Mines Company Limited, Unpublished Master Thesis, Mu'tah University, Jordan, pp134-135.

[7] Al-Atawi, Muhannad Hamid Yasser (2012), The Effect of Strategic Flexibility on the Entrepreneurship of Business Organizations: An Empirical Study of the Opinions of a Sample of Managers of Small and Medium Enterprises in the Construction Materials Industry in Najaf Governorate, Journal of Administration and Economics, Vol. I, No. 9.

[8] Al-Khalidi, M. (2012), The Relationship between Operational Strategies and Strategic Direction of Information Systems and their Impact on Supply Chain Management: An Empirical Study on Kuwait Oil Tankers Company, Unpublished Master Thesis, Middle East University, Amman.

[9] Taweel, Akram Ahmed, Ismail, Ragheed Ibrahim (2008), The Relationship Between Types of Technical Creativity and the Dimensions of Competitive Advantage, A Field Study in a Selected Group of Industrial Companies in Nineveh Province, Faculty of Management and Economics, Department of Industrial Management, Mosul University, Iraq.

[10] Obaid, Sulaiman, Al-Shawish, Najib (2001), Modern Warehouse Management and Procurement: Supply Chain Management, Dar Wael Publishing, Amman, Jordan.016.0072.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Total Factor Productivity in Sudan Economy Based on Growth Accounting Model

Safa Mohamed Elhassan Youniss
Faculty of Business, Jeddah University, Al-Kamel Governorate Branch- Jeddah, Saudi Arabia

ABSTRACT

Recognize the contributions of physical capital, human capital, and the rest of the other factors in the process of economic growth, according to an expanded approach of growth accounting. The study covered the period from (1970-2008) depending on annual data for the variables of this study. The gross fixed capital formation is used as an indicator of physical capital, and one of the objectives to reach a suitable estimate of the human capital that used in the analysis. Calculation the work item index and average wages using data on years of education, and the return from Education (intended here wages received by the worker). This method determining the weights of the various levels of educational attainment based on the rate of return, which received from the education, and the element of the adjusted Labor of human capital (or wages). The human capital is an index measuring the contribution of the skilled work rate element which is very good at the distribution of education gained by the country. The human capital is best measured by average years of schooling of the workforce. The study Applied the co-integration approach to estimate the elasticity of production for physical capital, then used ordinary least squares method to estimate the solow residual, Therefore the total factors productivity, the results of the study shows that physical capital accumulation plays an important role in economic growth in the Sudan during the period of 1970-2008, while human capital comes second in terms of importance. As well as show that the growth rate of total factors productivity factors in Sudan was very low and it takes negative values in some periods, especially during 1980 and 1990. The study proved that the total factors productivity does not play an important and decisive role in the economic growth process in Sudan during the period of study.

KEY WORDS: GROWTH ACCOUNTING, , TOTAL FACTORS PRODUCTIVITY (TFP), HUMAN CAPITAL INDEX, COBB–DOUGLAS PRODUCTION FUNCTION

ARTICLE INFORMATION:

**Corresponding Author: smyounis@uj.edu.sa*
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/13

INTRODUCTION

Adam Smith's productivity idea emerged through the division of labor, and the theory of growth was considered classic. The increase in productivity was linked to an increase in the share of capital, which would reach the diminishing returns. The authors of the modern theory of growth saw investment in human capital, increasing the training of workers in continuing education will necessarily increase productivity continuously.Economic growth has two sources: quantitative growth in factors of production; qualitative growth in the use of factors of production and management of the entire production process. The development of two types of productivity is usually seen as the productivity of each factor of production, often focusing on labor productivity, and the second on total productivity of production factors (TFP). Productivity is measured by the quality of input conversion to outputs or what is known as total productivity which reveal the effect of technological, cognitive and regulatory progress on increasing production, and indicate whether growth has been expanded through quantitative expansion of production inputs or qualitatively through the productivity of all its factors.

The total productivity of the factors of production is the qualitative source of economic growth (the quantitative source is the material investment and the number of workers). It reflects the technical aspect of the production process as well as the human capital. Thus, the economic growth rate cannot be sustained through cumulative increases in growth sources Quantity, because these resources are limited on the one hand and are subject to diminishing yield law on the other. Growth based on knowledge production generated by a high investment in human capital is reflected in the process of production through the process of technical progress leading to In addition, the state's investment in health, education and scientific research is a real investment and not a subsidy. Knowledge production returns are not subject to the law of diminishing yields because of its creative and creative capabilities. For example, more than 70% of the economic growth of the last century United States to total factor productivity, which was developed by Mabat, known as the "new growth theory," which argues that economic and social growth in the knowledge-based or commonly used economy under the name of the "knowledge economy" depends on the technological level and on the growth of this level measured by productivity measurement.

This study is an attempt to estimate the total productivity of the production factors (TFP) in the Sudanese economy in order to link economic development with both physical and human capital (as measured by the adjusted labor force) and total productivity of the factors of production. And then distribute the growth to its sources based on annual data covering the period 1970-2008, based on the principles of internal growth theory. This research consists of five sections, the first section introduction and the second section deals with the concept of total productivity of factors of production, in addition to the theoretical framework for estimating the total productivity of factors, and the framework of the expanded framework for growth accounting. The third section deals with the applied framework for estimating the total productivity of the factors of production. The fourth section is devoted to presenting and analyzing the applied results. The study also includes in its last section, the summary and the main findings and recommendations. In this study, the method of joint integration will be used to estimate the elasticity of production for capital and the method of ordinary squares to estimate the rate of growth of total productivity of production factors, in order to distribute economic growth according to its sources according to the expanded framework of growth accounting.

1. THEORETICAL AND EXPERIMENTAL FRAMEWORK

1.1 Total Factor Productivity (TFP)

Total Productive Productivity (TFP) reflects growth in the level of production that is not attributable to production inputs (physical capital, human capital) or the change in the economic yield. Efficiency and technical change are the two most important factors at this level. The total productivity growth rate is known as Solow Residual. Neither the solu- tors and total factor productivity are necessarily measured solely to measure the effect of technical progress on growth, but to explain the contribution of other factors to production inputs to output growth, On economic growth such as technical progress, innovations and others, including what affects negatively, such as disasters and crimes. The growth of total factor productivity is an important indicator of economic performance (Aiyar&Dalgaard, 2004).

1.2 The Theoretical Framework of Total Productivity of Production Factors

Several economic theories dealt with the subject of economic growth and the factors influencing its level. The classical economists linked the level of production with both capital and labor. They pointed out that increasing capital and labor leads to raising the level of production and then to growth. Influenced by the industrial revolution and the technological inventions that led to higher levels of production, the neo-classicalists added to the factors of traditional economic growth as an addi-

tional factor of technological progress. The concept of growth, as an increase in the volume of production, was defined as the Solow 1957 model. In this model, an analytical model was reached for long-term growth. With this approach, the role of technical progress has become critical and more important than the accumulation of capital. The model was based on two basic assumptions: first, the efficient use of all economic resources, the second is the decrease in capital returns and the increase in business returns. By accepting these assumptions, the model's expectations were summarized as follows:-

- Growth is generated by an increase in the share of capital to work due to higher productivity of individuals as a result of providing them with more capital.
- The rate of growth in poor countries is rising as the return on investment in physical capital increases faster than the rich countries, which have a large stock of capital.
- The economy is likely to reach a stable state in which the new increase in capital does not lead to economic growth due to the decline in capital returns. It is possible to overcome this situation and continue to grow through external factors (exogenous) of new technological innovations (Solow, 1994, p.2-3).

The theory of external growth (Exogenous Growth) was based on the possibility of overcoming the state of stability. The continued growth, despite the diminishing returns of physical capital, depending on an external or independent factor (determined from outside the model), is the creation of new technologies that allow for higher factor efficiency.The high level of capital formation in some countries has prevented them from achieving high growth rates, and some economists, such as Barro and Baker, have maintained economic growth models based on higher productivity based on technical progress as an external factor. Therefore, growth models have been developed where technical progress is driven by economic factors that are determined from within the model (Barro&Mankiw and Martin, 1994, p. 408-409). This trend reinforced the influence of some economists & Weil, Mankiw on the role of human capital in the economic growth observed in the German experience after the Second World War, which led to the emphasis on the importance of accumulation of human capital in a similar way to the accumulation of physical capital.

Endogenous growth theory provided an example of internal growth centered on integrating the concept of human capital, such as skills and knowledge that make individuals more productive. Unlike physical capital, human capital is characterized by increasing rates of return, so that growth does not slow down when human capital accumulates. Studies in this context have focused on factors that increase the efficiency of human capital (education), for example, or raise the level of technical progress (innovations). Thus, growth is linked to the theory of internal growth, in addition to the elements of physical and human capital, The efficiency of the labor force of skills and knowledge, or increases the level of technical progress such as innovations and inventions. These factors fall under the heading of total productivity of production factors (Mankiw, Romer and Weil, 1995, p.3-5).At the practical level, there are several approaches in which overall productivity growth of factor factors can be estimated, both in terms of the Solo approach and the broader framework of growth accounting methodology:

First: Solow Approach:

Solow, 1956, published a simplified model that included an analytical framework for the causes and dynamics of economic growth and then published a second paper entitled "Technical Change and Production Function" in 1957, in which he pointed out that the overall growth rate of production, Growth of factors of production, especially physical capital, labor, technical progress or (total factor productivity). Solo used the following model:

$$Y_t = A_t . F(k_t, L_t) \quad (1)$$

Where: :Y_t the total product or total income, k_t, capital stock used in production, L_t the size of the labor force involved in the production process, and the technical level A_t (total productivity of the factors of production). Taking into account the difference in the previous equation for time and shortness, and assuming that output returns are stable, the growth rate of output by growth sources can be divided into:

$$\dot{Y}_t = \dot{A}_t + \alpha \dot{k}_t + \beta \dot{L}_t \quad (2)$$

Where α and β, the production elasticities of both capital and labor and assuming the stability of the returns of the elements of production ($\beta = 1-\alpha$), and point above the variable on the growth rate. In order of the equation above, the growth of the total productivity of the factors of production (A_t) or the so-called Solo condoms can be obtained as follows:

$$\dot{A}_t = \dot{Y}_t - \alpha \dot{k}_t - \beta \dot{L}_t \quad (3)$$

The above equation has been used by Solo himself along with many researchers such as Senhadji as well as Iradian, Senhadji.

Second: Extensive Growth Accounting Approach:

Recent studies, such as Bosworth and Collins, Senhadji, Bosworth and Susan, and Abu-Qran& Abu-Bader, have

used the expanded framework of growth accounting to estimate the growth rate of total factor productivity by integrating the impact of education on economic growth with a capital appreciation Human. More specifically, the Cobb-Douglas model of fixed-size returns, including the two production factors: physical capital (K) and human capital (H), was estimated as shown in the following equation:

$$Y_t = A_t K_t^{\alpha} H_t^{1-\alpha} \quad , \quad (0 < \alpha < 1) \tag{4}$$

Where α share the physical capital K of the total product, and (α-1) share of human capital H. To estimate human capital (H), labor force (L) is weighted by coefficient (h_t), which represents the quality of education received by a worker. This rate is defined as the following:

$$h_t = e^{(r.s)t} \tag{5}$$

Where s_t is the number of years of schooling (average year of schooling) or average years of schooling as some call it, in the age group of the labor force (15-60) years, and (r) represents the rate of return on investment in education (The rate of return to schooling. Thus, human capital is defined as:

$$H_t = h_t . L_t = e^{(r.s)t} . L_t \tag{6}$$

The equation (4) is written in the same way as equation (2). After the variable L is replaced with variable (H), the output formula can be obtained by the following equation:-

$$\dot{Y}_t = \dot{A}_t + \alpha \dot{k}_t + (1-\alpha)\dot{H}_t \tag{7}$$

As above, the point above the variable indicates its growth rate.

By rearranging equation (7), the overall factor productivity growth rate can be obtained (Senhadji, 2000, p.132-133):

$$\dot{A}_t = \dot{Y}_t - \alpha \dot{k}_t - (1-\alpha)\dot{H}_t \tag{8}$$

In this research we will use this modern method to estimate the total productivity of the factors of production in the Sudanese economy.Despite the importance of this indicator, its assessment and calculation suffer from many difficulties. The calculation of the overall productivity growth rate of the factors of production is calculated in a safe manner; its estimation is closely related to the estimation of the other factors involved in the relationship. Solo errors include the model variables, especially those related to the various assumptions in estimating the capital stock, capital Human. In addition to the standard estimation of production elasticities for capital and labor, the constraints on volume returns in the production function and the method of calculating the growth rates of both output and physical and human capital.

2. SPECIFICATIONS AND ESTIMATION

2.1 Characterization of the model used in the study

Based on the theory of internal growth, and building the expanded framework for growth accounting used by a number of economists such as Bosworth and Collins, Senhadji Bosworth and Susan, Abu-Qran& Abu-Bader, Psacharopoulos, and Edward Denison. Assuming that the function of production we use is a form of the production of a fixed-size copodogloss which takes the following form:

$$Y_t = A_t K_t^{\alpha} h_t^{1-\alpha} \tag{1}$$

Whereas

Y_t: represents real GDP (Real GDP.

k_t: represents the physical capital stock.

h: Equivalent ($H_t L_t$), which is the modified work component of

human capital index (ie, human capital per worker.

A_t: Total productivity growth rate (Solow Residual*).α: share the* physical capital K of total output.

α: share of human capital per worker h.

(1 - α): The growth rates of the variables will then be estimated and the total productivity of the production factor will be calculated according to the following equation h*:*

The growth rates of the variables will then be estimated and the total productivity of the production factor will be calculated according to the following equation:

$$\dot{A}_t = \dot{y}_t - \alpha \dot{k}_t - (1-\alpha)\dot{h}_t \tag{2}$$

Where: *($\dot{y}_t$)* the GDP growth rate of the worker, obtained by dividing the growth rate of GDP by the economically active population (labor component.

($\dot{k}_t$): the rate of growth of the worker's physical capital, and also by dividing the physical capital by the economically active population (the labor component.

The value of α will be measured according to an appropriate standard model.

2.2 Applied Results to Estimate Total Productivity of Production Factors

Before starting the estimation, it is necessary first to define the variables used in this study and to clarify the methods followed by the study in the estimate, including the element of physical capital and human capital.

3.2.1. Definition of study variables

Gross Domestic Product "GDP"

In this study, real GDP data will be used as a standard measure of economic development, available to the Sudanese Statistical Organization

Physical Capital

It is an inhuman wealth made by humans and then used in the production process.

Measurement of physical capital: Unlike human capital, which is relatively easy to measure in monetary terms, as is well known, especially in developing countries, there is no time series data on physical capital stock. Therefore, it is often used as an alternative investment-based indicator, Gross fixed capital formation.In line with the traditional traditional theory, following several previous applied studies, it was found that they were based on the estimation of physical capital and the construction of a time series of physical capital on the permanent "Perpetual Inventory Method" which includes the previous investment flows over the years with taking into account the estimation of the duration of service and the rate of consumption of fixed physical capital, according to the following equation:

$$K_{t+1} = (1-\delta).K_t + I_T$$

Where I_T represents the total investment, and δ is the depreciation rate of fixed capital (Scoppa, 2007, p.20-25). Because of data constraints, particularly in developing countries, literature usually uses total investment as an alternative to the physical capital stock (Benhabib & Spiegel, 1994, p.146). In this study, we will rely on gross fixed capital formation as an alternative to physical capital in Sudan, using data available from the Central Bureau of Statistics for the period of study. These data are available in Annex 1.We obtain the stock of physical capital per worker used in this estimate by dividing the physical capital by the economically active population (labor component).

Economically Active Population (L): In this study, economically active population data will be used as an indicator of the labor force. The economically active population represents all individuals who are over a certain age and who can be classified as inactive or inactive in light of their basic activity (Cences, 1973, p.30). In most countries, economically active population data is available in censuses every five or ten years (available in Appendix 1). To complement the purposes of the analysis for the annual study series covering the period from 1970 to 2008, Exponential Method.

The exponential method (EM): EM is one of the most voluntary ways of a population subject to constant composite change when change occurs at every moment and day of the year. Thus, the exponential model or Lautka model created by mathematician Malthus and developed by Lotka) In 1907, based on the Maltos model in its derivatives, named after the Lautka model. Assuming that:

r: Annual growth rate
$N(t) = P_t$ Population per year t
$N(0) = P_0$ Population in the base year

The exponential model or Lautka model of population estimate is written as follows:

$$N(t) = N(0)e^{rt} \quad (1)$$

Or formulated as follows:

$$P_t = P_0 e^{rt} \quad (2)$$

Where e is a normal logarithm (2.71828), r is the exponential growth rate, t is the time difference between P_t and P_0.

For example, if P_t is the year 1984, the missing year is obtained using 1983 data, namely P0 or base year, but to use this equation first, the exponential growth rate for the base year must be calculated and calculated by the following equation:

$$r = \frac{1}{t} \ln \frac{P_t}{P_0}$$

Where: P_t is 1983 and are the 1973 data, where we obtain the growth rate for the base year based on the earliest previous year where t here is 10 years. Then we obtain the data for the comparison year using equation (2). Where the above equation is used for the distressing model in estimating the population and predicting future periods. The exponential model can also be used to estimate the number of births as well as the number of deaths. This method has been used to obtain all the data that is not available for many reasons in the competent authorities. This method has been adopted in many studies and scientific researches as the best scientific method in estimating and predicting and most suitable especially in the population data because the population is increasing exponentially and formulas Nonlinear forms are the most appropriate form, especially the Lautka model.

Adapted labor component of human capital (h)

Human Cpital Index

Most studies in growth accounting focus on the role of human capital and its contribution to economic growth. Most of these studies assume that human capital measured by education is an intermediate variable. In most cases, educational standards are inadequate, Status of use of agreed levels of comparison between States. Education may also result in benefits that are sometimes not measured within growth in GDP. For example, education improves the health of the population and, moreover, improves the ability to absorb information technology that facilitates the spread of technology and innovation. Direct to improvements in GDP growth that may

be associated with investment in education (Hers, 1998, p.15-23).

In the same direction, many studies found that it is difficult to detect the existence of a significant relationship of statistical significance between the change in the years of study and economic growth, and these studies have presented different explanations confirm the existence of some problems in obtaining data on educational achievement in some countries, And that it is not sufficient to measure the quality of work (because it allocates non-literate workers to zero weights), which indicates the unequal changes in the quality of work for countries that suffer From a drop in Primary levels of education. There are also many studies based on the ratio of students enrolled in schools to measure changes in education, but found that this indicator is facing a problem similar to the problems facing the investment rate as a measure of accumulation of natural capital (useful only if the case of stability or deviation to stability). In addition, many years of schooling were used in growth studies, but this method failed to measure the accumulation of human capital during the study period. Benhabib and Spiegel used average years of schooling in internal growth models where the rate of productivity growth depended on human capital formation (Susan and Bosworth, 1996, p.135-139)

As a result, many studies in a number of countries have made adjustments in the labor force, including education, age and gender. Both Psacharopoulas, Senhadji, and Susan Bosworth have introduced the labor quality index or the modified labor component of human capital as a production input in the production function, Human capital in economic growth, where they calculated the adjusted labor component index using data on years of education and return from education (this is the wage paid by the worker). This method includes determining the weights of the different levels of educational achievement based on the rate of return obtained from T Lim (Abu-Gran & Abu-Bader, 2007, p.753-755).

In this context, Edward Denison (1967) and others attempted to use estimates of the relative wage structure of workers with different levels of education to build two groups of workers across different educational levels and then calculate the human capital index using the following relationship:

$$H = \sum_{j=1}^{n} W_J P_j$$

Whereas:-

W_J: The total weights of wage averages for workers with different levels of education (that constitute the educational levels include uneducated workers, those with basic, secondary and university education). These weights are calculated from the wage scales issued by the competent authorities based on the grades of the different educational levels. The average wage data for the various educational stages are available in Appendix 4; Wages in any model or economic analysis to express in a simplified and concise manner the many determinants that reflect what is known as the wage structure.

P_J: The percentage of population with a specific educational level The percentage of educated population with primary, secondary and tertiary education is available in Annex 3.

After calculating the human capital adjusted by wages, as in the previous equation, the adjusted labor force is obtained by human capital: $H_t L_t$ = h by multiplying the value of (H) in the economically active population (L) as a labor force (LborForce (Susan and Bosworth, 1996, p.142-144)

The adjusted human capital component is an indicator that measures the contribution of the skilled labor component and is also very good in the distribution of in-country education gains better than the human capital measured by the average years of schooling of the labor force. Several studies indicate that the adjusted worker component is very important in explaining growth in GDP and its contribution to output growth is very high in most of the countries where such studies were conducted (Hers, 1998, p.14).

Using the structure of the previous equation, we calculated the adjusted labor component of human capital or the so-called skilled labor component in Sudan during the study period (in Appendix 1) for use in the growth calculations in the study period. We calculated the relative weights of all workers The different educational levels available to us in Sudan (where levels of education differ from one country to another). Pay scales are available in the Office of Service Affairs and are divided by sectors and according to service entrances and job grades based on the level of education of the worker. As for educational attainment data or population ratio data obtained at a certain level of education, we used the data in the various censuses as well as the data available in the Paro and Li database, available as is known every five years. In order to obtain the available years, Which we explained in previous paragraphs to obtain annual data supplement for research purposes. Data on economically active population (L) are available in population censuses, which we have explained earlier.

Educational Attainment Ratio

The main problem with this indicator is that it is available only in population censuses. Since Sudan, like all other countries, has a population census every 10 years, it is difficult to obtain data on educational attainment every year. The data used in the 1973, 1983, 1993 and

2008 censuses were used in this research. In addition, the data included in the Barrowli Information Base for the educational achievement of a number of countries, including Sudan, were used to estimate the average years of study in Sudan during 1950-2010 (Barro, R. and JW. Lee (2010, p. 24-25)).

The available data on the Education attainment data were used from the Barrow database every five years, in addition to the data obtained from the Central Statistical Organization in the census years mentioned above, the unavailability of data annually, and the obtaining of data on human capital in Sudan each year. A slight interpolating adjustment in Barrow and Lee equations for human capital estimation, taking into account that this amendment will not affect the general picture of the structure of the equations and is intended to obtain annual estimates. This amendment is to use the previous Exponential Method Mentioned to To obtain annual data on educational attainment using data from various population censuses as well as data from parliaments. These data are the ones we used to estimate the human capital component adjusted above.

The Applied Framework for Estimating the Overall Productivity of the Factors of Production

This study aims to measure the total productivity of the production factors in the Sudanese economy during the period from 1970 to 2008 using the above mentioned model. The first step is to estimate the value of α (the share of physical capital of the total product or the elasticity of production for capital).

2.3.1 Estimation of the share of physical capital of the product (α)

Several attempts have been made to determine the appropriate value of the capital share of the output. Bosworth and Collins have identified the value of this. The index is typically used in many economies. This value is 0.35, while Senhadji uses 0.62 as a result of his estimate of the Kop Douglas equation with two variables: GDP for human capital component and physical capital for the human capital component. Senhadji used the method of co-integration to estimate the function of production, beginning with testing the root of unit 1 (1), and thus the possibility of a common integration of variables in the model. Secondly, to estimate the equation for the combined integration of the two variables used and to obtain value (the elasticity of production for capital).

In their study of growth sources in a number of African countries, including Sudan in the period 1960-1990, Abu-Qran and Abu-BAader used two methods to calculate the value of (α); the first method is Bosworth and Collins, the same method used by Senhadji and others (y_t) and physical capital for human capital (k_t). The other method is to perform regression of the two variables using the normal lower squares method. (0.37) and (0.51), in addition to a very low value of (0.07) compared to the countries of Abu-Qran and Abu-BAader. The other, when the normal regression of (y_t) on k_t. Abu-Qran and Abu-BAader attributed this low value to (0.07) to the fact that the role played by both human capital and total productivity of the factors of production in the Sudanese economy is exaggerated during the study period.

To estimate the value of (α) in this study we will first, using the Senhadji method, start by testing the existence of the unit root of the GDP variable, for the human capital adjusted labor component ($y_t = y_t/h_t$) of the modified labor component of human capital ($k_t = k_t/h_t$). Second, we will use the regression method used by Abu-Qran and Abu-BAader to estimate the value of () and compare it with the values obtained by some studies covering Sudan.

Unit Root Test: By dividing the GDP by the adjusted human capital component (y_t/h_t) to obtain (y_t), and the physical capital for the modified labor component (adjusted human capital) (k_t/h_t) for (k_t), after taking the natural logarithm of the variables, the following table shows the results of the unit root test for each variable.

It is clear from the above table that all the variables: the GDP variable for the modified work element () the physical capital variable for the modified work element (Lk_t) is static in its first differences, The following is a test of joint integration between the two variables to determine whether there is a long-term equilibrium relationship between these variables using the Johansen test to estimate the value of α.

Common Integration Equation To estimate the value of α: we will use Johansson's co-integration method to estimate the equation of co-integration with a view to calculating a value. The following table shows the existence of a single vector of co-integration between the model variables.

The results in the above table show the possibility of a long-term equilibrium relationship between the two variables. The variables have the expected signs and the statistical significance at a significant level of 5%. By comparing the calculated and theoretical values of the effect statistics and the maximum value, it is clear from the test of the effect and the maximum value that there is one common integration vector at the 5% significance level, summarized by the following equation:

$$Ly_t = -8.244 + 0.4353Lk_t$$
$$(5.2033)\quad (4.5124)$$

It is clear from the above equation that the variables are statistically significant at the level of 5%, since the

values between the brackets below the estimations represent the calculated value (t), and the cointegration equation shows that the value of α = 0.44 is closer to the estimates of Abu-Qran and Abu-BAader , 2007) and can be said to be a value in the long term.

The second method of estimating a value in the short term is the regression procedure of Ly_t on Lk_t, using the normal lower squares method. The following table shows the results of the estimation:

Initial results showed that there was a problem of autocorrelation in the model because of the lower DW value below the moral level. The table below shows the results of the evaluation before the statistical treatment. In order to solve the problem of self-correlation, the moving average method (1) After deducting the self-correlation problem, the results of the estimation in the table above show that the value of DW is at the moral level (1.4), the value of the selection factor is economically acceptable, and all the model variables are statistically significant Material Money for Human Capital (Lk), Yep The value of the coefficient, which is equal to (0.62), is approximately 0.62, which is a value in the short term. This value appears to be close to the estimates of the International Monetary Fund (IMF) IMF) by Senhadji, 2000, p.142-143, when applying the growth accounting method to estimate the growth rate of total productivity of the production factors in a number of countries in the African world (including Sudan), Europe and Asia during the period 1960-1994 and the equivalent of 0.63. Based on the values we obtained from a long and short term (0.44 and 0.62) calculation, we will estimate the overall long-run and short-term growth rate of production factors (A) .

2.3.2 Estimation of Total Factor Productivity Growth Rate (TFP)

Due to the achieved values of (0.44, 0.62), which is the share of the physical capital of the gross product. In the long and short term, respectively, we can obtain the elasticity and share of the Human Capital Index Share, (0.56 and 0.38), respectively, in the long and short term, using data on the worker's physical capital and the real GDP per worker, in addition to the adjusted labor component data in human capital, and based on the values obtained The annual rate of growth of total production factor (TFP) is obtained (Solow Residual) and (-0.066) in the long term from 1971 to 2008. If we assume that the value of α is 0.62, the annual rate of growth of the total productivity of the factors of production in the short term is (-0.092) This growth is attributed to technical progress and other factors, in contrast to physical and human capital, and it is noted that the growth rate of GDP during the period from 1971 to 2008 estimated at (0.0617) may be divided among factors of production

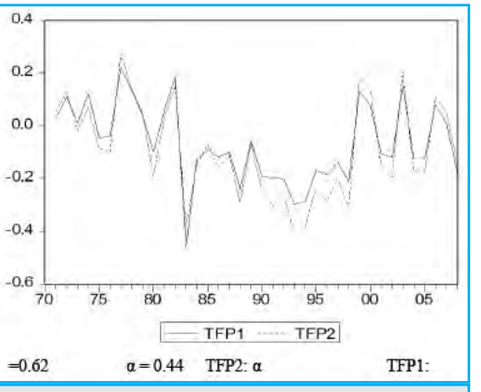


Figure 1. The rate of growth of total productivity of the factors of production during the period from 1970-2008

by 1.5% for physical capital and 0.6% Of human capital, and 1.1% of total productivity of production factors (long term). (In the short term); growth itself was distributed by 2.1% for physical capital and 0.40% for human capital, and -1.5% for total productivity of the factors of production during the study period, as shown in the following table:

Note: Figures in brackets are the ratio of total growth

From Table 4; the paths were divided into four secondary time periods for analytical reasons only. As mentioned earlier, the growth rate of total productivity of production factors represents the contribution of factors other than physical and human capital in the process of economic growth. It is clear from the table that the computational mean of the growth rate of total productivity of the factors of production was positive during the seventies and especially during the period from 1971-1983, While in other decades, especially in the late 1980s and 1990s, which was accompanied by well-known political and social events that affected economic and social conditions, with a sharp decline in real GDP growth rate. The results of the above table show that the growth rate of total productivity of the factors of production in Sudan was low and almost negligible as it is well below 1%. The following figure shows the rate of growth of total productivity of the factors of production during the study period in the long and short term:

- In view of the previous results and the graph showing the growth rate of total productivity of the factors of production in Sudan during the study period, the following can be observed:
- During the 1970s, overall productivity of production factors plays an important and positive role in economic growth and is therefore an important component of growth in that period.

Table 1. The Unit Root Test

Variable	Model without constant or trend		Model with constant only		Model with constant and trend	
	ADF-Stat	Critical Value 1%	ADF-Stat	Critical Value 1%	ADF-Stat	Critical Value 1%
Levels	-1.164	-2.63	-1.398	-3.62	-1.453	-4.23
	-2.525	-2.63	-0.423	-3.62	-1.660	-4.23
	-3.556	-2.63	-3.63	-3.623	-3.662	-4.23
First Difference	-2.1353	-1.950	-3.0143	-2.945	-2.873	-4.23

Table 2. The Co-integration test results

Eigen Value	Likelihood Ratio	Critical Value (5%)	Critical Value (1%)	Hypothesized No. of CE(s)
0.386144	18.84671	15.41	20.04	None *
0.034901	1.278872	3.76	6.65	At most 1
L.R. test indicates 1 co integrating eqn(s) at the 5% significance level				

- The accumulation of physical and human capital was the main element of growth in Sudan during the period from 1971 to 2008. This is evident from previous growth accounting procedures. The TFP growth rate does not appear to be a source of economic growth but rather a reduction in production efficiency.
- In the study period generally and in some secondary periods (1984-1996, 1997-2008), the growth rate of TFP is negative and leads to a decline in economic growth.

The results above agree with the findings (Senhadji, 1999, p.152-153), where the average capital share of growth was found to be greater than the average share of human capital and the average share of the total productivity growth rate of the production factor in some African countries.

Given Table 4, it is important to note the relationship between the value of α and the growth rate of TFP where we note that the increase in the value of α with the rest of the other things is the same, Of human capital or labor component adjusted by human capital (h) and total factor productivity (TFP). Collins and Bosworth, 1996, p.37), in their study of economic growth in some Asian countries, suggests that an increase in the value of α implies a decrease in the contribution of TFP to the growth process, Leads to a decline in the contribution of physical capital and an increase in the contribution of human capital, this result with the fact that physical capital is growing at a faster rate than human capital, and therefore leads to a negative correlation between the contribution of TFP and the level of α. This can be demonstrated by reference to the results we obtained in this study. For example, during the period from 1971-

Table 3. Dependent Variable: Ly

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Lk	0.617332	0.073507	8.398300	0.0000
C	-4.272187	1.054716	-4.050558	0.0003
MA(1)	0.723802	0.116054	6.236774	0.0000
R-squared	0.871414	Mean dependent var		-12.85939
Adjusted R-squared	0.864271	S.D. dependent var		2.674170
S.E. of regression	0.985204	Akaike info criterion		2.674170
Sum squared resid	34.94254	Schwarz criterion		3.009833
Log likelihood	-53.19640	F-statistic		121.9844
Durbin-Watson stat	1.352281	Prob(F-statistic)		0.000000
Inverted MA Roots	-.72			

Table 4. Distribution of overall growth among different factors of production (estimate of total productivity of production factors

Variables / Year	Average Growth rate of real GDP	Average Growth rate of real GDP Per worker (Y/L)	Value of capital share (α)	Average Growth rate of physical capital per worker (k/L)	Average Growth rate of human capital per worker (h)	Distribution of total growth between factors of production (average growth rate multiplied by the value of α)		Amount due to TFP
						Amount due to Physical capital (α *k)	Amount due to Human capital (1-α) *h	
1971-1983	0.170306	0.1386	0.44	0.154662	0.087299	0.0681 (49)	0.0489 (35)	0.022 (16)
-	-	-	0.62	-	-	0.0959 (70)	0.0332 (24)	0.009 (6)
1984-1996	0.03249	0.0105	0.44	0.35256	0.051226	0.1551 (15)	0.0287 (3)	-0.174 (-17)
-		-	0.62	-	-	0.2186 (20)	0.0195 (2)	-0.228 (-21)
1997-2008	0.06644	0.0338	0.44	0.106897	0.056726	0.0470 (1.4)	0.0318 (1)	-0.045 (-1.4)
-		-	0.62	-	-	0.0663 (1.96)	0.0216 (0.64)	-0.054 (-1.6)
1971-2008	0.090359	0.0617	0.44	0.20728	0.065304	0.0912 (1.5)	0.0366 (0.6)	0.0661 (-1.1)
-	-	-	0.62	-	-	0.1285 (2.1)	0.0248 (0.40)	-0.0916 (-1.5)

1983, it can be observed that an increase in α value from 0.44 to 0.62 reduced TFP contribution from 16% to 6% respectively. In the same period of time, It can be seen that the decline in the value of α from 0.62 to 0.44 leads to a decline in the contribution of physical capital from 70 to 49% and increase the human capital adequacy from 24 to 35%. In the period from 1971 to 2008, the increase in the value of α led to an increase in the contribution of physical capital and the decline in the contribution of human capital to the growth process. Also, the decline in the contribution of TFP to the production process is very significant, with the contribution of total productivity to factors of production very low sometimes , Which led to a decrease in the GDP growth rate of the worker (0.0617), which can be demonstrated by other time periods. It is therefore possible to say that the total productivity of the factors of production is not always a major factor driving economic growth, but often the contraction of economic growth.

It seems that the estimation of the total productivity growth rate of the factors obtained in this study can be compared directly with the results of other studies that estimated the rate of growth of this productivity for some regions and countries, which includes Sudan, or to cover the Sudanese economy. It should be noted here that the results of this study, which estimated the rate of growth of total productivity of factors do not contradict the results of many studies, as examples, Makdisi et al., 2002, p.35 showed in their study on growth in the MENA region During the period 1960-1998, that the overall productivity of the factors of production is not an important factor for growth in the countries of the Middle East and North Africa, and the results of this study that the contribution of total productivity of the elements were negative in most countries, or positive value, but low in some of them Sudan, Tunisia and Morocco), indicating their limited role in economic growth Financial money.

The study by Abu-Qarn and Abu-Bader, 2005, p.765-768, showed that the rate of growth of total productivity of productivity factors and their determinants for the MENA countries, Its countries have varied over the

last four decades of the last century. On average, the results of Abu-Qarn and Abu-Bader in another study of the sources of economic growth in the MENA countries in 2007 indicate that the average growth rate of the total productivity of the factors of production in Sudan is -0.012 during the period 1960-1997, Contradicts our findings in this case. Where we found that the average growth rate of total productivity of the factors of production in Sudan during the period from 1971 to 2008 is (-0.066, -0.092) in the short and long term, respectively.

In their study of growth sources in the MENA countries, Abuqran and Abu Badr found that the contribution of physical capital to growth is greater than human capital. In their analysis of growth sources, the role of total factor productivity in determining economic growth is insignificant and negative in some countries. MENA (such as Sudan) where most of the growth is due to the accumulation of other factors of production. The study pointed to the relative importance of production inputs, and showed that growth is almost entirely related to the formation of physical and human capital. Other factors contribute only to a weak percentage. It is clear that among these factors is technical progress that does not seem to have a significant impact on the growth of the economy Or that its effect fades under the influence of other factors involved in the composition of the total productivity of the factors of production, and the link between them is negative and unimportant. In summary, it can be argued that during the study period, the accumulation of physical and human capital has a fairly large contribution to the growth process, while the total productivity of the factors of production or the growth rate of TFP leads to contraction in economic activity as a whole, Real GDP during the study period as well as in most other secondary periods. As most studies have found, especially in Sudan, it can be said that the total productivity of the factors of production does not play an important and decisive role in the economic growth process in Sudan

SUMMARY AND FINAL RESULTS

- This study aimed at estimating the total productivity of the production factors (TFP) in Sudan, specifically during the period from 1970 to 2008. The study used gross fixed capital formation as an alternative to physical capital. In addition, TFP used the weighted human capital in the wages it earns from work Based on the level of education you get The study reached a number of results can be summarized as follows:-
- Appropriate estimation of the elasticity of production for physical capital by applying JOHN. And then used to calculate the growth rate of total productivity of the factors of production in Sudan.
- It has been showed that the growth rate of total productivity of the factors of production in Sudan was very low and takes negative values in some periods, especially during the 1980s and 1990s, and the relative elasticity of growth rates in the first case, for example, by 0.44 for physical capital and 0.56 for human capital.
- The contributions of physical capital, human capital and total productivity of the factors of production during the period 1970-2008 were distributed respectively: 1.5, 0.6 and 1.1%. The effect of the other factors of human and physical capital was small on economic development Sudan during the period from 1970 to 200 8 m. The overall productivity of production factors in the Sudanese economy does not play an important role in economic growth.

Thus, the results of the growth analysis show that the accumulation of physical capital was the main source of growth in Sudan during the period from 1970 to 2008, while the accumulation of human capital is the second most important element in contributing to growth. The weakness of human capital in the selected periods covered by the study was one of the main reasons for the significant decline in the growth rate during the 1980s and 1990s. This is not surprising because Sudan is one of the countries that suffer from a deficit in investing in education.

In conclusion, it can be said that the standard results of this study provide useful suggestions to the decision-makers in the Sudanese economy, because identifying the sources of economic growth allows the decision-maker to focus on the factors that stimulate growth, within the strategic direction of the state in diversifying the sources of income and not rely on certain revenues, After separation. The state must work to raise the level of investment in human capital, build knowledge and skills, intensify education, training and rehabilitation programs for the national workforce, encourage research and development, and ensure the right to education for all. The large gap between developed and developing countries Economic development is largely due to the formation of human capital, which requires developing countries to develop a comprehensive strategy to develop the potential of the human element in them, as the process of economic development depends greatly on the development of this element.

It should also be noted that the results obtained are subject to the variables used in this study and how they are calculated, especially with regard to the method of calculating physical capital stock, the wage-adjusted labor force (human capital), and the methodology we used to estimate the elasticity of production (A). In addi-

tion, the overall productivity growth rate of the production factors (solos) is the residuals in which the measurement and estimation errors occur. However, the overall factor productivity estimate and the Sulu condominium have been met by an enormous amount of research, studies and economic literature that have come from the usefulness of this concept, which has led us to try to apply it in a simple economic economy such as the Sudanese economy.

- In the light of the previous results, the study reached a number of proposals that may be useful to some policy makers and planners of educational and economic plans, as well as to the general researchers in this field, in order to know the shortcomings of this aspect and try to cover them,
- The need to raise the level of investment in human capital and build capacityKnowledge and skills, intensify education, training and rehabilitation programs for the national workforce, and encourage research and development spending.
- The large gap between developed and developing countries in the field of economic development is largely due to the formation of human capital, which requires developing countries to develop a comprehensive strategy to develop the potential of the human element in them, as the process of economic development depends greatly on the development of this element
- Improving the rates of return on investment in education generally requires upgrading the quality of outputs of the educational process so that it is reflected in the labor market in the form of high levels of productivity of the human element.
- There is a need to reconsider the peace of salaries and wages in Sudan in order to widen the gap between the different levels of education in a concrete way.

Researchers in this area should be cautious when using the methods of growth calculations, especially not to consider the results as merely a measure of technological progress. Furthermore, researchers must take into account that the methods of estimating the productivity growth of the total factor of production are neither a theoretical concept nor a theory of growth, because there is still no complete theory of total factor productivity, and most of these methods are valid only in countries where Has reached equilibrium in balanced growth as output grows at the rate of input growth

REFERENCES

[1] Abu-Qarn, Aamerand Abu-Bader, Suleiman (2005) AVersus K Revisited: Evidence from Selected MENA Countries Department of Economics, Ben-Gurion University of the Negev, Beer-Sheva, Israel, MPRA Paper No. 22280. Online at: http://mpra.ub.uni-muenchen.de/22280/

[2] Abu-Qarn, Aamer and Abu-Bader, Suleiman (2007), Sources of Growth Revisited: Evidence from Selected MENA Countries, Ben-Gurion University of the Negev, Beer-Sheva, Israel, World Development Vol. 35, No. 5, Elsevier Ltd. Online at: www.elsevier.com/locate/worlddev

[3] Abdelhak Senhadji I (1999) Sources of Economic Growth: An Extensive Growth Accounting Exercise, IMF Working Paper WP/99/77, IMF, Washington, DC.

[4] Abdelhak Senhadji I (2000) Sources of Economic Growth: An Extensive Growth Accounting Exercise IMF Staff Papers, 47, 129–157.

Central Bearu of Statistic, Sudan, Census, 1973

[5] Makdisi, S. Fattah, Z. and Liman, I. (2002), "Determinants of Growth in the MENA Countries". Arab Planning Institute , Working Paper.N0. 39 ref.

[6] Solow R. M. (1956). "A Contribution to the Theory of Economic Growth," Quarterly Journal of Economics, 70(1) .

[7] Solow, R. M. (1957). "Technical Change and Aggregate Production Function", Review of Economics and Statistics.

[8] Barro, Robert J. (1997). "Determinants of Economic Growth: A Cross-Country Empirical Study". MIT Press: Cambridge, MA.

[9] Bosworth B. and S. M. Collins (2003). "The Empirics of Growth: An Update", Brookings Institution

[10] Iradian. G (2007). "Rapid Growth in Transition Economies: Growth Accounting Approach. IMF. WP/07/164.

[11] Benhabib, J. and M. Spiegel (May 1994), The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country and Regional U.S. Data, Journal of Monetary Economics, final version.

[12] Lucas, Robert, (1988) 'On the Mechanics of Economic Development,' Journal of Monetary Economics, vol. 22.

[13] Barro, Robert J./Sala-i-Martin, Xavier(1995), Economic growth, New York: McGraw – Hill.

[14] Robert J. Barro (No date), Education and Economic Growth, Harvard University. This research has been supported, in part, by the National Science Foundation.

[15] Jess Benhabib and Mark M. Spiegel (December, 2002), Human Capital and Technology Diffusion, Economic Research, Federal Reserve Bank of San Francisco, 101 Market St., San Francisco.

[16] Robert J. Barro and Jong-Wha Lee (April 1993), International Comparisons of Educational Attainment, Working Paper No. 4349, National Bureau of Economic Research, Cambridge.

[17] George Psacharopoulos and Ana-Maria Arriagada (October 1986), The Educational Attainment, of the Labor Force: An International Comparison, THE World Bank, Education and Training Series, Report No. EDT38.

[18] Mankiw, N.G., Romer, D. and Weil, D.N.(MRW), (1992), "A contribution to the empirics of economic growth", The Quarterly Journal of Economics, Vol.107, No. 2.

[19] Robert J. Barro and Jong-Wha Lee (April 2010), A New Data Set of Educational Attainment in the World, 1950–2010, Nber Working Paper Series, Working Paper 15902, 1050 Massachusetts Avenue, Cambridge, MA 02138. Online at: http://www.nber.org/papers/w15902

[20] Susan M. Collins and Barry P. Bosworth (1996), Economic Growth in East Asia: Accumulation Versus Assimilation, Department of Economic Studies at the Brookings Institution & Department of Economics at Georgetown University, Draft 8/28/.

[20] James G. MacKinnon (2010), Critical Values for Co integration Tests, (QED) Queen's Economics Department Working Paper No. 1227. Online at: http://www.econ.queensu.ca/faculty/mackinnon/

[22] Gujarati, Damodar, (2004), Basic Econometrics, Fourth Edition, MaGraw-Hill New York, Companies, 2004.

[23] Paul Turner (2007), Testing for cointegration using the Johansen approach: Are we using the correct critical values?, Loughborough University Department of Economics, Discussion paper Series, ISSN.

[24] Shekhar Aiyar & Carl-Johan Dalgaard (2004), Total Factor Productivity Revisited: A Dual Approach to Development Accounting, Economic Policy Research Unit, Institute of Economics, University of Copenhagen. Online at: http://www.econ.ku.dk/epru/

[25] Robert M. Solow (1994), Perspectives on Growth Theory, The Journal of Economic Perspectives, Vol. 8, No. 1. Online at: http://links.jstor.org/sici?sici=0895-

[26] Psacharopoulos, George (1993), "Returns to Investment in Education: A Global Update," World Development, 22, No. 9, 1325.

[27] Jacob Mincer (1995), Economic Development, Growth of Human Capital, and the Dynamics of the Wage Structure, Columbia University and National Bureau of Economic Research, Discussion Paper Series No. 744.

[28] T. W. Schultz (March 1961) "Investment in Human Capital" American Economic Review, Vol. 51, No.1.

[29] Bassanini, S. Scarpetta and P. Hemmings (2001), "Economic growth: the role of policies and institutions. Panel data, evidence from OECD countries", OECD Economics Department Working Paper No. 283.

[30] United Nations (2007), Analysis of Performance and Assessment of growth and productivity in the ESCWA REGION, Economic and Social Commission for Western ASIA, Fifth Issue, New York.

[31] Johannes Hers (1998), Human capital and economic growth- a survey of the literature, CPB report.

[32] Denison, Edward F. (1967), Why Growth Rates Differ: Postwar Experiences in Nine Western Countries (Washington: The Brookings Institution).

[33] Barro, R. J., Mankiw, G. N., &tSala-i-Martin, X. (1995). Capital mobility in neoclassical models of growth, American Economic Review, No, 85.

[34] Psacharopoulos, G. (1985). Returns to education: a further international update and implications, Journal of Human Resources.

[35] Sudan Central bureau of statistics, (Cences, 1973).

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Employees Absenteeism Factors Based on Data Analysis and Classification

Afefa Asiri and Manal Abdullah*
Faculty of Computing and Information Technology, King Abdul Aziz University, Jeddah, Saudi Arabia

ABSTRACT

Coping with the high rate of business environment or gaining competitive advantages and customer satisfaction are mainly based on organizational resources, especially an employee. Employees with low performance cause a vital lose for organizations and the absenteeism consider to be one of the factors that affect performance So, understanding the causes of absenteeism may power the organization with a competitive advantages tool and open the area of research for computer and human resources fields. The aim of this paper is to discover the factors and causes of employees absence using computerized technologies. The research conducts data analysis on the absentee database and finds some factors that have a good correlation with absenteeism. Moreover, three prediction models are built: Naïve Bayes, Decision Tree, and Random Forest. These models discovered the factors and predict the absenteeism with high accuracy. The Random Forest is the best with an accuracy of 92% while the Naïve Bayes is the second followed by the Decision Tree model with an accuracy of 91% and 90% respectively.

KEY WORDS: ABSENTEEISM, CLASSIFICATION, PREDICTION, DECISION TREE, NAÏVE BAYES, RANDOM FOREST, EMPLOYEE ATTRIBUTES, MANAGEMENT, HUMAN RESOURCE.

INTRODUCTION

Recently, most of the organizations race to reduce expenses, increase productivity, catch the opportunity and meet customer satisfaction. In order to gain the race, the organizations should manage the factors that affect their performance. The main factor that has a direct effect on the organization's performance is the human resource. The presence of employees means the planned workflow is performed as expected. It also means a reduction in the costs of management and supervision, overtime, additional workers and the penalty clause. By contrast, the absence of an employee leads to the exact opposite.

Currently, organizations are seeking to find the main causes behind absence. This subject has been studied before decades form a different perspective. However,

ARTICLE INFORMATION:

*Corresponding Author: maaabdullah@kau.edu.sa
Received 1st Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/14

the statistical methods are the most common methods for analyzing data and finding direct relationships.

This paper focus on extracting the relationship between the general information about the employees, which stored in the organization database, and the reasons for the absence to predict their absenteeism ratio. By finding the relationship, the organization gains a highly competitive advantage tool that could be used to address the consequences of the employees' absence and help human resources management to improve the process of recruitment and crisis management.

In this paper, the statistical methods are used to understand the database and then find some absenteeism factors. Moreover, according to the type of data understudying, the most suitable technique is chosen, therefore the classification technique is used since the factors of absenteeism are categorical data. So, prediction models, based on classification, are built to uncover other factors that might have indirect causes in the absence.

Classification is a technique that can be done on different types of data, structured or unstructured. It is a process for categorizing the input data into a number of predefined classes. The objective of the classification technique is to identify and predict the class of the new data based on extraction rules from the previous data. It is one of the supervised machine learning techniques. Machine Learning is "the process of learning a set of rules from instances, for examples in a training set, which means, creating a classifier that can be used to generalize from new instances (Kotsiantis, 2007). Depending on how classifier is created, the classification algorithm, there are different types of classification techniques, such as: Naïve Bayes, K-Nearest Neighbor, Decision Tree, and Random forest.

The paper provides a brief background of the employees' absenteeism and presents some related works in section 2. Section 3 describes and illustrates the methodology of this research with four stages: data preprocessing, processed databases, prediction models, and results and decision. Finally, section 4 concludes the paper.

LITERATURE REVIEW

The absenteeism studies were considered to be one the management filed researches. However, as a result of technological development, these studies are being conducted using computerized concepts. In this section, the background and the related work of the absenteeism studies are presented.

Background

The employees have a significant role in any business. Organizational performance and success, competitive advantages and customer satisfaction are mainly determined by the employees' performance and human resource management [HR] (Binter et al., 1990) (Nickson et al., 2003) (Schneider et al., 2003). The crucial role of HR has been studied in 'management literature' via models, theories, and empirical studies. Managing the employees' absenteeism consider being one of the most vital issues for HR managers to deal with. Absenteeism is defined as "a temporary absence from work (temporary withdrawal from an organization) for reasons such as illness, death in the family, or other personal issues" (Mathis and Jackson, 2008). It is also defined as "an employee's intentional or habitual absence from work" (Cucchiella et.al., 2014).

Excessive absence can seriously affect any organization and it might lead to high direct and indirect costs and low productivity (Mathis and Jackson 2008) (Cikeš et.al., 2018). For example, in Tayler and Qi (2013) research, there is a loss of 3% of scheduled labor hours caused by unplanned absence. Moreover, many types of research have concluded that the low performance and high absenteeism of an employee gives an early indication for a turnover situation. Although it is a negative indicator, it could help business organizations and HR to search for more qualified alternatives before it occurs (Cohen and Golan, 2007) (Morrow et al., 1999).

So, understanding the employees' absence depending on the process of extracting meaningful information from the available data and information to help organizations to manage their business is known as knowledge management [KM]. KM is the new concepts that will lead the organizations into a new area or opportunities and advantages by combining the individuals' knowledge and effort with the capabilities of the new technologies (Becerra and Sabherwal, 2010). This research depends on the concept of KM to improve the organization management by understanding the absenteeism factors depending on the available data and information.

Related Work

In this research, the related work illustrates three stages of absenteeism studies. The first stage was for the early studies that focus on understanding absenteeism factors form administrative or social perspective or as a behavioral study. The computational method was used in the second stage while the computerized and machine learning technologies are used in the current stage, the last one.

Five decades from now, there were intensive researches to discover the absence behavior. In 1970, "the systematization of absenteeism causes and consequences" was the first significant paper (Muchinsky, 1977). In this paper, Muchinsky describes the relationship between absenteeism and personal, organizational and attitudinal variables. In addition, Muchinsky also studies the relationship between absenteeism and turno-

ver. Moreover, many types of research have been conducted from that time until now, but most of them were conducted from an administrative or social perspective or as a behavioral study and resulted in a recommendation for improvement (Rhodes and Steers, 1981) (Harrison and Martocchio, 1998) (Cikeš et.al., 2018).

However, there was a use of computational methods to understand the relationship between absenteeism factors. For example, Tayler and Qi (2013) used Poisson regression to discover different factors of unplanned absences in rail dispatcher scheduling and resulted that the unplanned absences are estimated to cause a loss of 3% of scheduled work hours, which are used as statistical evidence. In addition, absenteeism studies have been criticized for using unsuitable analysis as many researchers used regression and correlation models and changed the data to suit the requirements of these models (Sturman, 1996). However, new studies use different models to understand absenteeism. For example, classification models provide more insight into the factors and causes of absenteeism even if they do not have a direct relationship.

Recently, Martiniano et al. (2016) used multilayer perceptron for absenteeism prediction, the proposed method was published while the results are not yet released. In this paper, following the new trend of studies in this field, three prediction models are built based on the concepts of classification and how can indirect factor affect the prediction model.

DISCOVERING EMPLOYEE ABSENTEEISM METHODOLOGY

Employees' absenteeism has been studied widely from a managerial perspective. However, the methodology of this paper follows a systematic approach of data analysis and uses classification to understand the factors behind the absenteeism. Discovering the factors affecting employee absenteeism methodology consists of four stages as shown in figure 1. They are: preprocessing data, developing the processed databases, conducting prediction models, deciding on which classifier is the most accurate and appropriate.

Before working on the data set, it is important to describe data used in this research. It is a dataset of absenteeism of 'A Courier Company' in Brazil which was recorded from July 2007 to July 2010. It has 21 attributes and 740 instances (Martiniano et al. 2016). Table 1, shows the attributes and their description.

In this methodology, the work starts with preprocessing the absenteeism database by grouping some type of attributes and studying the correlation between the attributes and the absenteeism to find the significant causes of absenteeism.

After that, two databases will be used in the prediction models: the base database and the reduced one. For the base dataset, choosing the best classifier depends on the one with high accuracy. However, in the reduced database, to reach an accepted accuracy, the database is modified by adding an additional attribute, one at a time, even if there is no correlation between it and absenteeism. The process of adding the attribute discovers some factors of absenteeism which could not be known via regular data analysis such as correlation or regression.

Preprocessing Data

In any study, the quality of the data has a direct effect on the results, following the concept of 'garbage in garbage out [GIGO]' which describes: "the concept that flawed, or nonsense input data produces nonsense output" (Web-

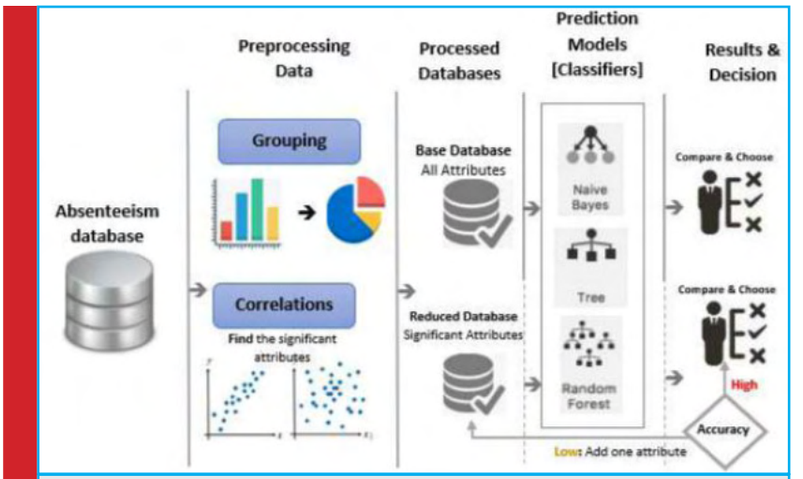


Figure 1. Methodology of Discovering the Hidden Factors of Absenteeism

Table 1. Absenteeism Dataset	
Attribute	**Description**
1. ID	Individual identification
2. Reason for absence (ICD).	Absences attested by the International Code
	of Diseases (ICD) stratified into 21 categories
	(1-21), and 7 categories without (CID),
3. Month of absence	1-12 represent real months
4. Day of the week	Monday (2), Tuesday (3), Wednesday (4),
	Thursday (5), Friday (6)
5. Seasons	1-4 represent seasons restively
6. Transportation expense	Integers
7. Distance from Residence to Work	In kilometers
8. Service time	In hours
9. Age	Integers
10. Work load Average/day	In hours
11. Hit target	Integers
12. Disciplinary failure	(yes=1; no=0)
13. Education	high school (1), graduate (2), postgraduate
	(3), master and doctor (4)
14. Son	Number of children
15. Social drinker	(yes=1; no=0)
16. Social smoker	(yes=1; no=0)
17. Pet	number of pets
18. Weight	Integers
19. Height	Integers
20. Body mass index	Integers
21. Absenteeism time in hours (target)	In hours

1). So, this process is the most significant part of this paper. In order to build a suitable prediction model, the database should be understood and studied carefully to get more insight about it and perform meaningful modifications.

In order to understand the database and choose the most significant attributes that affect the absenteeism, the relationship between the attributes and the importance of each one should be understated. Therefore, the 'Statistical Package for the Social Sciences' (SPSS) is used to discover and modify the database, as it is considered to be a good software to perform data analysis work and deal with format databases (Web-2) Two processes are performed on the database to be ready to use in the next stage: grouping and correlations.

Data Grouping

In this section, some of the database's attributes are not in a format that can be used directly into ML.
to overcome that, data grouping is used.

Transportation Expense and Distance to the Work attributes are presented in real numbers, their ranges are very big, instead of dealing with them as numbers, they could be categorized into groups, intervals. From figure 2, it is clear that 'Transportation Expense' can be classified into three groups [100,200], [200,300] and [>300]. In addition, the same process is done with 'Distance to the Work' and the categories are [0-20], [21,40] and [>40], as shown in figure 3 and figure 4 while the new categories is shown in figure 5.

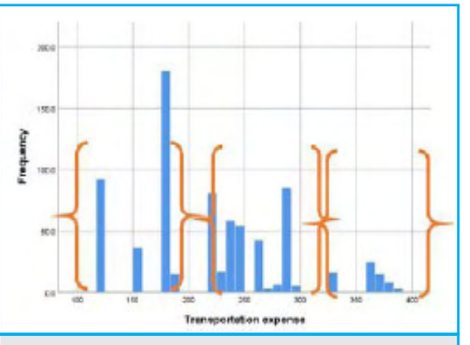


Figure 2. Transportation Expanse_ Frequency

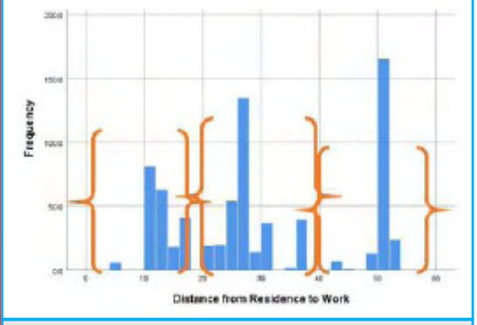


Figure 3. Distance from Resident to Work_ Frequency

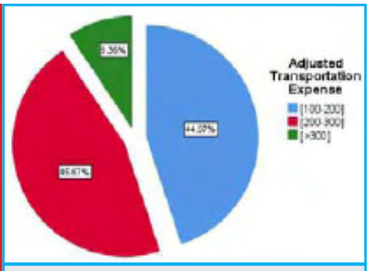


Figure 4. Grouped Transportation Expanse

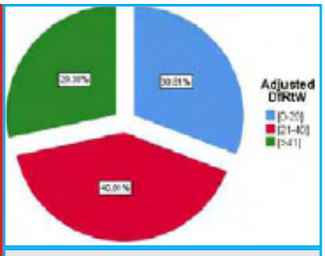


Figure 5. Grouped Distance form Resident to Work

In Addition, Ages are varied from 27 -the minimum- to 58 – the maximum. According to figure 6, it is obvious that the ages could be classified into 3 categories [25-35] [35-45] [>45]. Form the pie chart in figure 7 almost 50% of absence comes from employees who are between 35 and 45 years old.

Moreover, BMI attribute was provided in kilograms, which include a very long range of meaningless data. To overcome this, the data are modified according to the International formula for defining BMI (Web-3):

Underweight = <18.5
Normal weight = 18.5–24.9
Overweight = 25–29.9
Obesity >= 30

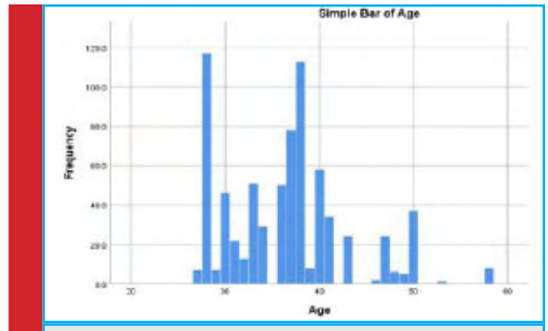


Figure 6. Age Frequency

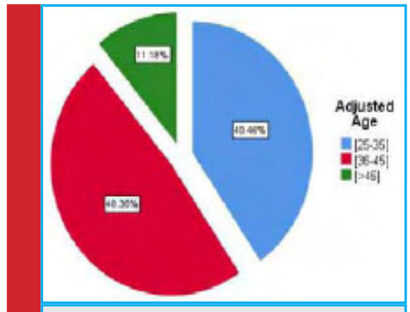


Figure 7. Grouped Age

The pie chart in figure 8 presents the grouped BMI which provides more meaningful information and indicate that 64% of absent employees are obese or overweight.

Finally, in the original database, the range of the absenteeism in hour attribute starts from zero to 120, as this attribute will be the predicted one, the range should be minimized to include fewer classes. With respect to the frequencies of the absenteeism times, almost 6% of data represents 0, where the major frequency with 85% lies between 1-0, leaving just 9% to represents all the absence time more than 10. As a result, this attribute could be classified into three categories [0], [1-10], and [>10], as shown in figure 9.

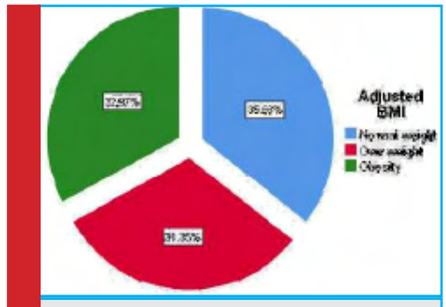


Figure 8. Grouped BMI

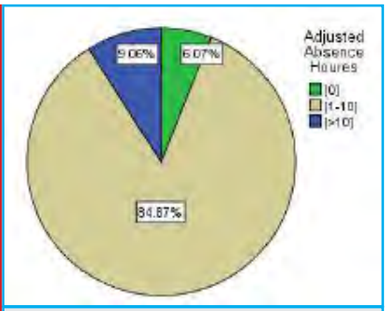


Figure 9. Grouped Absenteeism Hours

Correlations

Understanding the relationship between the attributes appears more insight and information about the dataset. To discover these relations, correlation is used. it is "a statistical measure that indicates the extent to which two or more variables fluctuate together. A positive correlation indicates the extent to which those variables increase or decrease in parallel; a negative correlation indicates the extent to which one variable increases as the other decreases" (Larson and Farber, 2015).

The database is analyzed using correlation to discover the most significant attributes that affect the absenteeism, as table 2 shows these attributes with the correlation values and at which significant level. It is obvious that the correlation between most of the attributes is positive. However, the surprising information here shows that the correlation between absenteeism and 'Distance form Work' is negative.

Processed Databases

The third stage of the methodology is to prepare the processed databases. There are two databases that are used for the next stage. The first database is 'Base Database', which consists of all the attributes of the main database but processed version. The second database 'Reduced Database', which contains the attributes that have a strong correlation with absenteeism attribute as shown in table 2.

Table 2. Correlation between Absenteeism and Attributes

Attribute	Correlation	Level of Significant
Distance from work	-0.071	0.05
Age	0.063	
Son	0.105	
Social Drinker	0.082	0.01
Hight	0.126	

Table 3. Naïve Bayes Results

Database	Accuracy	Sensitivity		Specificity	
The Base	0.88	[0]	1.00000	[0]	0.98974
		[1-10]	0.9489	[1-10]	0.5938
		[>10]	0.31579	[>10]	0.96296
The Reduced	0.91	[0]	1.00000	[0]	1.00000
		[1-10]	0.9943	[1-10]	0.4375
		[>10]	0.052632	[>10]	0.994709

Prediction Models

There are some insights about the employees absenteeism causes and factors are exposed during the preprocessing process in the previous section. However, to get more insights and discover hidden relationships, three classification prediction models are built: Naïve Bayes, Decision Tree, and Random Forest, where they have good performance with categorical data. The R language is used, as it is one of the most popular and efficient languages for data science and has the flexibility to deal with different topics by providing supported packages (Web-4). The base and reduced databases are used and divided into 75% training data and 25% testing data.

Naïve Bayes

It is the simplest classification methods which required low computational time. The model is run to classify the database into three classes [0], [1-10] or [>10], the result of this model using two databases is shown in table 3.

Decision Tree

It is generally used in ML applications especially with the categorical data type. It is a tree where nodes represent an event while the leaves represent the decisions. A decision tree recursively divided the predictor factor to represent the relation between the predictor variable and the responses variable. As decision tree has a -build in- attribute selection, which known as 'information gain', the most homogeneous set of attributes and ranks are discovered via constructing decision tree as shown in figure 10. The result of this model is presented in table 4.

Random Forest

It's concept based on creating large numbers of decision trees. Every observation is fed into every decision tree. The most common outcome for each observation is used as the final output. 500 classification trees are used in the Random Forest model. The result is presented in table 5.

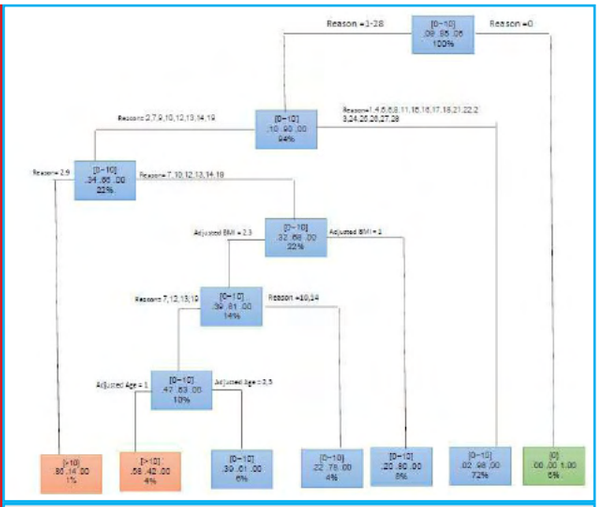


Figure 10. Decision Tree Model

Table 4. Decision Tree Result

Database	Accuracy	Sensitivity		Specificity	
The Base	0.89	[0]	1.00000	[0]	1.00000
		[1-10]	0.9636	[1-10]	0.5750
		[>10]	0.29167	[>10]	0.96610
The Reduced	0.90	[0]	1.00000	[0]	1.00000
		[1-10]	0.9909	[1-10]	0.4500
		[>10]	0.083333	[>10]	0.991525

Table 5. Random Forest Result

Database	Accuracy	Sensitivity		Specificity	
The Base	0.92	[0]	0.93750	[0]	1.00000
		[1-10]	0.9864	[1-10]	0.5750
		[>10]	0.33333	[>10]	0.98729
The Reduced	0.91	[0]	1.00000	[0]	1.00000
		[1-10]	0.9682	[1-10]	0.5500
		[>10]	0.25000	[>10]	0.97034

RESULTS AND DECISION

The last stage of the methodology is to investigate the results that come from the prediction models and decide which model has the best performance. Figure 11 shows the results of the three prediction models using the two databases. It is clear that the three models have almost high accuracy and the random forest provides the highest accuracy with 92% using the base database and it is the one that can be chosen to predict the absenteeism of the employees.

However, this research tends also to know the factors of absenteeism not only to predict it, so, when using the decision tree model with the reduced database, the resulted tree, as shown in figure 10 presented some attributes that did not have a high correlation with absenteeism and some of the highly correlated attributes are discarded. As a result, the prediction models provide not only prediction benefit but also can be used to dis-

Table 6. Summary of Models' Performance

Model	Database	Accuracy
Naïve Bayes	The Reduced	0.91
Decision Tree	The Reduced	0.90
Random Forest	The Base	0.92

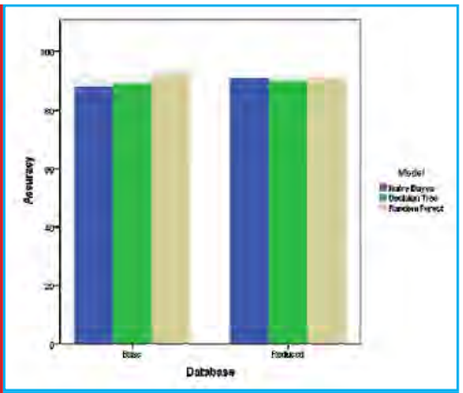


Figure 11. Results of Prediction Models

cover some relation between the data where the regular statistical methods cannot discover it.

CONCLUSION

Predicting the causes behind the employees' absence has a crucial impact on the efficiency of Human Resource Management. However, most of the current studies focused on statistical methods, such as correlation and regression. Nevertheless, the results of the prediction models lead to discovering the gaps in the statistical approaches and how the results of these approaches give narrow and incomplete information.

Despite of the relationship between the attributes in the reduced database, as this database includes only the attributes that have a good correlation with the prediction attribute, the models' performance is high with the base database, which contain all the attributes and with after adding additional attributes to the reduced database, as what happened in the decision tree model. Consequently, it is obvious that there are hidden factors that affect the absence even if they do not have a direct relationship with absenteeism. Table 6 shows that the random forest model excesses the other models by having an accuracy of 0.92 % by using the base database.

It is better for management, especially the Human Resources Department, to design an employees' database that includes as much descriptive data as possible about the staff, since the hidden causes of absence could be predicted via these data. As a result, absenteeism can be avoided before it occurs, or the prediction values can be used as an effective tool for crisis management. Moreover, these hidden causes of absenteeism could be used by the organizations to set additional requirements for a new job. Therefore, the percentage of the absence could be decreased.

Using the computerized approaches to discovering information and knowledge from the data such as machine learning techniques consider to be a rich field for researcher especially for human resources management.

REFERENCES

[1] Becerra-Fernandez, Irma, and Rajiv Sabherwal. 2010. Knowledge Management: Systems and Processes. Armonk, N.Y: M.E. Sharpe.

[2] Binter, Marry Jo, Bernard Booms, and Marry Stanfiled. 1990. 'The Service Encounter: Diagnosing Favorable and Unfavorable Incidents'. The Journal of Marketing, 71–84.

[3] Cikeš, Vedrana, Helga Maškarin Ribarić, and Kristina č rnjar. 2018. 'The Determinants and Outcomes of Absence Behavior: A Systematic Literature Review'. Social Sciences 7 (8): 120. https://doi.org/10.3390/socsci7080120.

[4] Cohen, Aaron, and Ronit Golan. 2007. 'Predicting Absenteeism and Turnover Intentions by Past Absenteeism and Work Attitudes: An Empirical Examination of Female Employees in Long Term Nursing Care Facilities'. Career Development International 12 (5): 416–32. https://doi.org/10.1108/13620430710773745.

[5] Cucchiella, Federica, Massimo Gastaldi, and Luigi Ranieri. 2014. 'Managing Absenteeism in the Workplace: The Case of an Italian Multiutility Company'. Procedia - Social and Behavioral Sciences 150 (September): 1157–66. https://doi.org/10.1016/j.sbspro.2014.09.131.

[6] Harrison, David A., and Joseph J. Martocchio. 1998. 'Time for Absenteeism: A 20-Year Review of Origins, Offshoots, and Outcomes'. Journal of Management 24 (3): 305–50. https://doi.org/10.1177/014920639802400303.

[7] Jensen, Taylor and Sun, Qi. 2013. Absenteeism Prediction and Labor Force Optimization in Rail Dispatcher Scheduling.

[8] Kotsiantis, S B. 2007. 'Supervised Machine Learning: A Review of Classification Techniques', 20.

[9] Larson, Ron, and Elizabeth Farber. 2015. Elementary Statistics: Picturing the World. 6th edition. Boston: Pearson.

[10] Martiniano, A, R P Ferreira, R J Sassi, and C Affonso. 2016. 'Application of a neuro fuzzy network in prediction of absenteeism at work', 4.

[11] Mathis, Robert L., and John Harold Jackson. 2008. Human Resource Management. 12th ed. Mason, OH: Thomson/South-western.

[12] Morrow, Paula C., James C. McElroy, Kathleen S. Laczniak, and James B. Fenton. 1999. 'Using Absenteeism and Performance to Predict Employee Turnover: Early Detection through Company Records'. Journal of Vocational Behavior 55 (3): 358–74. https://doi.org/10.1006/jvbe.1999.1687.

[12] Muchinsky, Paul M. 1977. 'Employee Absenteeism: A Review of the Literature'. Journal of Vocational Behavior 10 (3): 316–40. https://doi.org/10.1016/0001-8791(77)90066-5.

[13] Nickson, Dennis, Tom Baum, Erwin Losekoot, and Alison Morrison. 2003. 'Skills, Organizational Performance And

Economic Activity In The Hospitality Industry: A Literature Review', 109.

[14] Rhodes, Susan, and Steers, Richard. 1981. A Systematic Approach to Diagnosing Employee Absenteeism, Employee Relations, Vol. 3 Issue: 2, pp.17-22.

[15] Schneider, Benjamin, Ellen G. Godfrey, Seth C Hayes, Mina Huang, Beng-Chong Lim, Lisa H Nishii, Jana L Raver, and Jonathan C Ziegert. 2003. 'The Human Side of Strategy': Organizational Dynamics 32 (2): 122–41. https://doi.org/10.1016/S0090-2616(03)00014-7.

[16] Sturman, Michael C. 1996. 'Multiple Approaches to Absenteeism Analysis', 32.

Web Sites

Web-1: https://heapanalytics.com/blog/data-stories/garbage-in-garbage-out-how-anomalies-can-wreck-your-data, consulted 13 November 2018.

Web-2: https://www.ibm.com/analytics/spss-statistics-software, consulted 20 November 2018.

Web-3: https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm, consulted 8 December 2018.

Web-4: https://www.r-project.org/, consulted 8 December 2018.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Digital Security Using Multimodal Template Protection Schemes

Khaled Alfawaz
King Abdul-Aziz University, Jeddah Kingdom of Saudi Arabia

ABSTRACT

The main issue of all the security and verification system is authentication and security by the user. This is needed to the enhancement of a mechanism which ensures users' privacy and security. This is a vast research area to develop security system in this field and different types of technologies have been proposed earlier. The conventional methods use tokens and passwords for providing security to the users and this system is compromised by hackers and also necessity to verification system design to ensure authentication and provide more security to the users. In recent years researchers have combined the key generation of cryptographic and biometrics method. The important features of biometrics are, it is a template which is not possible to revoke by an unauthorized person. The very familiar soft biometric features are the iris, retina, face, fingerprint, voice and so on. There is a cryptographic key generation technique Fuzzy Vault combine's soft biometrics. Providing more security to the users is necessary to avoid attacks. This technique gives an additional layer of security. Since this technique combines soft biometrics as well as cryptographic key generation which overcomes the limitation of biometric system when implemented individually. This paper proposes fuzzy vault scheme which uses retina as a soft biometric and gives best results when the performance is compared with other authentication system in ensuring the authentication.

KEY WORDS: SECURITY, BIOMETRICS, SOFT BIOMETRICS, NETWORK SECURITY, FINGER PRINT, RETINA

INTRODUCTION

Soft biometric technology recognizes the persons with the help of biological or behavioral characteristics. The main advantages of soft biometric system are, it cannot be forgot or lost when compare with the conventional system such as tokens and passwords. These new methods provide an innovative, also well suitable for the user information for identification and authentication. There are different stages for providing authentication to the users. The first step is enrollment of user. The process of this step is the user has to register their biometric

ARTICLE INFORMATION:

**Corresponding Author: kalfawaz@kau.edu.sa*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/15

features in different position for calculating in different measurement. The entire measurements are stored in a table after applied in some algorithm. Few of the biometric feature used for authentication is face, fingerprint, hand geometry, keystroke dynamics, hand vein, iris, retina, signature, voice, facial thermo gram, and DNA. The use of above mentioned biometrics is search the biometric templet from the table in a database and compare with the person who try to access the system. If the template matchers with the stored data and sensed data the system give the authentication to access it [1] [2] [3]. This system has both advantages and disadvantages. Once a biometric template of a user is stolen and the template not able to re-issue, destroy or update. Another disadvantage is one biometric system of a user can be used to access many systems, hence the attacker may easily access the system and utilize the data of the specific user. This is the major problem in the security.

As of late, novel cryptographic strategies, like fuzzy commitment and fuzzy vault has been proposed to give safe and secure storage [4] [5]. This fuzzy vault system uses biometric system along with randomly generated cryptographic key and it enhance the security like system authentication and access permission. This research paper concentrates a heuristic verification system of biometric, with the combination usage of soft biometrics features measurement and fuzzy vault scheme. According to the proposed approach, use retina as soft biometric template which is unaltered for entire lifetime of the user. Numerous testing were directed to inspect the execution of the proposed verification framework.

RELATED WORK

Abhilasha et al [5] [6] [7] mentioned in their paper that vector space model has been used to create biometric key with cryptography.. In vector space model the keys are kept secret and thus the system has more confidentiality in maintaining biometric data. This system use the advantages of biometric authentication. The second phase combines several authentication factors concurrently with soft biometric to provide more security. The main advantage of this system is, to authenticate using biometric any of the combination of factors may use. Their proposed method enhance the biometric data security and reliability. The challenges and issues of authentication system implementation is discussed by Uludag et al [10]. They proposed various methods combined with cryptographic key and template using biometric stored in the database for authentication. They assessed the performance for binding and generation algorithms using fingerprint. They revealed that it is very big challenges to generate biometric key due to extreme data acquisition variations. They provide more reliability and suitability of this algorithm for digital rights management systems. Experimental results shown their performance and discussed in improving authentication. Cimato et al. [12] proposed a biometric authentication technique using multiple biometric data. The privacy of the document is guaranteed against loss or steal of the document since, the control of authentication can be performed offline and it is not possible to show any information. Proposed approach of them ensures security with high level as they are using various biometric data. These techniques are highly developed to make fast the security system and make it very convenient and coherent the process for identification. The combination of cryptography with soft biometrics increases the confidentiality using biometric templates which stored in the database for verification.

Hao et al [15] proposed a security system which combines iris soft biometric with cryptographic key for the first time. A string of binary data called as biometric key has been generated from the iris. This key created with a support of auxiliary error correction data from iris image, this cannot be disclosed and can be stored in a smart card [12] [13]. The regeneration of security key based on token and biometric of iris. So the system hacker in a position to retrieve the both keys. According to this paper, they applied and evaluated this strategy with 70 different samples of iris and 10 samples biometric data from left eye and right eye. From these samples they find out key with no error may be regenerated from a genuine point of iris with almost 99% rate successfully.

PROPOSED APPROACH

Our fuzzy vault constructing based on the retina for biometric methodology followed three steps. The first step is the random transformation applied in to the retinal temple. This method provide the advantages for soft biometrics and fuzzy frame work, its enhance the high level security and privacy. The second template which got from the first step is secured using the application of fuzzy vault.

The third and final step consist the random generation of key from the template construct soft biometric measurement, password from the user and fuzzy vault. To provide the extra layer the password has been given. Fig 1 displays soft biometric tempering of fuzzy vault scheme based on the retina

A. Feature Point Extraction – Retinal Bifurcation

RBFPE technique is implemented by Chen et al. in [19] is followed in this paper. There is a need to extract the bifurcation from retina. The bifurcation point fixed and to retrieve the bifurcation feature. Again the bifurcation

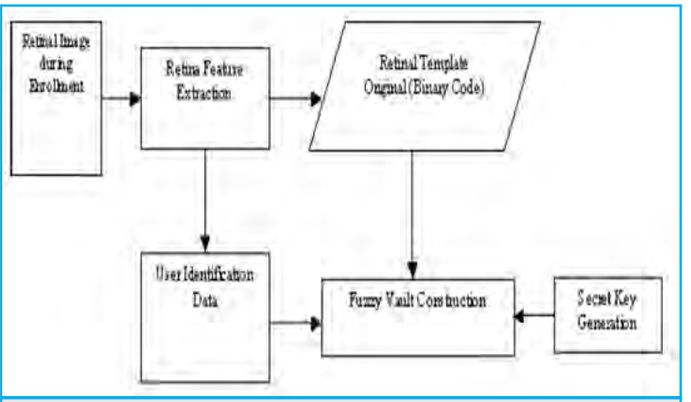


Figure 1. Soft biometrics fuzzy vault based on retina

points of retinal are extracted to improve the security and privacy.

Soft Biometrics traits are physical, behavioral or adhered human characteristics, classifiable in pre–defined human compliant categories like color, height, skin color, eye color, weight etc. is used in most of the research work. The fuzzy vault scheme and soft biometrics together exploit the performance of authentication now a days. In the proposed method bifurcation feature of retina retrieved from pattern of retina.

Thinning and Joining operations are applied into the retinal template as a major process. During this process the vascular pattern extracted. End of the this process from the retinal template, the bifurcation feature points are extracted, it is shown in the figure 2. The actual retinal template shown in figure 2a. After completion of the thinning and joining process the highlighted bifurcation feature points of retinal vascular tree shown in figure 2b.

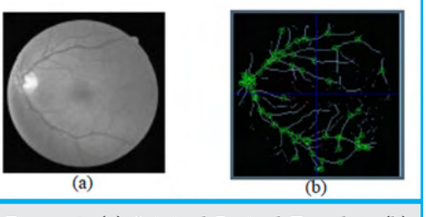


Figure 2. (a) Original Retinal Template (b) Highlighted Bifurcation Feature

B. The Retinal Fuzzy Vault Hardening

This step is the tedious and significant step in the authentication design system to enhance security. All the templetes stored in the database. During hardening the retinal fuzzy vault using password the sample of retinal are retrived from the database first and it has been resized depending upon the requirement. The system highlights the feature points of retinal bifurcation to identify to lock or unlock data. The permutation and translation are subjected by the bifurcation feature points.

The primary and essential need of this procedure is to attain the parameters like (u, v, θ). Here u', v' are proposes a row and column indicator of the image and θ represent the orientation. This translated feature biometrics points are more secured in the fuzzy vault. It generate a 128 bit random key. A password with 64 bit is used to transform the randomly generated key. And also the same may be used for encrypting the vault

C. Extracted Bifurcation Feature Transformation

Permutation, combination and translation are used to create the vascular tree and based on this only the bifurcation points are described. At the end of this operation a new points created from the original bifurcation transformation. Only a single character has been used for the password of the user. The password of the user character length is 8. So it occupies 64 bits. There is a limitation for the number of characters in the password. Only 8 characters of password length used in this research. So 64 bits are weighted for randomization totally. In this 16 bits, divided by 4 blocks. Every block comprising of 16 bit. The first five character is password and the remaining three characters are biometrics of the user. The implementation of proposed method we put VAULT as a password. Height of the user is the sixth character and gender as seventh character and the eighth characters is the color of iris.

At the first level implementation the bifurcation has been divided into four quadrants. All the quadrants is operated with a single password before permutation combination and translation process. The relative position cannot be changed in the bifurcation points. 2 bit block to be segmented of the each quadrant of 16 bits. The first one consist of nine bits and remaining has 7 bits. The T_u has seven bit and T_v has nine bits length. The

translation amount in the horizontal direction is T_u and vertical direction is T_v.

Fig 3 shows transformed retinal bifurcation points.

The new retinal point is derived from the followings:

$$X_{u'} = (X_u + T_u) \bmod (2\hat{}7)$$
$$Y_{v'} = (Y_v + T_v) \bmod (2\hat{}9)$$

The distance in horizontal direction is Xu before transformation. Likewise the distance in horizontal direction after transformation is Xu'. Similarly, Y_v is the distances before transformation. $Y_{v'}$ is the distance after transformation.

D. Encoding and Decoding the Vault

According to this stage it provide security to the the vault temporarily modified from the password. The proposed approach in this step replaces Reed-Solomon reconstruction step using Lagrange interpolation. For error detection the Cyclic Redundancy Check has used. The retrieved feature points are changed as binary strings. The chaff points generation method mentioned in [6][7] are used to implement this step. At the last the feature points obtained and it combined with chaff points to make imposter unaware of genuine points in the retina and the same reverse technique is used for vault decoding.

TRANSMISSION WITH THE SECURITY

The generated key has been placed in to the application and it will be transmitted in the wireless networks. As the data size increased when apply the security, an existing sleep wake up method has been used to transfer from source to destination. In this method, only one node is active in a region and the remaining are in sleep state. During the transmission all the secured data transmitted from one active node to another active node.

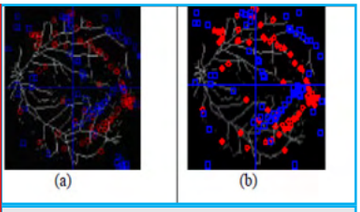


Figure 3. (a) and (b) Transformed bifurcation Points. (Blue-Transformed, Red-Original Points)

EXPERIMENTS AND RESULTS

This research method is implemented using MATHLAB. The required parameters which are used in this is c denotes the count of the chaff points, r the count of the genuine points. From this the total counts of points are (t+c). When chaff points increases the privacy and security also increased. The number of chaff point declared in the system should be more than ten times. Then only the retinal templates will be available with the genuine points. The capable of being this work is evaluated using the retinal transforming template technique for biometric features and password given by the user. This research proposed to make use of eight character for security vault as mentioned above. The eight characters formed with the user password and the remaining characters are soft biometrics. Those eight character grouped into two parts and it consist five character as password. The sixth character is height of the user, seventh character represents the gender and eighth denotes the gender and iris color.

The table 1 shows an example transformation code obtained from soft biometrics and bifurcation feature points before transformation and after transformation. The 8 character has been taken for secure fuzzy vault. ASCII value of all the characters used in the implementation calculated. The five character password VAULT determined as 86, 65,85,76,84. The rest of the three characters are soft biometrics of the user. The ASCII value of height represents one parameter and gender for one parameter and iris color is one parameter. Many applications uses different password for cross matching purpose.

This proposed multimodal biometric key based network security in order to transfer data in a secure way and with the process of authentication and validation used secret key generated from the fused images of fingerprint, iris and retina. The evaluation of the proposed method is proved with three different metrics of false rejection rate (FRR), false acceptance rate (FAR) and the processing time of proposed method compared with the existing ones.

Performance Comparison of Proposed Multimodal Biometric Method with Single Biometric Based on False Rejection Rate in Network Security Systems

The metric FRR is defined as a percentage of real users which rejected by the biometric system. In authentication biometric system, the user of the system will make the claims of their identity, hence the security system must not reject an enrolled user and number of False Rejections must be kept as small as possible. Thus False Rejection must be minimized in comparison to False Acceptance.

The table 1 and figure 4 shows the performance of proposed fusion technique authentication system by varying the number of users which ranges from 1 to 100. From the result it is observed that the single biometric based authentication system fingerprint, iris and retina

Table 1. Feature Points

Ist Quadrant and soft biometric features	Feature Points				Transformation code obtained from soft biometric	
	Before Transformation		After Transformation			
	Horizontal Distance Xu	Horizontal Distance Yv	Horizontal Distance Xu'	Horizontal Distance Yv'	Row index with respect to horizontal axis Tu	Column index with respect to horizontal axis Tv
'VAULT' Height=157 Iris Color='B' Gender='M'	105	18	55	84	78	322

Table 1. Performance Analysis of Proposed Method based on False Rejection Rate

User	Finger print	Iris	Retina	Proposed Method
1 - 10	86.5	87.4	91.4	88.3
11 -20	88.5	82.9	93.5	83.2
21-30	91	87.8	93.2	86.2
31-40	90.7	88.3	91	87.6
41-50	91.7	91.3	93.8	90.3
51-60	85.2	84.6	89.8	83.7
61-70	90.5	88.8	92.5	86.7
71-80	89.3	86.8	91.7	84.4
81-90	90.3	87.9	93.8	86.4
91-100	90.9	89.2	93.6	88

Table 2. Performance Comparison of Proposed Fusion method with single biometrics based on False Acceptance Rate

User	Finger print	Iris	Retina	Proposed Fused Image
1 – 10	0.43	0.48	0.38	0.11
11 -20	0.42	0.45	0.4	0.1
21-30	0.41	0.43	0.43	0.14
31-40	0.38	0.39	0.41	0.08
41-50	0.37	0.4	0.38	0.09
51-60	0.44	0.42	0.33	0.07
61-70	0.43	0.43	0.31	0.16
71-80	0.42	0.45	0.41	0.24
81-90	0.4	0.47	0.43	0.19
91-100	0.46	0.42	0.4	0.16

have less value of rejection rate while the proposed multimodal fusion method produce high false rejection rate and proved its performance is better than the others in validation and verification of network security.

Performance comparison of proposed fusion method based security using False Acceptance Rate

In biometric system based identification the users doesn't make claim about their identities. So it necessitates the

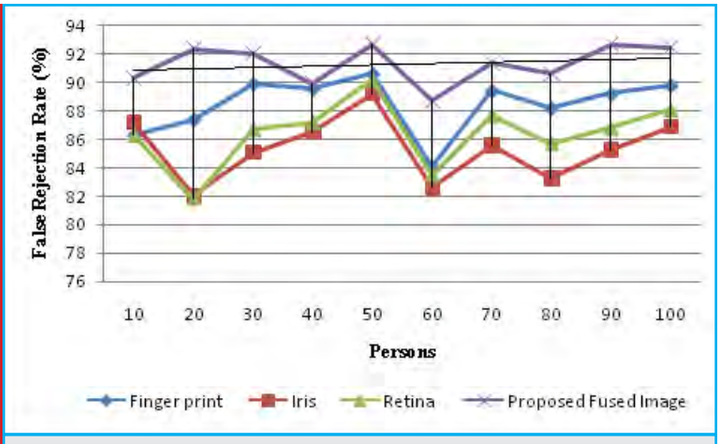


Figure 4. Performance Analysis of Proposed Fuzzy C-Means Fusion Method based on False Rejection Rate

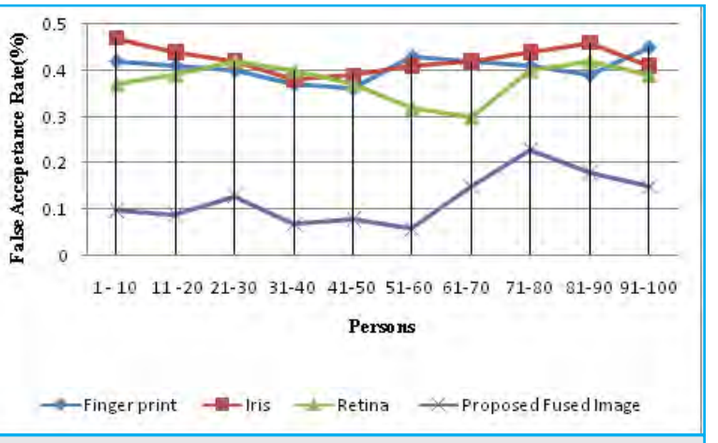


Figure 5. Performance Comparison of Proposed Fusion method with single biometrics based on False Acceptance Rate

importance of false acceptance rate must be smaller as much as possible so that the malicious users can not able to access the system under security. Thus the value of false acceptance rate must be considerably minimized comparing to false rejections

The table 2 and figure 5 depicts the performance of the proposed fusion technique false acceptance rate of the system by varying the number of users which ranges from 1 to 100. From the result it is observed that the single biometric based authentication holds the high value of false acceptance rate while the proposed multimodal biometric based authentication system produced low value of false acceptance. It proves that it is very hard to brute force the multimodal based key generation secure system.

CONCLUSION

Even though there is no perfect accuracy technique for the past decades, lot of methods given by the researchers. The proposed research consist of proper design and implementation to enhance the overall security. The secure system should be more secure and as well as user friendly. The proposed method satisfies the more security and user friendly as it is the combination of soft biometrics features and framework taken from the cryptographic for verification. The advantage of this method is determination of retinal based genuine point is the challenge one for the hackers. Fuzzy vault frame work comprises the cryptographic key generation with soft biometrics. The password given by the user is additional layer to provide security. If anyone know the password it is not possible to match the biometric template developed by this method. In the future works the existing security system can be eradicated and the proposed system can be implemented. In this work has been proposed with the 8 character from soft biometrics and password. In future there is many characters of human being can be increase. During the transmission life time, energy and efficiency has to be concentrated when apply these type of security. The convenience and adroitness may give higher level of security, as unapproved access would cut a shrewd gadget down and bargaining different endpoints on the system. The latest approaches not much suitable in IoT for user authentication. Though the classical security authentication provide adequate security, biometrics provide high level security for smart devices too.

REFERENCES

[1] K. Jain, L. Hong, and R. Bolle, O-line Fingerprint Verification, IEEE Transaction on Pattern Analysis and Machine Learning, vol. 19, no. 4, pp. 302-314, April 1997.

[2] C Harris, M Stephens, A Combined Corner and Edge Detector, in Proceedings of the Alvey Vision Conference (University of Manchester, 1988), pp. 147–151

[3] S Sukumaran, M Punithavalli, Retina recognition based on fractal dimension. IJCSNS Int J Comput Sci and Netw Secur. 9(10), 66–7 (2016)

[4] M. A. Olsen, V. Smida, C. Busch, Finger image quality assessment features—definitions and evaluation *IET Biometrics*, 2015.

[5] N. K. Ratha, S. Chikkerur, J. H. Connell, and R. M. Bolle, Generating Cancelable fingerprint templates, IEEE Transactions on Pattern Analysis and Machine Learning, vol. 29, no. 4, pp. 561-572, 2007.

[6] Aujol, J. F., Aubert, G., Blanc-Féraud, L. and Chambolle, A, 2005 Image decomposition into a bounded variation component and an oscillating component Journal of Mathematical Imaging and Vision, Vol.22, No.1, pp.71–88.

[7] Miles EP and Nuttall AL, 1993, Matched filter estimation of serial blood vessel diameters from video images IEEE Trans Med Imag, Vol. 12, No.2, pp. 147–152.

[8] Abhilasha Bhargav-Spantzel, Anna Squicciarini, and Elisa Bertino, Privacy preserving multi-factor authentication with biometrics, Conference on Computer and Communications Security, pp. 63-72, 2006.

[9] Maciej Szymkowski; Khalid Saeed, A novel approach to fingerprint identification using method of sectorization, International Conference on Biometrics and Kansei Engineering (ICBAKE), September 2017, pp: 55-59

[10] M. Ortega, C. Mari˜no, M. G. Penedo, M. Blanco, and F.Gonz´alez, 2006, "Personal authentication based on feature extraction and optic nerve location in digital retinal images". WSEAS Transactions on Computers, Vol.5, No.6, pp.1169–1176.

[11] Jinyang shi, Zhiyang you, Ming gu and Kwok-yan lam, 2008, "Biomapping: Privacy TrustWorthy Biometrics Using Noninvertible and Discriminable Constructions". in Proc. ICPR 2008.

[12] J.J. Staal, M.D. Abramoff, M. Niemeijer, M.A. Viergever and B. van Ginneken, 2014, "Ridge based vessel segmentation in color images of the retina". IEEE Transactions on Medical Imaging, Vol. 23, pp. 501-509.

[13] Oechslin, Philippe (2003): Making a Faster Cryptanalytic Time-Memory Trade-Off, Laboratories de Security et de Cryptography (LASEC), Ecole Polytechnic

[14] Zalewski, Michal. Silence on the wire, a field guide to passive reconnaissance and indirect attacks. 2005, No Starch press.

[15] Cransor, 2015 Lorrie Faith Cranor, Simson Garfinkel, "Security and usability: designing secure systems that people can use, O'Reilly Media, Inc., 2005, ISBN 0596008279

[16] Lai. 2011 Lifeng Lai, Sui Wai Ho and H. Vicent Poor Privacy Security Trade-Offs in Biometric Security Systems - Part 2: Multi Use Case IEEE Transactions on Information Forensic and Security, Vol 6, No.1, March 2011

[17] Jain, A., Bolle, R. and Pankanti S. (2009). Biometrics: Personal Identification in Networked Society. Kluwer Academic Publishers.

[18] Srinivasa Reddy, and I. Ramesh Babu, Performance of Iris Based Hard Fuzzy Vault, Proceedings of IEEE 8th International conference on computers and Information technology workshops, pp. 248 – 253, 2008

[19] Savvides, B. V. K. V. Kumar, and P. K. Khosla, Cancelable Biometric filters for face recognition, Proceedings of ICPR, Vol. 3, pp. 922-925, Cambridge, UK, September 2004

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Influence of Management Information System Integration in Decision Making of Managers

Najah K. Almazmomi and Ibraheem M. Alharbi

Department of Information Systems Management, College of Business, University of Jeddah, Jeddah, Saudi Arabia

ABSTRACT

The use of information is substantially recognized in the modern world assisting the company in effective management of its operations. The objective of the present study is to evaluate the influence of management information system integration in decision making of the managers. It also investigated the information systems integration benefits for management decision-making particularly in terms of ease, accuracy, and speed. To this end, the study has employed a survey approach constituting a total population of 112 participants recruited from two organizations; healthcare and financial firm. Respondents of the survey questions were the managers who were associated with firm decision making procedure at different levels. The data gathered was statistically analyzed using SPSS in the form of frequencies, and Chi square test. The results of the study have revealed that the information from the integration of the information system was effective in improving the managers' decision making and which further facilities the organization operations in a positive way. The study further concluded that the management system integration must be sustained in the organization for informed and prompt decision making by the managers.

KEY WORDS: MIS, DECISION-MAKING, MANAGERS, INFORMATION SYSTEM

INTRODUCTION

In recent time, the technological revolution has created great competition in the market, which allows the company to take initiatives to sustain their competitive edge. To take these initiatives, companies require a system that can integrate into different information units, which assists in a successful decision making and adaption to the ever-changing technological environment[1]. These offerings are not required entirely but its possession with respect to accuracy, quality, timeliness, and accessibility is essential so that quality and valuable decisions can be made. Thereby, it is a prerequisite for not only maintaining their functional capacity but for successful achievement of the objectives[2].

ARTICLE INFORMATION:

*Corresponding Author: nalmazmomi@uj.edu.sa
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/16

Table 1. Management Decision Level

Management Level	Decision Type	Information System Support
Strategic Management	Unstructured	Executive information system
Tactical Management	Semi-structured	Expert systems, decision support systems
Lower Management	Structured	Transaction processing, automatic decision-making or accounting models

The technology innovation combined with the information needs of the organization is fulfilled by the use of a management information system (MIS). It integrates the information, which supports the functioning of the business, its management, and abilities for decision making[3]. The use of Big Data Analytics development and its benefit for the organization has further been stressed by Loebbeck and Picot[4]. According to them, the BI system improves the functionality of the organization, leveraging its performance. The use of advanced system not only integrates the independent components of the organization but also improve the structural as well as unstructured communication mediums within the organization, improving information retrieval routines[5]. The information system has been used by various studies for the indication of multivariate decisions[6].

Consequently, the decision-making success is partly based on the information provided by the system and partly on the functional process of the organization component. Therefore, the receiving, as well as effectual supplying of the information is essential for the effective decision making of the organization (Table 1).

With context to the human nature, earlier studies have established that the efficiency of organization decision is not guaranteed by the individual perception and common sense. The study by Klatt et al[7] which explored the organization performance provide that the effective decision making within the organization are the result of the effectual evaluation of the data available in the form of information. The study by Lavalle (2011)[8] further adds that the effective evaluation of the organization information is linked to the low reliance on the judgements passed in the unstructured manner, which substantially impact the firm performance. This sets the base for the emergence of information system in various disciplines. This is the reason that managers aspire to design and execute the system which ensures more effective formation of strategies associated with performance of the business. The use of information system and its contribution for providing a competitive edge to the firm has been endorsed by various studies[9,10,11]. The decision making at different levels such as operational, tactical as well as strategic level is supplemented by the data provided by these systems.

Multivariate view of individuals is observed with regard to the utilization of the information system in decision making[9,10,12]. Some of these studies view information system as an investment in the infrastructure, which poses various challenges in execution as most of the managers are oblivious to the kind of information being received, integrating reluctances on its utilization on the part of firm personnel's. The associated cost of the decision is also viewed in a sceptical manner aimed at increasing the firm productivity.

Njonjo[13] stressed upon the integration of the MIS system in manager's decision making as it allows the formation of an effective decision and allows overcoming the issues affecting the origination of effective utilization of resources. Likewise, Wixom, Yen, and Relich[14] also endorsed the use of the system for the fashion retail business, whereas Anderson-Lehman et al[15] highlighted a parallel experience of the manager at an airline firm. Afandi[16] identified that the management information systems impact the job performance among the private sector employees.

Moreover, the system functioning is not only limited to the information but also to disruptions monitoring, which take place in the organization, providing the routes to overcome it and also supplying the alternative actions as reported by Sharma, Mithas, and Kankanhalli,[10]. It produces information products, which assist the decision making and are the outcomes of the collaborative actions among the individuals, technology and procedure[17]. The business administration supports the reports required at the strategic level, conducts internal diagnosis, and assists in planning, controlling, and decision making.

It is statically deemed that controllers at the company invest 70 percent of their time by processing data to the forms, which are requested at a company. Considering this, it is natural that controllers simply do not have sufficient time for generating qualified decisions and producing suggestions for the management, although it should be the most important part of their work[19]. Consequently, the valuable manpower and knowledge of the company is bottled-up by this routine. Additionally, the role of the system is continuously evolving, which requires the integration of this system to provide an actual picture the management information system plays in the managerial decision, along with its mechanism of correlation with decision making in various fields. Shanks and Sharma[20] highlights that the absence

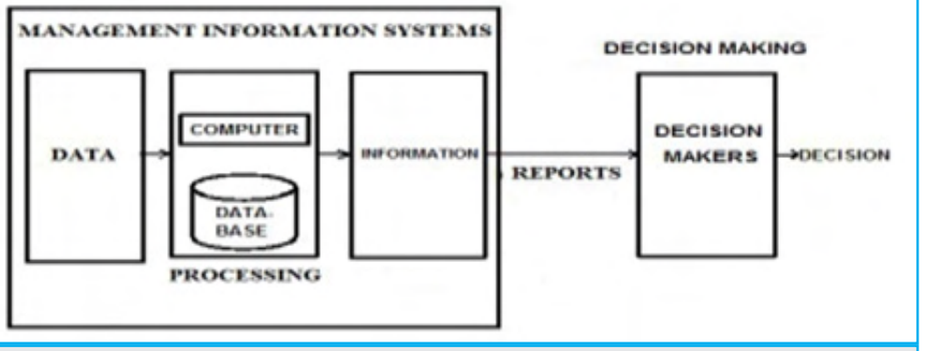


Figure 1. Association between Management Information system and decision making (Source: Al-Mamary, Shamsuddin, and Abdul Hamid[18])

of this system makes it challenging for the business units to provide value-based decisions requiring competitive actions for the business units. More prominently, it is unclear as to how the structural innovation can overcome the parameters set on the production of the valuable insights provided by the system. The research is further driven from the Davenport et al's[21] discussion, which raises questions as to how the decision-making structure and processes impact the manager's ability to produce insights and valuable decision for being executed in the firm. The study's objective is to evaluate the impact caused by the integration of MIS system in decision-making of managers. The study will help in forming a standardized policy for the integration of the MIS system in the corporation.

Hypothesis

The hypothesis set for the study include:

H_0: The MIS has no significant impact on manager's decision making in terms of accuracy, speed, and easiness.

H_1: The MIS has a significant impact on manager's decision making in terms of accuracy, speed, and easiness.

Methodology

The present study employs a quantitative method for evaluating the impact caused by the integration of management information system in the organization on the decisions made by the managers. The study assists in exploring the functional improvement and value provided with the decisions made using the information's provided by the MIS system.

Study Sample

The study was conducted on managers who were employed in both public and private organizations and

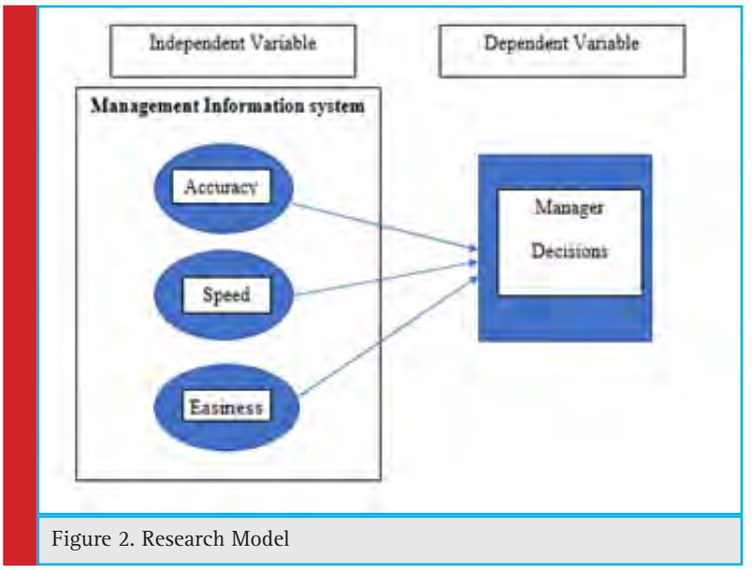


Figure 2. Research Model

equipped with MIS knowledge. The participants of the study were selected randomly from two different corporations belonging to healthcare and the financial sector. The selection of these participants is based on their involvement directly in the decision-making process ensuring that the obtained data is authentic. A total of 112 participants were selected from the top management (strategic), mid-level (tactical) and normal staff.

Study Variables

In the study, the management information system used in the organization is treated as independent variable whereas the manager's decision-making acts as a dependent variable.

Data Collection

The study collected the data by using a self-administered questionnaire based on the information derived presented in the literature review. The questionnaire was prepared on the website named survey monkey, which was then dispersed among the managers involved in the decision making of the two organizations. The items of the questionnaire are related to the quality of decision making in terms of accuracy, speed, and ease of decision making. The perception of the managers is assessed based on the performance enhancement provided by the system integration.

Data Analysis

The collected data was presented and analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. The data was presented through descriptive statistics, percentages and Chi square to draw final conclusions on the findings.

RESULTS

Before evaluating the responses of the participants provided, the items of questionnaire were assessed for calculating the internal consistency of the questionnaire. For this evaluation, the study used the Cronbach alpha. The internal consistency of the items in terms of Cronbach alpha coefficient was 0.979, signifying greater consistency and reliability among the questionnaire items.

The first section of the questionnaire gathered the demographic details of the participants. The responses of the individuals exhibited that the majority of the participants were male i.e. 83 whereas the number of female participants was 29. Considering the age group of the managers, most of these lie in the 25-40 years age group accounting 60.78%.

The following questions after demographic assessed the profile of the managers. Majority of the managers in both the firms were middle managers indicated through the increased percentage i.e. 42.5%, followed by lower level managers (42.5%) and top-level management (18.3%). Along with it, the major population of the managers has 5 to 10 years of experience (34.2%), reflecting upon their involvement in the organization operations, followed by above 10 years of experience (33.3%) and 5 years (25.8%). Considering the education level of the managers, equal population of bachelors and managers was part of the survey i.e. (n = 45), whereas 22 participants hold post-graduate degree.

With respect to the decision making, the managers were first asked about the organization dependency on the information system. The participants also improved the coordination of the individual as highlighted by majority of managers i.e. (n = 88). Their integration also

Table 2. Questionnaire Reliability

Cronbach's Alpha	N of Items
.979	14

Table 3. Participants Demographics

Variable		N	%
Gender	Male	83	74.10
	Female	29	25.89
Age	Below 25 years	19	16.97
	25-40 years	68	60.78
	40 years or above	25	22.32

Table 4. Managers Profile

Variable		N	%
Positions	Lower Level Manager	39	32.5
	Middle Level Manager	51	42.5
	Top Level Manager	22	18.3
Work Experience	5 years	31	25.8
	5 - 10 years	41	34.2
	Above 10 years	40	33.3
Education Level	Bachelors	45	37.5
	Masters	45	37.5
	Post Graduate	22	18.3
Total		112	100

Table 5. Impact of Decision-making on Organization Operations

Decision Making		N	%
Dependency on IS	Yes	81	72.32
	No	31	27.67
Co-ordination Level	Yes	88	78.6
	No	24	21.4
Ease of decision	Yes	84	75
	No	28	25

Table 6. Managers Decision Effectiveness			
Decision Making			
		N	%
Accuracy of Decision	Yes	77	68.75
	No	37	33.03
Speed	Yes	89	79.46
	No	23	20.53
Decision Flexibility	Yes	81	72.32
	No	31	27.67

Table 7. Decision-making and Overall Organization Functionality			
Decision Making			
		N	%
Information Flow	Yes	89	79.46
	No	23	20.53
Improved Monitoring	Yes	73	65.1
	No	39	34.82
Achievement of Strategic Goal	Yes	83	74.10
	No	29	25.89

improved the decision-making ability of the individuals making the formation of the information easy i.e. (n = 84).

Participants were asked about the effectiveness of the decision in terms of accuracy and showed that the information system integration improves the accuracy of the decisions (68.75%). The speed of the decision was also improved subsequent to the integration of the information system (79.46%). The increase in information has induced the flexibility among the managers' decision making (n = 81).

The information system integration has improved the flow of the information within the independent departments of the organization (n = 89). Moreover, the monitoring capacity has also improved with the information system integration as signified by the 73 individual whereas 83 participants highlighted that strategic goals improves the information system integration.

Chi-Square test is one of the most commonly used probability distributions where there are many applications. Chi-Square test of independency is a simple test by the researchers to see if there is a relationship between two variables. This test is carried out by comparing the value determined by the researchers in advance known as the level of the alpha in the value named p-Value calculated from the data available, it will be shown by comparing the two values whether there is a relationship between the two or not.

The Chi Sequered analysis demonstrates the strength of the relationship between the dependence on management information systems and the accuracy of decisions. Table 8 shows that the value of the Chi-Square test is 21.146 with a degree of freedom of 1 The table shows that the minimum value of the significance level is 0.000 which is smaller than the level of of $\alpha = 0.005$, and we accept the alternative hypothesis

Table 8. Chi-Square Tests Dependency on IS * Accuracy of decision					
	Value	**df**	**Asymptotic Significance (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	21.146a	1	0.000		
Continuity Correction	19.132	1	0.000		
Likelihood Ratio	30.428	1	0.000		
Fisher's Exact Test				0.000	0.000
Linear-by-Linear Association	20.958	1	0.000		
N of Valid Cases	112				

Table 9. Chi-Square Tests Coordination level * Accuracy of decision					
	Value	**df**	**Asymptotic Significance (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	15.069a	1	0.000		
Continuity Correction	13.228	1	0.000		
Likelihood Ratio	22.355	1	0.000		
Fisher's Exact Test				0.000	0.000
Linear-by-Linear Association	14.935	1	0.000		
N of Valid Cases	112				

Table 10. Chi-Square Tests Information Flow * Accuracy of decision

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.279a	1	0.000		
Continuity Correction	12.462	1	0.000		
Likelihood Ratio	21.273	1	0.000		
Fisher's Exact Test				0.000	0.000
Linear-by-Linear Association	14.151	1	0.000		
N of Valid Cases	112				

Table No. 9 examines the relationship between the levels of coordination in the institution based on management information systems and the level of accuracy of the decisions that deal with this issue. As the figures in the table show the strength of the link between the two variables where the value of test is 0.000 which is smaller than the level of $\alpha = 0.005$, so that we reject the null hypothesis which provides for the independence of the variables and accept the alternative hypothesis A relationship between the two variables

One of dimension of our study is also the study of the relationship between the level of information flow of management information systems and the level of accuracy of decisions, which shows its results in Table 10, which confirms the acceptance of the alternative hypothesis is a relationship between the two variables where the value of the test 0.000 less than the level of $\alpha = 0.005$.

DISCUSSION

As per the results of the survey, managers in both organizations reflected the integration of the information in a positive way. It can lead to additional information about the organization and can also assist in centralizing the management decisions. The results provide that the integration of the system increases the management dependency to pertain its utilization. It is because the nature of both organizations requires prompt responses by the managers as the money is at stake in the finance organization, whereas the human life is at stake in the healthcare. The dependency allows the managers on crafting of information-based decision lacking any sort of biasness towards judgement, as highlighted by the study of Argote, and Miron-Spektor [22]. The results also provide that the integration of the information system improves the coordination level among the employees. It is because the information is transmitted at an increasingly high speed, and all the changes made can be observed by employees at various levels ensuring the information authenticity. This aspect of management information system integration has been illuminated by the study of Michálek [23], endorsing the study findings.

The decision-making of the organization is also enhanced based on the speed and accuracy of the information available at disposal. Managers in both firms use the information provided by information system integration for improving the functional capacity of the organization, as decisions related to comprehensive issues are easy to devise as compared to earlier times. These results are supplemented by Pärn, Edwards, Sing [24] which provide freedom to the managers in terms of accessing favorable information.

The results of the study provide that the integration of the study have improved the managers' decision quality. This has been endorsed by Caniëls and Bakens[25] which states that the quality information part of the firm organization system is positively associated with the decision outcomes of the managers. It highlights the direct relationship of the information quality on the manager's decisions.

The study findings agree with Delorme and Arcand[26] who reflected that the traditional role of the managers has been amplified with the integration of the information system, providing that strategic perspective of managers is more developed, which allows them to view the relative shortcomings affecting their performance. The prompt and flexibility is another aspect, which allows the promotion of the information within the firm, improving the intellectual capability. It is because the individual learns about new ways and processes[27]. Peters[28] further adds that the integration of information system supports the knowledge acquisition, its dissemination, and interpretation. The improved organization information flow benefits the organization at large as information is better shared within the organization in an efficient manner, which also allows improved knowledge management within the organization. Chen, Chiang, Storey [29] illuminate that good decisions take place when the quality data is provisioned in a timely manner, which is achieved by the integration of the information system particularly designed to cater to this need.

The monitoring potential of the organization management also increased with the system integration allowing better decision making. Such as Gabriel and Obara [30] highlight that the real time updated information entered in the data improves the firm capacity for monitoring the business operations and taking required actions. The point is further supported by Allen, Heurtebise, and Turnbull[31], who provide that this system integration is highly beneficial in situation of crisis or discovery of something new. This amplifies the firm decision-making capability. Gikang[32] provides that in the present time the slight lapse indecision at the manager's part can cause huge losses. Kuoa and Ye[33] further reveal that the employee's capacity and knowledge can better predict organizational outcomes. Positive influence of information system integration has been explored by Park et al.[34] on the overall achievement of the firm goals.

The study of Laudon and Laudon[35] further highlights that the management information system allows the head managers to craft decisions in an effective and efficient manner by declining the decision-making meetings held. The results of the present study have highlighted that with the integration of management information system, managers' capability for devising information and executing focused decision improves, adding towards the overall efficiency of the firm. The decision-making area such as workers' performances evaluation, planning budget, hiring or firing a personal are supplies in with the needed information in real time by information system integration. With respect to the study results, the study of Safford et al[36] suggests that organization must train its managers for effectual use of the information.

CONCLUSION

It has been concluded from the study that integration of the information systems in the decision making of the organization serve as a great tool for making informed and quick. Considering the dynamic nature of the healthcare and financial firm, the information at hand allows the managers to make prompt decisions. The findings of the present study confirm to the determined hypothesis that integration of the information system improves the decision-making capability of the managers in terms of speed, accuracy and ease. The outcomes of the study reveal that the use of MIS can ensure the sustainment of effective flow of information in decision-making. The study suggests that the managers at all levels must be provided with proper training for the adequate use of the information system essential for crafting better decisions. This requires the integration of management information management system for instilling coordination, and control within the managers. The study suggests that the policy makers must identify a unified set of information which enables the crafting of secure, effective and fruitful managers decisions. Along with it, the study also directs the future researches to produce a replica of the study by improving the sample size or the length of the study. Including various regions and more companies are further recommended which can assist in setting out sturdy and informed decisions at the firms improving it determined goals achievement.

REFERENCES

[1] Rhodes, J. (2010): the role of Management Information Systems in Decision- Making. eHow. Retrieved November 2, 2018 from http: www.eHow.com/facts 7147006 role-information-systems-decision-making.html

[2] Teichert T, Grinband J, Ferrera V. The importance of decision onset. Journal of neurophysiology. 2015 Nov 25; 115(2):643-61.

[3] Gabriel JM, Adiele KC. Competitive Intelligence as panacea for environmental vagaries in Nigeria. Economic Journal of A 2 Z. 2012;1(1):25-30.

[4] Loebbecke C, Picot A. Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda. The Journal of Strategic Information Systems. 2015 Sep 1;24(3):149-57.

[5] Gandomi, A. Hairder, M. Beyond the hype: Big data concepts, methods, and analytics. International Journal of Information Management, 35 (2015) 137-144.

[6] Arnott, D. Pervan, G. Design Science in Decision Support Systems Research: An Assessment using the Hevner, March, Park, and Ram Guidelines. Journal of the Association for Information Systems 13: 11 (2012) 923-949

[7] Klatt T, Schlaefke M, Moeller K. Integrating business analytics into strategic planning for better performance. Journal of business strategy. 2011 Oct 31;32(6):30-9.

[8] LaValle S, Lesser E, Shockley R, Hopkins MS, Kruschwitz N. Big data, analytics and the path from insights to value. MIT sloan management review. 2011;52(2):21.

[9] Popovič A, Hackney R, Coelho PS, Jaklič J. Towards business intelligence systems success: Effects of maturity and culture on analytical decision making. Decision Support Systems. 2012 Dec 1;54(1):729-39.

[10] Sharma R, Mithas S, Kankanhalli A. Transforming decision-making processes: a research agenda for understanding the impact of business analytics on organisations. 2014

[11] Peters MD, Wieder B, Sutton SG, Wakefield J. Business intelligence systems use in performance measurement capabilities: Implications for enhanced competitive advantage. International Journal of Accounting Information Systems. 2016 Jun 1;21:1-7.

[12] Petter S, DeLone W, McLean E. Measuring information systems success: models, dimensions, measures, and inter-

relationships. European journal of information systems. 2008 Jun 1;17(3):236-63.

[13] Njonjo M, N. Strategies adopted by aid liaison department in Uganda to monitor use of aid funds (doctoral dissertation, school of business, university of Nairobi). 2013

[14] Wixom BH, Yen B, Relich M. Maximizing Value from Business Analytics. MIS Quarterly Executive. 2013 Jun 1;12(2).

[15] Anderson-Lehman, R, Watson HJ, Wixom BH, Hoffer JA. Continental Airlines flies high with real-time business intelligence. MIS Quarterly Executive. 2004; 3(4), 163-176.

[16] Afandi WS. Management information systems and their impact on job performance among employees in the private sector: SAUDI Telecommunications companies. International Journal of Computer Applications. 2017 Apr; 164(11).

[17] Gabriel, J. M. O. (2013). The Systems Concept: An unpublished Lecture note giving to B. sc year 3 Students of Faculty of Management Sciences. Rivers State University of Science and Technology, Port Harcourt.

[18] Al-Mamary YH, Shamsuddin A, Abdul Hamid NA. The impact of management information systems adoption in managerial decision making: A review. Management Information Systems. 2013;8(4):010-7.

[19] Asemi A, Safari A, Zavareh AA. The role of management information system (MIS) and Decision support system (DSS) for manager's decision making process. International Journal of Business and Management. 2011 Jun 30;6(7):164.

[20] Shanks G, Sharma R. Creating value from business analytics systems: The impact of strategy. 2011

[21] Davenport TH, Harris JG, Morison R. Analytics at work: Smarter decisions, better results. Harvard Business Press; 2010.

[22] Argote L, Miron-Spektor E. Organizational learning: From experience to knowledge. Organization science. 2011 Oct; 22(5):1123-37.

[23] Michálek, D. Benefits of Management Information Systems and Important Conditions for Successful Implementation and Running.

[24] Pärn EA, Edwards DJ, Sing MC. The building information modelling trajectory in facilities management: A review. Automation in Construction. 2017 Mar 1; 75:45-55.

[25] Caniëls MC, Bakens RJ. The effects of Project Management Information Systems on decision making in a multi project environment. International Journal of Project Management. 2012; 30 (2): 162-75.

[26] Delorme M, Arcand M. HRIS implementation and deployment: a conceptual framework of the new roles, responsibilities and competences for HR professionals. International Journal of Business Information Systems, (2010). (5): 148-61

[27] Argote L, Miron-Spektor E. Organizational learning: From experience to knowledge. Organization science. 2011 Oct; 22(5):1123-37.

[28] Peters MD, Wieder B, Sutton SG, Wakefield, J., Business intelligence systems use in performance measurement capabilities: Implications for enhanced competitive advantage. International Journal of Accounting Information Systems. 2016. 21:1-17.

[29] Chen H, Chiang R.H, Storey VC. Business intelligence and analytics: from big data to big impact. MIS Quarterly. 2012 . 36 (4):1165–88

[30] Gabriel JMO, Obara LC. Management Information Systems and Corporate Decision–Making: A Literature Review. The International Journal of Management. (2013). 2(1): 78-82.

[31] Allen B, Heurtebise A, Turnbull J. Improving Information Access. Business Management US. Retrieved from http://www.busmanagement.com/article/Improving-information-access/. 2010.

[32] Gikang'a SG. Role of Management Information Systems on Strategic Decision Making Among Tea Factories in Kenya (Doctoral dissertation, COHRED, Business administration, JKUAT).

[33] Kuoa YK, Ye KD. How employees' perception of information technology application and their knowledge management capacity influence organizational performance. Behav. Inform. Technol. 2010; 29:287-303.

[34] Park S, Zo H, Ciganek AP, Lim GG. Examining success factors in the adoption of digital object identifier systems. Electronic commerce research and applications. 2011 Nov 1;10(6):626-36.

[35] Laudon KC, Laudon JP. Management information system. Pearson Education India; 2016.

[36] Safford HD, Sawyer SC, Kocher SD, Hiers JK, Cross M. Linking knowledge to action: the role of boundary spanners in translating ecology. Frontiers in Ecology and the Environment. 2017 Dec;15(10):560-8.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

On the Measurement of Data Accuracy During Large-Scale Software Systems Implementations

Wajdi Aljedaibi[1] and Sufian Khamis[2]

[1]*Department of Computer Science, Faculty of Computing and Information technology, King Abdulaziz University, Jeddah, Saudi Arabia*
[2]*Deanship of Information Technology, King Abdulaziz University, Jeddah, Saudi Arabia*

ABSTRACT

Successful implementation of large-scale software systems urgently needs to apply Critical Success Factors "CSF". Data accuracy is one of the important CSFs which need to be measured and monitored carefully during the implementation of LSSs. This article focused on developing a method for measuring, monitoring and controlling Critical Success Factors of large scale software systems called "CSF- Live". Then, we apply CSF-Live for the data accuracy CSF. The CSF-Live uses the Goal/Question/Metric paradigm (GQM) to yield a flexible framework contains several metrics that we used to develop a formulation which enables the measurement of the data accuracy CSF. The formulation that we developed it for the data accuracy CSF is crucial to maintain accurate data in the legacy system during the transformation to the LSS.

KEY WORDS: ENTERPRISE RESOURCE PLANNING SYSTEMS (ERPS), CRITICAL SUCCESS FACTORS (CSF), MEASUREMENT, GOAL/QUESTION/METRIC PARADIGM (GQM), DATA ACCURACY

INTRODUCTION

Large-scale software systems (LSS) represented by Enterprise Resource Planning systems (ERPs) are complex according to its great size as well as the number of applications and services that they offer it. These systems work in different environments in which influential factors exist, termed as Critical Success Factors (CSFs). Data accuracy is among the CSFs and refers to either the data values stored for an object are the correct values or not, i.e. which means that data values must be represented in a consistent and unambiguous form; for example, if the following date September 20, 1959 is to be expressed in USA format then the it should be displayed as 9/20/1959." [16]. Large-scale software systems are complex, and they need to have precise data to work effectively. So, the data

ARTICLE INFORMATION:

**Corresponding Authors: waljedaibi@kau.edu.sa, smkhamis@kau.edu.sa*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/17

must be true and accurate when used in ERP systems to ensure no disruption to performance and it is working efficiently and with fewer errors [17].

Inaccurate data negatively affect the functioning of system's modules. If there are errors in data such as empty mandatory fields, then developers must monitor this data or try to alter them in the early stage before large-scale software system is implemented [4]. During the implementation of new ERP systems, we suggest that usage of legacy systems should continue but with no further development and enhancement, however, we measure and monitor the data accuracy in legacy system during transformation from legacy system to the large-scale software systems. we need to make sure that data accuracy does not decline and no any radical changes during the new project implementation. Despite the importance of data accuracy, there were no attempts to measure it using numerical values. However, it was measured using descriptive measures, e.g. high, medium and low [18]. In this work, we changed this descriptive method by proposing a new method to quantify the data accuracy factor. Using this quantified measure, we can monitor data accuracy in a more accurate manner. The proposed method is based on the GQM paradigm.

This article has the following sections: in Section 2 presents a background, while paper design and methodology is discussed in Section 3. Section 4 shows CSF-Live Method then Section 5 shows Measure of Data Accuracy. Conclusion are presented in Section 6.

BACKGROUND

The difficulty to manage and implement Large-scale software systems (LSS) is raised from different aspects related to the project management, requirement analysis, design, implementation, testing the LSS, and post-implementation maintenance [1]. These steps requires careful attention and detailed execution by experienced team. ERP is a common examples of LSS [4]. An ERP can be defined as a software concerned in business management which is implemented and effectively used by a company collect, store, manage, and interpret data that is obtained from many business activities including human resource, administrative, customer service, financial management, production, sales, business intelligence and functional in corporations and organizations, as shown in Figure 2.1 [9].

Numerous studies and research discussed [4, 10, 11] several ERP implementations have failed or encountered serious delays. Many issues and obstacles appeared in the performance of these tasks within the ERPs [12]. It was noticed that during such projects there were several factors that yielded such final results and that gave rise to what is known today as the critical success factors (CSFs) of large-scale software systems [4].

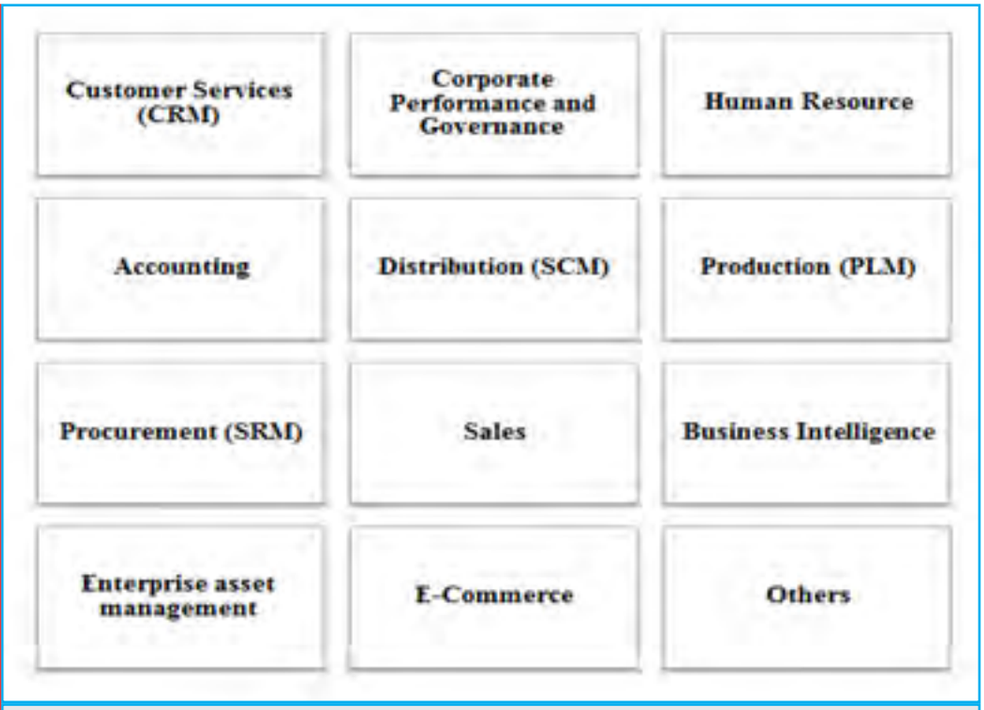


Figure 2.1. ERP various Modules [9]

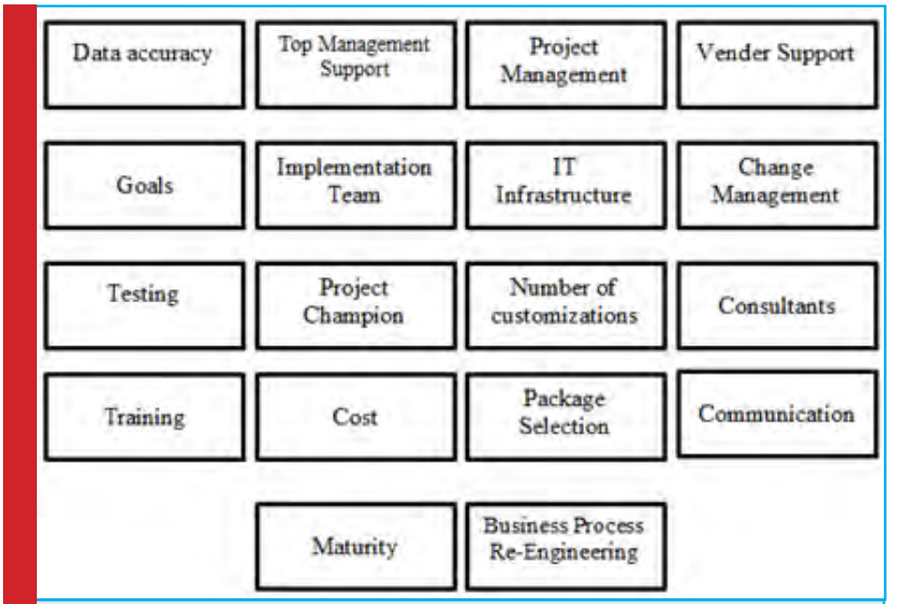


Figure 2.2. Set of Critical Success Factors [4]

There are above 66 critical success factors that have been reported [4], and which were found to affect ERP implementations. These factors have been further reduced to 18 factors as shown in Figure 2.2.

There were no previous attempts to measure these factors which we believe is important to assess the status of each and its subsequent impact on the success or failure of the program. Basili et al. introduced the Goal/Question/Metric paradigm (GQM) to address measurement of some goal, which maybe an object as well, according to the following approach:

- Identification of (a) goal(s) of the project.
- Ask questions related to how the goal can be achieved.
- Identify metrics.

GQM consists of three levels [8]:

A. Conceptual level (Goal)
We define a goal for a specific object in a particular environment, using different quality models and for a variety of reasons from different points of view.

B. Operational level (Question)
It is the use of a group of questions to determine the project goal and identify the evaluation characteristics or complete a specific goal.

C. Quantitative level (Metric)
A group of metrics, based on the models, are associated with each question in order to answer it in a measurable manner.

The Goals is the top of GQM model and it is refined to many questions. Answers of these questions called "metrics". The same metric can be the answer for more than one question as shown in Figure 2.3. Differing viewpoints in answering some of the questions affect the determination of the metrics.

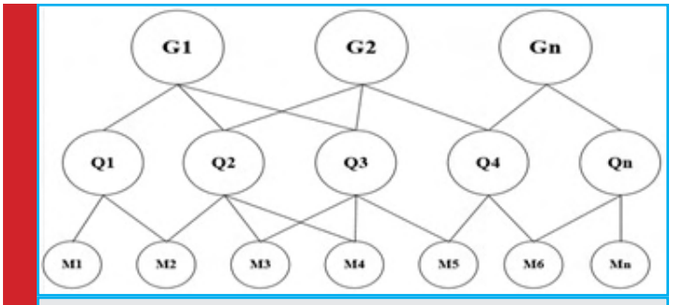


Figure 2.3. GQM Model Hierarchical Structure

Table 2.1. GQM Goal Definition Template [8]	
Analysis	**The object under measurement (process, product, other experience models).**
For the purpose of (Why)	Characterization, evaluation, prediction, motivation, improvement, understanding, controlling, or improving the object.
With respect to	The quality focus of the object that the measurement focuses on (cost, correctness, defect removal, change, reliability and user friendliness....).
From the viewpoint of (Who)	The people that measure the object (user, customer, manager, developer and corporation....).
In the context of	The environment in which measurement tasks place (problem factors, people factors, resource factors and process factors....).

Basili et.al. described his GQM process composed of six steps as in follows [8]:

A. Establish a set of goals and objectives for the project associated with the measurement of productivity and quality.
B. Ask questions to define those goals clearly.
C. Determine measurements to be collected, which will help you get answers.
D. Develop data collection methods.
E. Collect and validate data on time.
F. Collect and validate data on time.

Measurement goals have to be defined in an understandable manner and should be clearly structured [14]. The goal is defined by filling in a set of values for the several parameters in the template, it includes purpose (what object and why), perspective (what aspect and who) and the characteristics of the environment (where) see more Table 2.1.

PAPER DESIGN & METHODOLOGY

To achieve the goals of this article, the following steps were followed which were applied on data accuracy factor:-

1. Study of critical success factors for large-scale software systems
   We present a study of the previous research that focus on the critical success factors for implementing large scale software systems (e.g. ERP systems) and from which we selected data accuracy factor of these factors to be studied in the framework
2. Apply GQM-analysis
   To measure the impact of the data accuracy to the success/failure of the project of implementing large-scale software system, we used GQM to reach a set of metrics directly linked to data accuracy factor to enable monitoring and controlling capabilities.
3. Measurement Formulation
   Using GQM analysis, a formulation of the metric is presented as part of the measurement model for data accuracy factor.

CSF-LIVE METHOD

In this work we used a method (CSF-Live) [15] that represent our proposed framework for measuring data

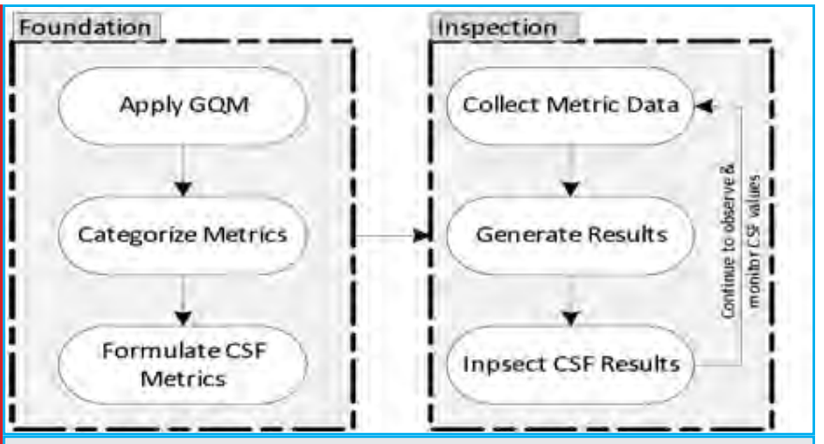


Figure 4.1. CSF-Live! Method

Table 5.1. GQM for Data Accuracy
Goal
Analyzing the data accuracy in order to achieve the purpose of evaluation with respect to data precision/data correction in view point of project manager/project sponsor in context of legacy software system.
Questions
How many tables? Is there new data stored in tables? How many columns in all tables? How many empty cells? Is there new data stored in lookup tables? How many empty mandatory fields? Is there duplicated data between tables? How many scripts run on data? How many batches requests?
Metrics (Answers)
Tables # Records # Columns DB Size # Empty Cells/Table # Lookup Tables Records # Empty Mandatory Fields # Duplicated Records # Batches

accuracy factor. The purpose of the CSF-Live method is to measure, track, monitor, and control the critical success factors during the implementation of large-scale software systems by using the Goal/Question/Metric (GQM) paradigm. The CSF-live method has six steps as shown in Figure 4.1.

MEASURE OF DATA ACCURACY

5.1 Data Accuracy as a Numeric Value

Despite the importance of data accuracy, there were no attempts to measure it using numerical values. However, it was measured using descriptive measures, e.g. high, medium and low [18]. In this work, we changed this descriptive method by proposing a new method to quantify the data accuracy factor. Using this quantified measure, we can monitor data accuracy in a more accurate manner. The proposed method is based on the GQM paradigm.

As shown in Table 5.1, a goal has been formulated to measure data accuracy and from the workshop that we conducted with the graduate students and some staff at King Abdulaziz University (KAU), we generated a set of questions and metrics during the discussion which helped us to measure the goal. The generation of questions and metrics is driven by the actual formulation of the goal. In addition, metrics must be represented numerically so that we can quantify the performance of the goal.

A formulation of the derived metrics will yield a single number that represents the goal, through which progression towards goal achievement can be monitored. It should be noted, that our method to CSF measurement does shows an accurate indication of current status of a single CSF quantified numerically. Figure 5.1 depicts the GQM analysis for data accuracy (top-down) where level one (top) represents the goal and level two (middle) represents questions and level three (down) contains the metrics. Sometimes, the same question is associated to more than one metric. For example, the question "*Is there new data stored in tables?*" is associated with two metrics "**Number of Records**" and "**Size of DB**". As mentioned earlier, for data collection we created a batch of queries to read from the HR active database daily for 189 days.

In order to measure the data accuracy, we created a collect resource system (HR) at an enterprise level organization joining more than 9,000 employees. In this case, 130 tables from which our scripts collected 189 days are putted on our database. It is presumed that any change in values of metrics above indicates a possible change in data. In general, change in data is not prohibited but data changes in legacy systems are expected to be less sensitive to ERP requirements of new standards of data structuring. Consequently, if any metric in the legacy system database is increasing while we implement the new ERP system for example, then this signals a risk that may affect accuracy of the data stored in the database.

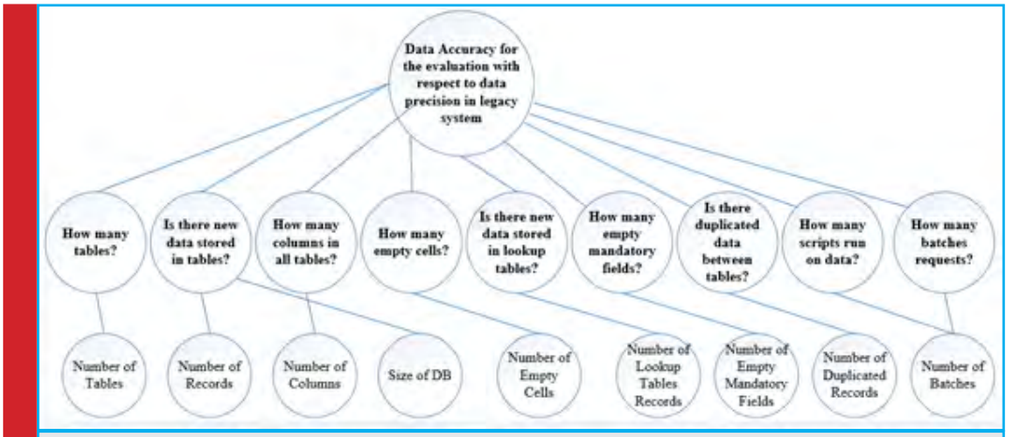


Figure 5.1. GQM Analysis for Data Accuracy

For example, when analyzing data collected for *number of records* metrics, we noticed that 872,190 new records were added in the HR database through 189 days. Such great increases in the number of records increases the probability of errors such as adding empty mandatory fields etc. This data represents 27 weeks in which the value of metrics was collected in two weeks interval and every two weeks, it is accumulated for a period of 27 weeks. Then, we calculated the following metrics':-

a) Maximum values of metric during the measured time interval.
b) Minimum values of metric during the measured time interval.
c) Stability Ratio is calculated by minimum values of metric divided by maximum values of metric.
d) Metric Change Ratio which is calculated as (1-Stability Ratio).

Metric Change Ratio yields results between zero and one as shown in Figure 5.2. Metric Change Ratio of 1 (or close to 1) means that a number of new changes have been added to the database. On the other hand, Metric Change Ratio of 0 (or close to 0) means that no new (few) changes have been added to the database. We confirm and assure that adding new data to a legacy system database will not be a recommended practice and may lead to a decline in the total accuracy of the data as will be shown later on in next paragraphs. Table 5.2 illustrates us the interpretation of different values for Metric Change Ratio for the new data. The following sections explain the details of each metric related to data accuracy.

NUMBER OF TABLES METRIC

The number of tables metric is defined as: a numerical count of the data tables within a single database of a legacy system. Figure 5.3 shows the actual data that we obtained representing the number of tables metric which were read from HR database. No changes were observed during the first six weeks, after which six more additional tables were added to the database within 12 weeks. Subsequently, Number of Tables Change Ratio was increased. Then, the number of tables was stable during the last 9 weeks as shown in Figure 5.3. We noticed that increasing the number of tables lead to an increase in the number of columns and number of records which have a negative impact on the data accuracy in the legacy system.

NUMBER OF RECORDS METRIC

The number of records metrics is defined as: a numerical count of the data records within a single database of a legacy system. Figure 5.4 shows the actual data that is obtained representing the number of records metrics which we were read from HR database. We note that records were continuously increasing since the beginning of the first week until the last week as shown in Figure 5.4, thus increased the Number of Records Change Ratio.

Figure 5.2. Bounds of Metric Change Ratio

Table 5.2. Interpretation of Metric Change Ratio

Metric Change Ratio	Meaning
0	0% New Data
0.01	1% New Data
0.02	2% New Data
0.03	3% New Data
0.04	4% New Data
0.05	5% New Data
0.06	6% New Data
.....	.....
.....	.....
0.99	99% New Data
1	100% New Data (Impossible)

THE NUMBER OF COLUMNS METRIC

The number of columns metric is defined as: a numerical count of the data columns within a single database of a legacy system. Figure 5.5 shows the actual data that is obtained representing the number of columns metric which we were read from HR database. We note strong relationship between the increase in the number of tables and increase the number of columns as in the eighth week created one table and two columns and in the tenth week created two tables and twelve columns.

Table 5.3 shows detailed comparison between the increase in the number of tables and columns during the project. Sometimes columns are added onto existing tables without creating new tables as in the sixteenth week where one column was added while the number tables were fixed. Also, in the 22nd week, two columns were created while the number tables did not change; but this introduced a new weakness to data accuracy since the number of empty cells in all of the older records within the database is increased. To be accurate, this column addition introduced empty fields in that are equal in count to the number of all older recorded existed in the table. A negative impact on the data accuracy in the legacy system because of the increase in the number empty cells on the pervious data (i.e. the previous records that already exist in the tables). We note that columns were stable during the first six weeks but after

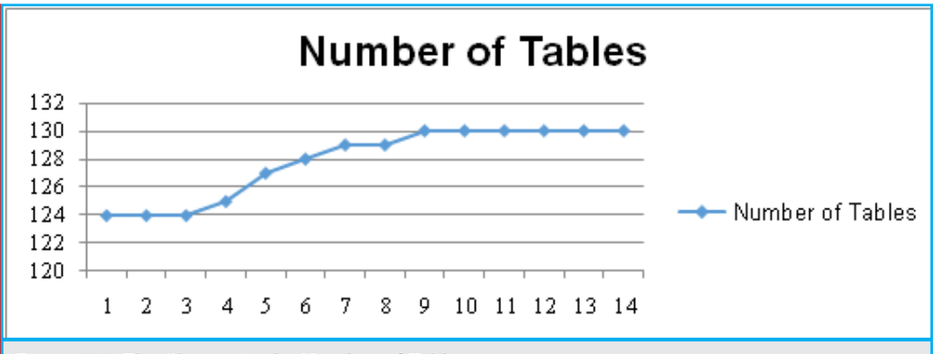


Figure 5.3. The Change in the Number of Tables

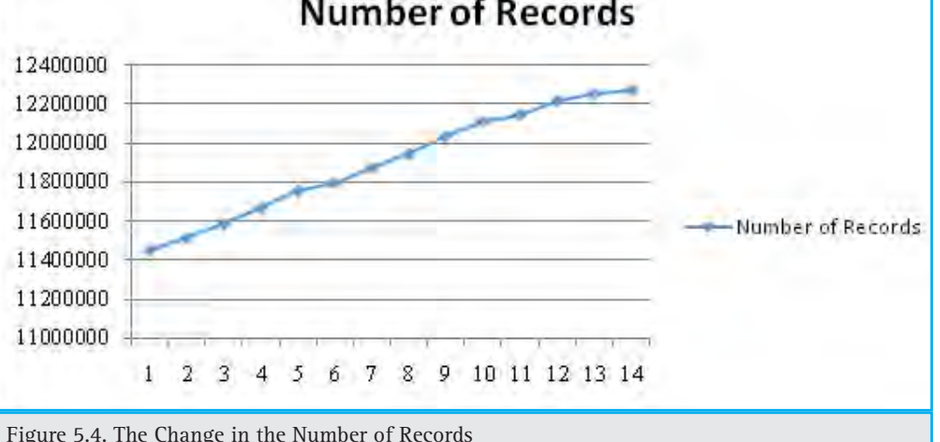


Figure 5.4. The Change in the Number of Records

Table 5.3. Comparison between Number of Tables and Columns

Sequence	Weeks	Tables	Columns
1	1-2	0	0
2	1-4	0	0
3	1-6	0	0
4	1-8	1	2
5	1-10	2	12
6	1-12	1	3
7	1-14	1	42
8	1-16	0	1
9	1-18	1	29
10	1-20	0	0
11	1-22	0	2
12	1-24	0	0
13	1-26	0	0
14	1-27	0	0

that 91 columns were created in the database in the next 16 weeks and thus increased the Number of Columns Change Ratio. Then, the number of columns was stable during the last 5 weeks (i.e. from the 23rd week until the 27th week) as shown in Figure 5.5.

SIZE OF DATABASE (DB) METRIC

The size of database (DB) metric is defined as: a numerical count of the size of database of a legacy system. Figure 5.6 shows the actual data that is obtained representing the size of database metric which we were read from HR database. We measure the size of database in KB. It is highly correlated with the number of records in the database, such that the more number of records the more increase in the database size. We note that the size of the database was stable during the first few weeks but after that increased size of database because number of records was increased and consequently the number block to store this data in the database increased. We notice that the Size of Database Change Ratio was small. In the last few weeks, the size of database did not change as shown in Figure 5.6.

NUMBER OF EMPTY CELLS METRIC

The number of empty cells metric is defined as: a numerical count of the data empty cells within a single database of a legacy system. The empty cells appear when users insert data records into the tables and leave some fields empty or maybe the empty cells are created by running a specific batch. This empty cell issue happens when the database designer allows the crated column(s) to be empty (ability to have NULL value). Figure 5.7 shows the actual data that is obtained representing the number of empty cells metric which we were read from HR database. We note that empty cells were did not change during all weeks as shown in Figure 5.7 therefore the Number of Empty Cells Change Ratio is zero because of no increase in the number of empty cells. Usually, increasing the number of empty cells occur if the number of records is increasing in the database.

NUMBER OF LOOKUP TABLES RECORDS METRIC

The number of lookup tables records metric is defined as: a numerical count of the data lookup tables records within a single database of a legacy system. The lookup tables refer to tables that contain static, unchanging information often and that can provide keys usable in other tables [19]. Lookup tables are important in any database. They are used by different queries to connect

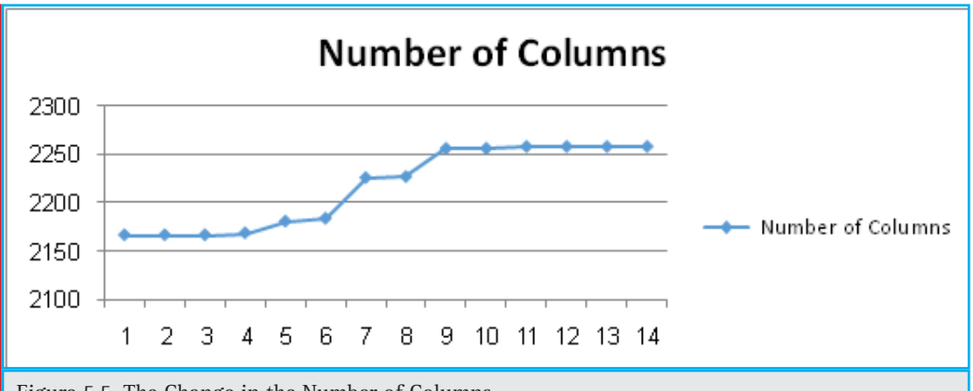


Figure 5.5. The Change in the Number of Columns

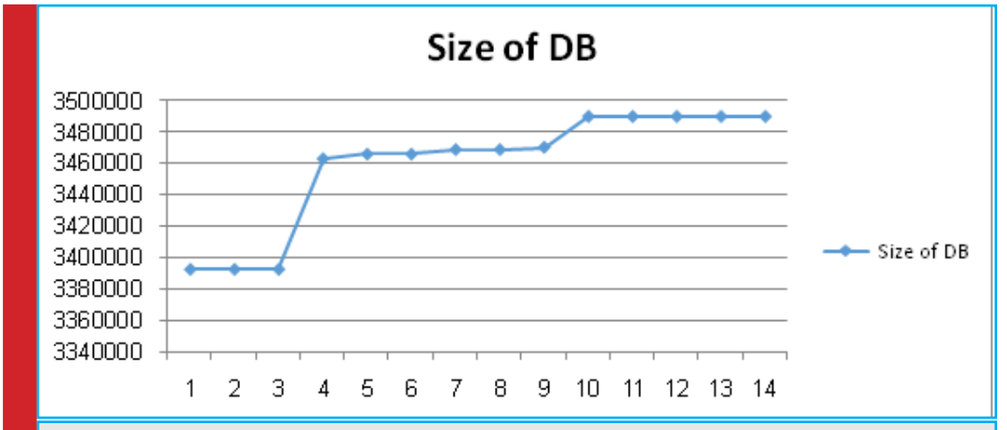


Figure 5.6. The Change in the Size of DB

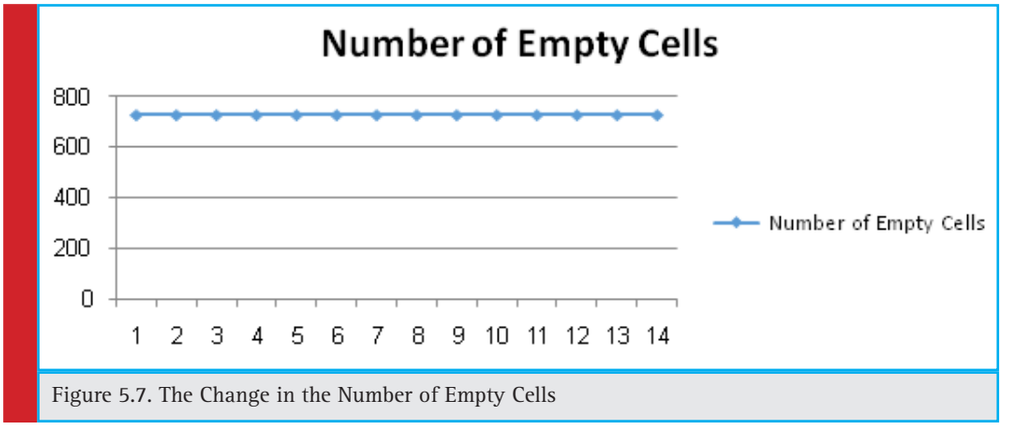


Figure 5.7. The Change in the Number of Empty Cells

tables and identify relationship. Figure 5.8 shows the actual data that is obtained representing the number of lookup tables records metric which we were read from HR database. This data consists of 15 weeks only because we needed few weeks' time to determine lookup tables an identify them in the database. It was shown that the numbers of lookup tables' records were increasing continuously since the beginning of the fourteenth week until the last week except of the last six weeks as there was no change in the number of lookup tables' records as shown in Figure 5.8. Also, we note a small increase in the Number of Lookup Tables Records Change Ratio because of limited number of inserted lookup tables' records.

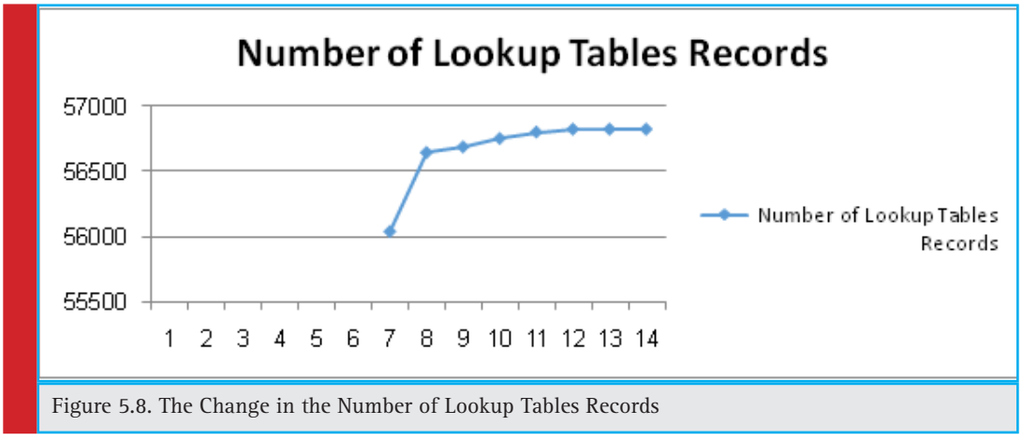


Figure 5.8. The Change in the Number of Lookup Tables Records

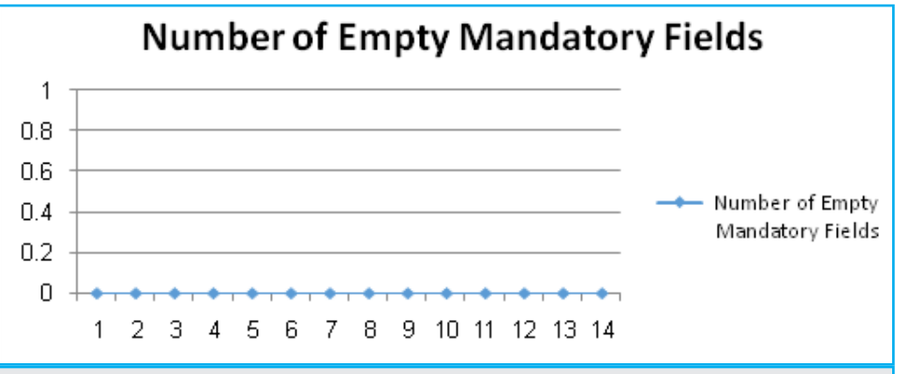


Figure 5.9. The Change in the Number of Empty Mandatory Fields

5.8 NUMBER OF EMPTY MANDATORY FIELDS METRIC

The number of empty mandatory fields metric is defined as: a numerical count of the data empty mandatory fields within a single database of a legacy system. The mandatory fields refer to fields that must be filled when user insert data to the table. Empty mandatory fields appear when designer allows the column to be empty when he creates the column. Mandatory fields are also called "required" fields. Figure 5.9 shows the actual data that is obtained representing the number of empty mandatory fields metric which we were read from HR database. We note that empty mandatory fields were zero during all weeks as shown in Figure 5.9; this means that either designer did not allow the mandatory fields to be empty or users entered data in the all the mandatory fields as part of application requirement. Therefore, Number of Empty Mandatory Fields Change Ratio was zero because of no increase in the number of empty mandatory fields.

NUMBER OF DUPLICATED RECORDS METRIC

The number of duplicated records metrics is defined as: a numerical count of the data duplicated records within a single database of a legacy system. The number of duplicated records metrics refers to the number of duplicated the data records in different tables. Figure 5.10 shows the actual data that is obtained representing the number of duplicated records metrics which we were read from HR database. We note that duplicated records are zero during all weeks as shown in Figure 5.10. This means repeating rows data is difficult to be replicated in the tables of the database, yet the duplicated records metric is important to measure data accuracy in legacy system. In HR the Number of Duplicated Records Change Ratio was zero because of no increase in the number of duplicated records.

NUMBER OF BATCHES METRIC

The number of batches metric is defined as: a numerical count of the data batches within a single database of a

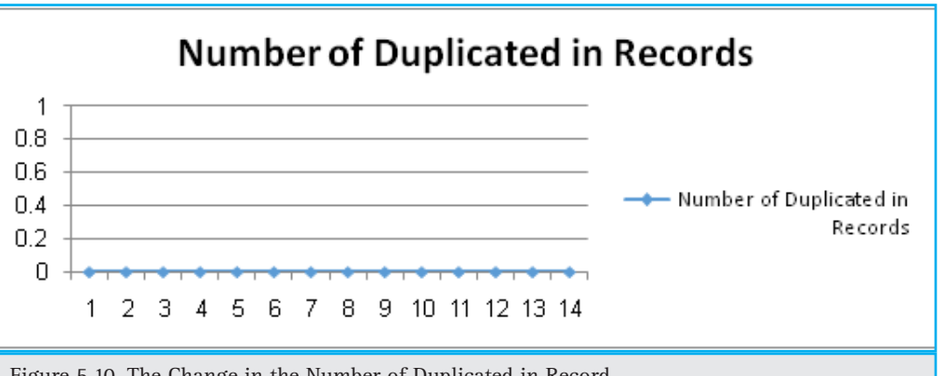


Figure 5.10. The Change in the Number of Duplicated in Record

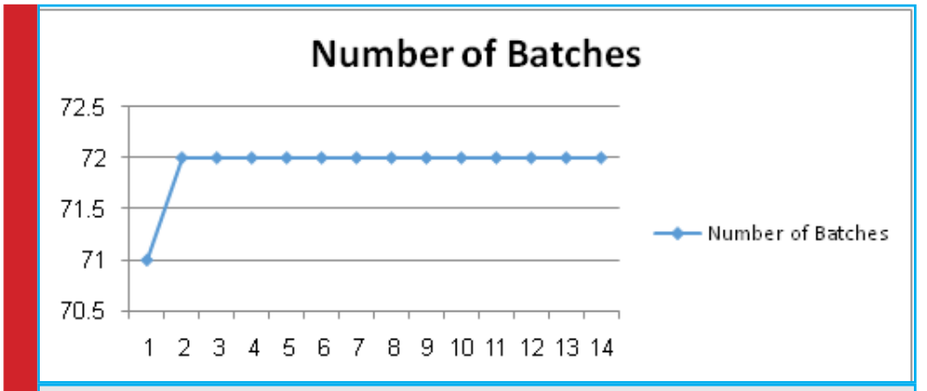


Figure 5.11. The Change in the Number of Batches

legacy system. The number of batches metric refers to the execution of a series of programs on a data without manual intervention (non-interactive) [20]. In HR database, Job Control Language (JCL) is a program that has many batches. During working days there exist 7 Job Control Language which have 70 batches that are executed every day except weekend. During weekends, there exists 3 Job Control Language which have 7 batches to work. In addition, there are some batches that are executed by requests from other departments in the deanship to perform some specific functions on the data. Batches execution has a negative impact on the data accuracy in legacy system because of the risk of creating new data which may have errors or empty.

Figure 5.11 shows the actual data that is obtained representing the number of batches metric which we were read from HR database. We note that there is great difference between maximum batches and minimum batches because many of the batches work only on working days, so Number of Batches Change Ratio is big number and also it is stable during the weeks as shown in Figure 5.11.

FORMULATION OF DATA ACCURACY (DA) METRIC

We formulated data accuracy as the summation of all the nine 'change ratio' metrics that we described in the previous sections as shown in Table 5.4:

$$DA = TCR + RCR + CCR + SCR + ECCR + LTRCR + EMFCR + DRCR + BCR \quad (1)$$

where

TCR: Number of Tables Change Ratio,
RCR: Number of Records Change Ratio,
CCR: Number of Columns Change Ratio,
SCR: Size of Database Change Ratio,
ECCR: Number of Empty Cells Change Ratio,
LTRCR: Number of Lookup Tables Records Change Ratio,
EMFCR: Number of Empty Mandatory Fields Change Ratio,
DRCR: Number of Duplicated Records Change Ratio,
BCR: Number of Batches Change Ratio.

The actual data is shown in for all nine-change ratio of metrics and values of the data accuracy Table 5.4.

Data accuracy is calculated in two successive weeks then accumulated every two weeks until the 27th week. From the achieved results, we notice that the highest impact on the performance of data accuracy is represented by the Number of Batches Change Ratio while on the other hand the Number of Empty Cells Change Ratio, Number of Empty Mandatory Fields Change Ratio and Number of Duplicated Records Change Ratio did not effect on the performance of data accuracy in this legacy system. In addition to this important note, we observe that in the first four weeks that the data accuracy did not change but after that increased in the next 20 weeks due to the increase in some values of the change ratio metrics but in the last 3 weeks the data accuracy become constant without any change as illustrated in Figure 5.12.

As shown in Fig. 5.13, Data accuracy gives results ranging from zero to nine. The accuracy of data 9 (or approximately 9) means that a number of new changes have been added to the database. On the other hand, data accuracy (0 or close to 0) means that no new changes have been added to the database. According to that result, we confirm that adding new changes to the old system database is not a recommended practice as it may result in a reduction in the overall accuracy of the data. Accordingly, the percentage of the extent of the accuracy of the data is calculated for each value obtained for the accuracy of the data.

Table 5.4 Measurement of the Data Accuracy

Sequence	Weeks	Number of Tables Change Ratio	Number of Records Change Ratio	Number of Columns Change Ratio	Size of Database Change Ratio	Number of Empty Cells Change Ratio	Number of Lookup Tables Records Change Ratio	Number of Empty Mandatory Fields Change Ratio	Number of Duplicated Records Change Ratio	Number of Batches Change Ratio	DA
1	1-2	0	0.01	0	0	0	0	0	0	0.9	0.91
2	1-4	0	0.01	0	0	0	0	0	0	0.9	0.91
3	1-6	0	0.02	0	0	0	0	0	0	0.9	0.92
4	1-8	0.01	0.02	0	0.02	0	0	0	0	0.9	0.95
5	1-10	0.02	0.03	0.01	0.02	0	0	0	0	0.9	0.98
6	1-12	0.03	0.03	0.01	0.02	0	0	0	0	0.9	0.99
7	1-14	0.04	0.04	0.03	0.02	0	0	0	0	0.9	1.03
8	1-16	0.04	0.05	0.03	0.02	0	0.01	0	0	0.9	1.05
9	1-18	0.05	0.05	0.04	0.02	0	0.01	0	0	0.9	1.07
10	1-20	0.05	0.06	0.04	0.03	0	0.01	0	0	0.9	1.09
11	1-22	0.05	0.06	0.04	0.03	0	0.01	0	0	0.9	1.09
12	1-24	0.05	0.07	0.04	0.03	0	0.01	0	0	0.9	1.1
13	1-26	0.05	0.07	0.04	0.03	0	0.01	0	0	0.9	1.1
14	1-27	0.05	0.07	0.04	0.03	0	0.01	0	0	0.9	1.1

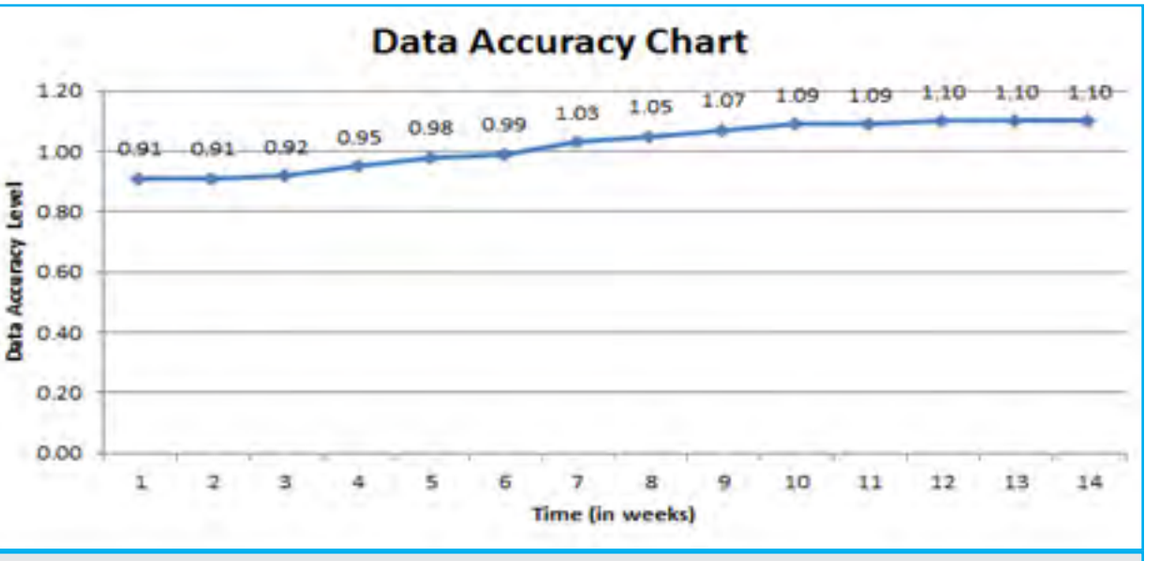


Figure 5.12. Measurement of the Data Accuracy

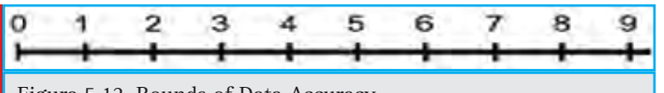


Figure 5.13. Bounds of Data Accuracy

For example, at the end of the 12th week of data collection, the result of data accuracy was: 0.99

This means that the change in the data accuracy was by 11%

Since:

$$\left(\frac{0.99}{9}\right) * 100 = 11\,\%$$

Our data shows that the value of the data accuracy metric based on 27 weeks of data collection was:

Data Accuracy Metric = 1.1

This means the change in the data accuracy was 12.22%, since:

$$\left(\frac{1.1}{9}\right) * 100 = 12.22\,\%$$

In a summary, the higher the change percentage the lower the data accuracy becomes. Table 5.5 shows us the summary of interpretation of different data accuracy values and the corresponding change percentage in data accuracy described in the following formula:

$$\left(\frac{0}{9}\right) * 100 = 0\,\%$$

$$\left(\frac{1}{9}\right) * 100 = 11.11\,\%$$

$$\left(\frac{2}{9}\right) * 100 = 22.22\,\%$$

$$\left(\frac{3}{9}\right) * 100 = 33.33\,\%$$

$$\left(\frac{4}{9}\right) * 100 = 44.44\,\%$$

$$\left(\frac{5}{9}\right) * 100 = 55.55\,\%$$

$$\left(\frac{6}{9}\right) * 100 = 66.66\,\%$$

$$\left(\frac{7}{9}\right) * 100 = 77.77\,\%$$

$$\left(\frac{8}{9}\right) * 100 = 88.88\,\%$$

$$\left(\frac{9}{9}\right) * 100 = 100\,\%$$

Table 5.5. Interpretation of Data Accuracy

Result	Meaning
0	0% Change
1	11.11% Change
2	22.22% Change
3	33.33% Change
4	44.44% Change
5	55.55% Change
6	66.66% Change
7	77.77% Change
8	88.88% Change
9	100% Change (Impossible)

CONCLUDED COMMENTS

Large-scale software systems (LSS) are seen as a complex problem given their size, quantity, source lines, number of users, number of data sizes, and the variety of services and applications they provide. In this regard, there are many factors play a major and pivotal role in the successful implementation of LSS, which are called critical success factors (CSFs) for large-scale software systems. In this paper, we chose the CSF to investigate it by measuring its impact on the old software system during the conversion to the software system on a large scale. So, we apply CSF-Live! . This parameter is a way used to measure and control the data accuracy factor that may affect the implementation of programs on a large scale. We have also created a set of metrics that are numerically represented to enable goal control, control and data collection to reflect metrics. Finally, we succeeded in formulating a mathematical expression representing the data accuracy factor, the data collected, and presented a case study that explored and explained the results.

REFERENCE

[1] Bar, Adnan Al, et al. "An Analysis of the Contracting Process for an ERP system.", SEAS-2013, Computer Science Conference Proceedings in Computer Science & Information Technology (CS & IT) series, Dubai, UAE, November 2-3, 2013

[2] She, Wei, and Bhavani Thuraisingham. "Security for enterprise resource planning systems." Information Systems Security 16.3 (2007): 152-163.

[3] Oracle Corporation, Redwood Shores, CA 94065 U.S.A, 10 Reasons Why Oracle Infrastructure Provides the Best Platform for SAP Environments April 2012, Version 1.0

[4] Ahmad Mutahar, "An Empirical Study of Critical Success Factors for ERP Software System Implementations in Saudi Arabia", Master thesis, Work under progress, 2016.

[5] Somers, Toni M., and Klara Nelson. "The impact of critical success factors across the stages of enterprise resource planning implementations." System Sciences, 2001. Proceedings of the 34th Annual Hawaii International Conference on. IEEE, 2001.

[6] Holland, Christoper P., Ben Light, and Nicola Gibson. "A critical success factors model for enterprise resource planning implementation." Proceedings of the 7th European Conference on Information Systems. Vol. 1. 1999.

[7] Boynton, Andrew C., and Robert W. Zmud. "An assessment of critical success factors." Sloan management review 25.4 (1984): 17.

[8] Caldiera, Victor R. Basili-Gianluigi, and H. Dieter Rombach. "Goal question metric paradigm." Encyclopedia of Software Engineering 1 (1994): 528-532

[9] Bauer, Rich. Just the FACTS101 e-Study Guide for: Introduction to Chemistry. Cram101 Textbook Reviews, 2012.

[10] Fang, Li, and Sylvia Patrecia. "Critical success factors in ERP implementation." (2005).

[11] Allen, David, Thomas Kern, and Mark Havenhand. "ERP Critical Success Factors: an exploration of the contextual factors in public sector institutions." System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on. IEEE, 2002

[12] Bar, Adnan Al, et al. "An experience-based evaluation process for ERP bids.", arXiv preprint arXiv:1311.2968 (2013)

[13] Melia, Detta. "Critical Success Factors and performance Management and measurement: a hospitality context."(2010)

[14] Esteves, Jose, Joan Pastor-Collado, and Josep Casanovas. "Monitoring business process redesign in ERP implementation projects." AMCIS 2002 Proceedings (2002): 125.

[15] Sufian Khamis and Wajdi Aljedaibi, A Framework for Measuring Critical Success Factors of Large-Scale Software Systems. International Journal of Computer Engineering and Technology, 7(6), 2016, pp. 71–82.

[16] Olson, Jack E. Data quality: the accuracy dimension. Morgan Kaufmann, 2003.

[17] Wu, Jun. "Critical success factors for ERP system implementation." Research and Practical Issues of Enterprise Information Systems II. Springer US, 2007. 739-745.

[18] Osman, M. R., et al. "ERP systems implementation in Malaysia: the importance of critical success factors." International Journal of Engineering and Technology 3.1 (2006): 125-131.

[19] Quamen, Harvey et al. Digital Humanities Database, 2012.

[20] Furdal, Stanislaw, and N. J. Plainsboro. "Quick Windows Batches to Control SAS® Programs Running Under Windows and UNIX,2008

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Learning Arabic Language in the Age of Computing Between Reality and Hope: Ambition and Challenges

Adel Alkahtani
University of Jeddah, Jeddah, Saudi Arabia

ABSTRACT

The Arabic language is the most powerful link between the Arab people and the Islamic people, which participated in the flourishing of the Arab-Islamic culture. In this sense, the Arab consensus and Islamic solidarity must be based on this strong foundation: the language of the Holy Quran and the language of Arab Islamic culture. Hence, the great importance of strengthening the status of the Arabic language, spreading it and teaching it, even to non-Muslim people, is of great importance. Because it is a protection for the cultural and cultural security of the Arab Islamic nation. On other side, the computer is a learning tool and a tool in the teaching and learning process. As a result of the developments in this era - the information age - the computer has witnessed a qualitative development in the service of the educational process, it provides many of the auxiliary effects that contribute clearly to the content of the course by Colors, sounds, images, static and moving contrary to the traditional teaching methods and methods used in education, and the advantages of the use of computers in the educational environment ability to provide the scientific material in a systematic and appropriate to the capabilities of students, so that the student or teacher to restore the Wei again and again so that the student can understand and mastery. Thus, this article try to discuss the role of computers and information technology in the teaching of Arabic language" in an attempts to answer the following problem: What is the role of computers in teaching Arabic language and what are the areas of its use? Also, the article shed the light on the main challenges that face teaching Arabic language in the era of computation and advanced information technology.

KEY WORDS: INFORMATION TECHNOLOGY - EDUCATIONAL AIDS, EDUCATIONAL PROCESS, ARABIC LANGUAGE, COMPUTER, HOLY QURAN- TEACHING AND LEARNING

ARTICLE INFORMATION:

**Corresponding Author: aalqahtani@uj.edu.sa*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/18

INTRODUCTION

In the last quarter of the twentieth century, the world witnessed an amazing pace of change Which have spread in the scientific, economic, social and political spheres and have known the means of communication. The transfer of knowledge was a stunning development accompanied by an explosion in computer technology and information led to a change in how to get knowledge, and on various subjects and dictionaries in CDs, if they are Globalization is an imperative necessitated by political, economic and cultural transformations With this new global situation to be able to participate effectively in social development, to achieve. It is necessary to develop scientific thought and renew the means of education through the use of audio and visual [1].

One of the progress and advancement of any nation is its interest and keenness to master its language and its steadfastness in the provision of extraneous languages. Language is an important part of the components of identity, and every nation hovers to progress and rise and rise on the brink of growth and development is developing its language is a development that combines Originality and contemporary.

Language is a means of understanding among the members of the nation and is the lifeblood of societies where understanding is achieved. It is the foundation upon which the child depends - after God - to gain the skills and expertise he assigns to communicate with his environment, through which he can understand and interact with that environment first, and with the nation to which he belongs Second, it is linked to its religious, cultural and intellectual heritage, and language is the medium that reaches the knee Civilization and the introduction of rapid development, and a large area to express the feelings and feelings in the soul and complete maritime views, in which the development of his character. The teaching of Arabic is not an innovation of science and the arts [2].

The education must be subject to modern theories in the teaching of science in general and the teaching of languages, especially in primary or secondary languages. It is necessary to keep pace with the educational process of these changes to address the problems that may result, such as: the abundance of information, the increase in the number of students, the shortage of qualified teachers, the distance, the increasing need for education, And the emergence of the concept of lifelong learning. These changes have led to the emergence of many patterns of individual or self-learning in which the learner moves according to his abilities and abilities, and the speed of his learning, according to his previous experiences and skills. New educational concepts have emerged, such as the concept of programmed education, the concept of computer-based learning, and the concept of distance education, in which a student learns anywhere without the need for a permanent teacher.

It is necessary to teach the Arabic language - in particular - to gain the learner the ability to deal with information, how to obtain it from multiple sources, and how to organize this information and employment, and the ability to link information, and the recognition of mutual relations, and the development of new information, As well as the ability to absorb the outputs and use of modern technologies, and the skill of maintaining them, and maintenance and development of performance. At the other end, the heads of information technology and the support of the owners of the Arabic language and its specialists to adapt the technology to the Arabic language and not vice versa, may require a new definition of some of the concepts of Arabic language and rules, but in the same language and language [3].

Therefore, it is necessary to serve the Arabic language in terms of supporting software, such as exchange software, grammar, semantic aids, translations into and from Arabic, maps of linguistic concepts, study of linguistic phenomena, etc. But we are facing a problem in the culture of many Arabic language specialists and teachers towards the field of information technology to serve the Arabic language. There is also a digital divide between these language specialists and their students who were brought up in modern technology, the most important of which is information technology. On the other hand, there are a number of demands to be adopted when adopting the use of technology in teaching and learning Arabic. There are also many methods and applications used to teach Arabic. For example, language labs should be used in the teaching of Arabic speakers, and the labs are now used to teach us - we are Arabs - English.

There are some obstacles to the use of technology in our education in general and in the teaching of the Arabic language in particular, some of which some teachers believe that the use of technology in education may eliminate the role of the teacher, where the learner can receive his lessons directly, without the need. But the fact that the role of the teacher from the teacher to the director or counselor of education changes, through the planning of the educational situation, in the framework of the method of systems and selection of sources of learning that fit with the goals planned and record his observations on the progress of the learner and then directed.

In conclusion, we find that the Arabic language today is witnessing Arab and global challenges in the present era not only from its opponents, but also from its own people, because of the current circumstances surrounding it, including the launching of calls to marginalize it, change its features, or diminish its function and ability.

The vitality of the Arabic language again in an attractive manner by teaching it functionally in the fields of science and knowledge, and creating an artistic and creative taste among the learners, especially the young ones; to get to learn the Arabic language in a modern manner that inspires in its children a sense of its value and valuable treasures. At that they can use in all linguistic situations - literary and scientific.

THE IMPORTANCE OF LEARNING ARABIC & ITS RELATIONSHIP WITH COMPUTER TECHNOLOGY

The Arabic language is called the language of the oppressed, the language of reluctance, the standard language, and the language Eternal has reached us through transportation, and saved us the Holy Quran. The Arabic language is a pot thought and mirror of human civilization reflected in the concepts of communication between humans and means of communication. It is easy for him to pay attention to them, and it is sufficient for the Arabic language to be elevated and honorable, because it is the language of revelation Hakim to bring people out of the darkness to the light, has been attached to the Ajam through the Holy Quran, and their tongues stopped, and they seized their tongues, and almost forgot them [4].

The Arabic language represents the Book of God, the highest Arabic speech and its name and the splendor of the Qur'an and its eloquence and clarity And his language, the Arabic language and the language of the Prophet peace be upon him and the transfer of his conversations Prophet Muhammad It was the year of the cleansing, and in Arabic, the Arabic culture, the language of eloquence, luxury and wisdom Power and rhetoric. The Arabic language was distinguished between languages as a language with a large and significant balance in prose different types and hair on different objects and subjects and this balance is in itself a treasure of treasures of our Arab Islamic civilization. The Arabic language with its poetry, prose, rules, individualities and methods is an large element of culture is the subject of attention and study in all corners of the earth.

The Arabic language has a lot of advantages given by:-

- The language of the pot of thought, defined for its special and general features and influential in its present and future and the target thereof.
- Arabic, like other languages, is the instrument of expression of our civilization for thousands of years.
- Arabic is the book that God has promised to save.

So, there is a need to experiment with modern methods and methods through which language weakness can be addressed is therefore urgently needed Arabic, accordingly it works on its development and from those educational means (computer).

Educational means are used as a means of learning and lead to learning The research has shown that students learn more and become more attractive I used the educational means that raise more than the sense of them, the sharing of senses of hearing and sight In learning it is better to use hearing alone. Educational means are an integral part of teaching methods and have a role to play in Educational process, and the need to use them in our time. Teaching aids also have great value and relevance in the process of teaching your language skills Learner, and show that importance through many evidence, including [5]:

- Stabilization of information in the mind of the learner: has confirmed many studies conducted in the states that the learner can (remember 10% of what he read and 20% of what he heard, and 30% of that, 50% of what he heard and saw at the same time, 70% of what he said, and 90% of what he did).
- Means that if learning is done by more than one sense, it leads to a higher recall rate and learning more effective.

The advantage of using the computer in the educational environment, for example, is that it provides many Auxiliary influences that clearly contribute to the presentation of the content in an interesting way through the use of colors, sounds and images, static and moving contrary to the traditional ways and means of education The computer also distinguishes its ability to provide the scientific material in an organized manner and a level commensurate with the capabilities of students, so that the student or teacher to re-content time and time again, So that the student can understand and master.

The computer is used in language learning in particular; to learn language skills, whether Mother tongue, or foreign language. Computer technology has been used as an educational tool to assist language learners; To develop their language skills, thus constituting an integral element in addition to other teaching methods Helps create an active, linguistically rich learning environment.

The computer was actually used in language learning in the 1960s and language learning programs were developed Computer-aided English with the early 1980s, and the use of computers Assistant in the teaching of languages and learning stages of three as the first phase began an idea in the fifties, Applied in the 1960s, and based on the behavioral theory that made the computer an ideal tool Because it allows repeated learning of the material many times. The second phase has started in 1970s, continued during the eighties, and based on the principles of communication theory, was the cause The prevalence of this theory is the criticism of behavioral

theory; On which the theory of behavior depends on repetition, and thus lack the communication factor; The theory of communication on the student's use of language in real-world purposes, the student is evaluated based on Give it the answer, not through the mistakes it makes. Many programs have been developed that this theory is based on education and gives some control and freedom during learning [6].

The main Obstacles of using computer in education are summarized as follows:

- Lack of specialized frameworks in the field of educational computer in the education system in different countries and few adequate awareness of the importance of introducing computers in the field of education.
- Lack of appropriate high-level software because of the considerable effort required to design Software and writing.
- The scarcity of educational programs in Arabic, where this is an obstacle to the expansion of the introduction Computer Education.
- The computer does not provide opportunities for proper social interaction among students themselves during learning. Learning Arabic has become a science that receives the attention and attention of researchers and specialists in Unfortunately, we find this interest extended to the use of technology in particular the computer. If there are no programs dedicated to teaching the Arabic language, whether to her parents or to other people, only what although there are Arab societies that have limited interest in heritage aspects of the language Arabic language without attention to an important aspect of language and computer linguistics attention in the design of programs in e-learning, including the following:-
- Develop a computer program that develops the need of Darcy Arabic and fits them all regardless of level their linguistic competence
- Providing content in fluent Arabic.
- Reassuring the Arabic language and heritage and intensifying its teaching in general education materials.
- To guide users of Arabic dictionaries to the importance of electronic dictionaries.

THE MAJOR PRIVILEGES OF E-LEARNING APPROACH

- ***Increase communication*** between students, between students and teachers through easy communication between these parties in several directions such as discussion boards, e-mail, dialogue rooms. The researcher believes that these things increase and stimulate students to participate and interact with the topics in question.
- ***Contribution to the different views of students:*** E - learning allows the exchange of views on the topics raised, increasing the opportunities to benefit from the views and proposals put forward and integrated with the views of the student and this helps to form a solid basis for the learner and has a strong knowledge and opinions and through the acquired Of knowledge and skills through dialogue rooms.
- ***Sense of equality:*** The tools of communication allow every student the opportunity to express his opinion at any time without embarrassment, unlike the traditional classrooms that deprive him of this feature either because of the poor organization of the seats, or the weakness of the student's voice itself, or shame or other reasons, This type of education allows students to send their opinion and voice through available communication tools. This feature is more useful for students who are afraid and anxious because this method of education makes students more daring to express their ideas and find facts than they would in the classroom Traditional [7].
- ***Easy access to the teacher:*** E - learning has made it easier to get the teacher and access to it as soon as possible outside the official working hours, because the trainee has been able to send inquiries to the teacher, and this advantage is more useful and appropriate for the teacher rather than stay confined in a library.
- ***The possibility of adapting the teaching methods:*** Receive the scientific material in a way that suits the student, some of which fit the visual method, including the method of audio or read, and some suit the method of practice.
- ***Fit different methods of education:*** Allows the learner to focus on important ideas while writing and compilation of the lecture or lesson, and also allows students who have difficulty concentrating and organize tasks benefit from the material because they are arranged and coordinated in an easy and good and important elements are specific.
- ***Additional help on repetition:*** An added advantage for those who learn in practice. Those who learn through training, if they want to express their ideas, put them in certain sentences, which means that they repeat the information they have been trained on, as students do when preparing for a particular exam.
- ***The availability of curricula throughout the day and on all days of the week:*** useful for people who are moody or who want to education at a certain time, as well as those who bear the burdens

and personal responsibilities, this feature allows everyone to learn in a time that suits them.
- ***Continuity in access to the curriculum:*** makes it able to get the information at a time that suits him

DEVELOPING THE SKILLS OF LEARNING ARABIC LANGUAGE ACCORDING TO THE DATA OF CONTEMPORARY TECHNOLOGY

Education in the information age is moving towards the diversity of knowledge and skills, and it has become possible for the school, thanks to computers and information and communication technology, to simulate the external reality within its walls. Having had many ways to communicate directly with the sources of knowledge, it became a belief that information technology was the effective means of transferring reality and vitality to school so that education would become more realistic and interesting [8].

If we look at the Arab learner, we see that he is studying all the Arabic language courses, but we notice deficiencies or weaknesses in the basic points of skills. Therefore, we must focus in our Arabic courses on high skills in the Arabic language to reach the creative learner. This can only be achieved through the development and activation of the language skills, which are appropriate to the age and intellectual level of the learner:

- Reading (active and conscious, both speed and depth of understanding).
- Conversation: (Clearly understandable, masked, evidence-based, and proof-based).
- Listening to language speakers and understanding their meaning directly.

However, acquiring and possessing these skills requires the creation of an appropriate atmosphere and conducive conditions, which are reflected in the use of the modern age data (education technology), such as language laboratories, computers, the Internet, the video room, the theater, etc. Focusing on the use of fluent Arabic, direct communication and direct expression will make the study hall an arena for practicing language skills, using the video room for listening and viewing, and the modern computer, which is connected to the Internet. The goal is to emphasize the practical, practical, and attention to the functional aspect related to the future learner's life, develop his abilities, satisfy his tendencies and achieve serious benefit for him, while training him in ways of collecting information, which helps him to exploit his time in a fun way. This is called "smart class": the ability to self-learn, to create, to acquire skills and experiences, by employing modern technology, which helps the student succeed in benefiting from his or her own experiences by direct practice [9].

Therefore, modern education emphasizes the importance of caring for the learners' ability to use language skills, which helps them to use Arabic in vital situations. This ability is achieved not only by defining the language and rules of use, but also by random learning based on repetition and not based on diagnosing the reality of learners. Unless it is training on sound practices, to consolidate and stabilize these correct responses. This is reflected in the teaching of spelling in the primary stage, for example: where it is by dictating phrases and sentences to the learners, followed by correction and so, there is no doubt that spelling in this picture is a kind of test, but is supposed to be preceded by the process of education and training through using technology, so that the learner can acquire the skill better, in an interesting and enjoyable way, where he has this method of technology (computer), the skill of correcting his spelling mistakes himself, and rewriting in a multi-choice attempt to reach the correct answer, And dealing with it easily, but the teacher has a suitable tool, which can be used to diagnose the level of students, and their weaknesses in written skills. Now we wonder how to develop Arabic language skills: listening, reading, writing, expression, according to modern technology:-

- ***Listening skills:*** The listening is of great importance, it is the art of all the arts of speaking, reading and writing. It was therefore necessary to take care and attention to the skills and experiences that would improve the listening ability through achievement tests, to provide appropriate grades as well as other language skills, to provide all assistance in their application, and to implement them in the field of education from media, recording devices and other The learner needs a variety of texts, based on listening positions, materials, functions in school and working life, and his needs, especially in the first stage of basic education, which can be used in the use of texts of starting, reading and adapting, And other materials to listen, can achieve the goals in a better way, especially if we note the need for good listening, and its impact on communication, understanding, and language learning and pronunciation spontaneous and natural, especially if we use the audio and visual devices, and other means to possess this skill.
- ***Oral expression skills:*** To develop oral expression skills, learners should have many opportunities to practice language in terms of oral expression, vitality, diversity, and responses to practical and natural needs. The text of the starting stage in the first stage is useful in acquiring an initial balance, through teaching listening, to build learning other skills on it. It compensates for the expression

by saving written texts that are suitable for the characteristics of the oral language, and does not give expression to the learners and their departure. Which serves the purposes of expression. Note that the written text has characteristics that distinguish it from oral discourse, and its use is not justified in oral expression, unless it is intended to make learners speak orally, as written books do. But using technology, modern means, and mediums we can love them in language and encourage them to gain, by increasing the exercise, and exercises gained by the skills of oral expression. We should also encourage them to be proficient in written expression, in parallel with the oral expression appropriate to their age, level, and interest in modern methods, which have proved to be very useful in the fields of oral and written expression.

- ***Reading and memorization skills:*** Specialists in the field of reading, special software for determining the level of reading, have developed the text used by learners. It determines the level of pacing along the sentence, the length of the word, the difficulty level of the word, or the filling of the appropriate floor space, Basis. This allows the teacher to delete some words of text, and asks the learner to fill the blank with the appropriate word. Such software helps to determine the level of reading in a classroom where the teacher can measure the individual's ability, and in view of the level of reading, the student is given the best teaching material.

  Some programs can help students memorize poems, sayings, chats, and texts. To provide the text and delete some of the implications gradually: or provide the student after each erasure gradually by the correct answer, and to help the accuracy of the preservation, and the understanding of reading, and at the end of the program, to save the entire text, without any hint. In order to develop reading and memorization skills, we need to use literacy content and texts that support listening and expression skills and enrich them, serve reading functions in general, and their functions in student learning and response to their own needs. It is necessary to diversify the reading texts in a variety that is capable of developing literacy tendencies, using the sources of children's literature and culture, investing in the classroom, the school treasury, video, television, computer, and ... to develop the tendency to free reading, interacting withthe various reading materials and selected by students.
- ***Writing skills:*** Writing skills are drawings and mistakes that require strengthening their connection to reading, listening, expression, and taking into account their association with psycho-motor skills, discrimination, drawing and error. Many teachers have suggested the development of special manuals to train on the origins of writing, the line and its controls, and special attention to drawing and handwriting, especially at this stage. He is encouraged by the love of language because it gives him the last assessment of his work. The computer, and modern technology, are able to support and acquire Arabic skills easily, easily and thrilling, but also to teach them very important skills at this stage. The computer skills that the learner can acquire are Arabic word processing skills, and the computer in the school can provide the students with adequate training to acquire the skill of word processing. It has the ability to store and retrieve text, and speed in correcting spelling and grammatical errors without reprinting this activity It should be available to every student in the Arab world, to have the opportunity to train and acquire his skills. The learner has to use it in expression, writing, more quickly, and at a lower cost. Where he immediately sees the words he writes on the screen, corrects and corrects them, and may change the font sizes. And their forms. This creative method of expression is interesting for students, improves their performance in expression, creation, and output of publications, wall magazines and periodicals, and makes them more articulate to express in a sound language, more proficient in spelling and more precise in style and organization [10].

Provide language presentations in a fun, interesting and interesting way by students using computer, The Internet provides active learning that relies on the use of sound, image and motion and see some practical applications in Arabic so that students can practice the language. And attention to develop the four skills of Arabic (listening, speaking, writing and reading) Trendy in line with what the computer and the Internet provides:

- An exploratory and experimental sense of the learner.
- Raising thought and satisfying tendencies.
- Rich opportunities to identify and address errors.
- The computer provides the self-confidence and the ability to make decisions because it evaluates its own work.

ARABIC LANGUAGE AND CHALLENGES OF KNOWLEDGE AND COMMUNICATION

The Arabic language is currently facing major challenges that can be summed up In making Arabic the

language of development, knowledge and communication so that they are able to be the language that Knowledge, and also the language that produces and disseminates the knowledge that members of the community communicate. and therefore the biggest challenge of the Arabic language is its transformation into a language for spreading knowledge. Since there are other modes like. The World Wide Web of Information and various technological tools that compete in the dissemination of knowledge, must the language has sufficient content and content. To date, the Arabic language presence in the informatics network is By 1.6%, which is a good number for the beginning of the presence of almost non-existent. But However, it is far from the figure that the Arabic language can be. There is a good presence of Arabic, and there are other areas where Arabic is needed to encourage and support [11].

Smaller computers are becoming more widely available, new educational programs are appearing in our schools and others in our educational institutions. Many language teachers have begun to write their own learning programs or courses, along with the use of those currently available in the market and education with the help of electronic computers The term used to describe computer programs designed for teaching. It is important not to confuse the term and learning languages with the help of electronic computer, a term called forms. Different types of computer-based instruction.

The usage of information technology in teaching Arabic can be done based on the following:-

- Integration of linguistic and computer labs and multiple presentation programs.
- Adoption of the methods of searching and extrapolation of the Arabic language on the computer.
- Encourage students to write and communicate with others through different communication technologies.
- Utilization of the programming systems and applications designed for the Arab user such as:
- Automatic drainage, which is based on the analysis of the word to its derivational and discharge elements.
- Automatic expression and semantic analysis, which extracts the meanings of words from their context and determines the extent of correlation and consistency of sentences with each other.
- Using databases, dictionaries and electronic dictionaries (Internet)

There are many reasons why computers are used in education:-

- Knowledge explosion and the flow of information where this era is called the era of information revolution.
- Need for speed in the information age: because this era is the age of speed, making Human beings need to deal with this vast amount of information.
- Finding solutions to the problems of learning difficulties facing learners in general and children of Arabic language especially where studies have shown that the computer has an important role in helping to solve learning difficulties.
- Improve future job opportunities by preparing students for a world of advanced technology

In order for the teacher to become important in guiding students to the right direction to make the most of the technology, the teacher should do the following:-

- To transform his or her classroom from a place where information is transferred in a consistent and one-way direction from the teacher to the learner to a dynamic learning environment.
- To develop a practical understanding of the characteristics and needs of students.
- To follow the teaching skills take into account the needs and expectations varied and different recipients and there is no doubt that the role of the teacher will always remain, but it becomes more difficult than before, because the teacher is the essence of the educational process so it must be open to all new and flexible to enable him to creativity and innovation.

The adoption of any new educational method often finds supporters and opponents, each with a different view of the other.

Firstly: The point of view of e-learning enthusiasts is:-

- When schools are connected to the Internet, it makes teachers rethink their old teaching methods.
- Students have sufficient capacity to use technology.
- Using the computer to transmit energy to students.
- Using the computer makes the classroom a learning environment that is interactive
- The use of the computer makes students feel confident and responsible. The use of computers leads to the development of students' ability to work as a team.
- E-learning makes students think creatively to reach solutions.

Second: The point of view of opponents is:-

- E-learning requires an intensive effort to train and qualify teachers and students in particular in preparation for this experiment in conditions of
- widespread technical illiteracy in society.
- Linking e-learning with other technical factors such as the efficiency of

- communication networks, the availability of hardware and software, continuous electricity flow, and the ability to produce programs professionally
- Cost factor in production and maintenance.
- E-learning weakens the teacher's role as an important educational and educational influence.
- The frequent use of technology at home, school and daily life may lead to the boredom of the learner of these media and lack of seriousness in dealing with it.

CONCLUDED COMMENTS

The teaching of Arabic through the use of e-learning brings life and movement in the formation of educational attitudes, and makes them full of freshness and vitality needed by the process of teaching the article, which positively affected the student's achievement. Also, teaching in e-learning requires more time, effort and skill than the teacher when using traditional methods and methods. Finally, through this research work, we reach to the following results:-

- The use of computer in teaching Arabic makes Arabic language more interesting and attractive for students.
- The use of technology in teaching Arabic is a means of preserving it and a guide. However, the language is able to cope with the developments of this age.
- High cost of computers and programs.
- The need of some teachers for longer time and training courses to learn how to use the computer in education the language.
- The goal of teaching Arabic language using computers is to respond to those who are accused of language with sternness and lack of The ability to keep pace with civilization and its proof of the ability of the Arabic language to meet the challenges addressed to them.

REFERENCES

[1] Zainham, Abu Hajjaj, 2004, Some Characteristics of the Structure of the Reading Text in the Basic Seminar, Cairo, Journal of Reading and Knowledge, 4th Conference of the Reading and Knowledge Society.

[2] Shehata, 2004, teaching Arabic language between theory and practice, Cairo, the Egyptian Egyptian publishing house.

[3] Ashour, Rateb Kassem, Al-Hawamdeh, 2007, Mohamed Fouad, Methods of teaching Arabic language between theory and practice, i 7, Dar al-Masirah for publication and distribution.

[4] Attia, Mohsen Ali, 2008, Strategies and Strategies in Effective Teaching, Jordan, Amman, Dar Safa for Publishing and Distribution.

[5] Ahmed Youssef 2004: Educational computer and its educational applications

[6] Hersh, Ayed Hamdan, 2004, Educational software design, production and educational applications, Dar Al-Masirah, Amman, Jordan.

[7] Musa, Abdullah and Mubarak, Ahmed, 2004 E-learning foundations and applications

[8] Al-Ajili, Sabah Hassan et al., 2001, Principles of Educational Measurement and Evaluation, Ahmed Al-Dabbagh Office, Baghdad, Iraq

[9] Aqeel, Fakhir, 2003, Educational and Psychological Glossary, I 2, Shuaa Publishing and Distribution, Syria

[10] Schunk, A.,1998, Effect of Computer Games on Curiosity for Children's, Pediatric Annals, Vol. 27, part. 2, No.1

[11] Nabhan Yahia Mohammed 2014: Computer Use in Education, Dar Al Yazuri Scientific Publishing and Distribution, DAT, 20

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Electronic Marketing and Contemporary Challenges in Business Environments

Atif M. Qatan

Information Science Department, Faculty of Arts and Humanities, King Abdulaziz University, Jeddah, Saudi Arabia

ABSTRACT

Social networking is one of the most important tools of e-marketing that helps reach customers, identify their trends and communicate with them. Social networking sites can help policy makers to prioritize decisions, choose between opportunities, and encourage the public to accept new programs, plans and policies. Overall marketing strategies are one of the most important new global developments that forcefully imposed itself during the last decade of the 20th century. Has become one of the pillars of the new global economic order, there is no doubt that the new economy focuses on the simultaneous use of the Internet. There is no doubt that e-commerce has become a reality. There are profits to be gained Because of the e-commerce. There are laws governing e-commerce and legislation among countries to regulate the procedures of this trade to serve the economies of those countries. The study will highlight the most important indicators that reflect the size of its spread worldwide. Then, it will discuss the online shopping, the most important indicators that reflect the spread of this new style of shopping, and then identify the main advantages of online shopping and challenges, and determinants of the success of online shopping . This research focuses on the factors influencing consumer adoption of the Internet as a means of shopping, which contributes to the rapid adoption of this type of shopping. Considering the researcher's review of the findings of the previous studies on the factors affecting the adoption of shopping online, the researcher will shed light on the role played by the researcher in addition to what the role of social networks can play in supporting shopping in different business environments.

KEY WORDS: SOCIAL NETWORKS, INTERNET MARKETING, SOCIAL MEDIA, E- COMMERCE, E-PAYMENT AND MARKETING STRATEGIES

ARTICLE INFORMATION:

**Corresponding Author: amgattan@yahoo.com*
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/19

INTRODUCTION

In this age of information that has invaded and penetrated the technology of our present world until it has become an essential part of our daily lives, the emergence of electronic commerce has surfaced, even though it is late in the ladder of historical development of IT growth, but there are many technical difficulties Met The major challenges, notably information security, electronic payment methods, intellectual property, electronic contracting, technical authority, standards, etc., to impose digital life impose itself on everyone, with all its electronic features. The term E-Commerce is called the E-Commerce on the implementation and completion of marketing, selling and buying through electronic means, where the Internet is one of the most electronic means used for this purpose [1]. E-commerce is not limited to selling through the Internet, it is a broader concept that can be considered as a means of delivering information, services or products over telephone lines or through computer networks or through any technical means. From the business point of view, Transactions are automatic and fast. So as to meet the wishes of companies and consumers and managers in reducing the cost of service and increase the efficiency and accelerate the delivery of service, to open the way for the sale and purchase of products and services and information through the Internet, and the simplest manifestations of online shopping online, which allows people to visit dozens of exhibitions, Widgets, behind their offices or in their homes.

Because e-commerce between companies and consumers, known as online shopping, has received only a small amount of research efforts so far, mainly dealing with the most traditional forms of shopping such as shopping by mail and telephone or more complex forms of online shopping such as video shopping and shopping So this paper will address some key points as a general conceptual input to illustrate the concept of online shopping. “Internet marketing” is one of the most important new global developments that strongly imposed itself during the last period of the 20th century and has thus become one of the pillars of the new global economic order, Kotler asserted. The new economy focuses on the simultaneous use of the Internet [2]. Internet marketing is primarily based on modern communications and information technology, particularly the Internet.

E-commerce is a generic term intended for any type of business or business transaction involving the exchange of goods and services at any time through channels. For example, the process by e-Payment Gateway uses e-payment gateway to pay bills by telephone, Buying a product or service online The Internet is a new era in the marketing world for both the marketer and the shopper. Companies have been able to manage their information in a practical way, develop accurate and scientific strategies for online marketing, and can meet customer requirements .In an atmosphere of intense competition [9]. Definition of electronic commerce (EC)) as a process of buying, selling ,or exchanging products, services or information through computer networks.

“Social Networking”, the Internet is the first important historical development in human life after the Industrial Revolution. This network connects many local and international networks and allows many people to talk or exchange information through computers. Social networking sites are classified in terms of Public access is divided into two main sections: Section 1: sites that include individuals or groups of individuals with professional frameworks: the first is a specific social section, and these sites are closed and are not accessible to the general public; while section II is known as: Social open for all those who are entitled to have an online account, join and choose his friends, and these sites network Facebook. Classified by social blogging, blogging, blogging, and blogging sites. The importance of social networking as a set of practices that helps in determining the field of shopping airlines at all levels to clarify the practices required for social networking sites in the field of Saudi air transport in particular and then work on developing, deploying and employing them to achieve the main objectives Lines of the Saudi air transport, thereby contributing to the achievement of basic management tasks show through capacity planning and decision-making and problem-solving.

INTERNET & SOCIAL NETWORKS

During his long history, humankind has not experienced changes in the pattern of production, exchange and communication, but in the way of life in the depth, comprehensiveness and speed of the societies since the introduction of modern information and communication technologies. These technologies have penetrated in some sectors such as the financial sector and the banking sector, The methods and practices used by institutions working in these sectors are comprehensively transformed. The transformation included the structures and the structure of these institutions. As a result, a type of organization has no specific location or structure of a traditional hierarchy or a physical entity, but its existence and activity depend on the network of exchange and communication relations through which its activities activities are carried out. It is its own institutional entity, which has become a flexible entity Material existence, but communicates information and communication, and if it is a fictional or virtual book. The information and communication revolution has contributed significantly

to increasing the size of the current global economy and the lifestyle of its societies known as the globalization trend over the past quarter century. The effects of this information and communication wealth are expected to continue and expand to all sectors of activity, production and exchange in societies [3].

The Internet is the first important historical development in human life after the Industrial Revolution. This network connects many local and international networks and allows many people to talk or exchange information via computers. This rapid communication has increased the value of the Internet as an important tool of Access to information tools. The World Wide Web has gone through several stages of development until it has reached the accepted form, sponsored and funded by ARPANET. The Internet is in fact a network project, dubbed the Advanced Research Projects Agency of the US Department of Defense, in 1968, time spent on building a cohesive network that could withstand difficult conditions such as a nuclear accident. Milnet could transmit government military information, and the arbanet was divided into two networks: the first was Milnet to transmit government military information, the second was Arpanet, Is the The real state of the Internet.

It is worth mentioning that this network was not the only one of its kind at the time, but several networks started in BITNET. In 1980, some other networks emerged, such as the Bitnet network, and connected to the Internet after its establishment. In 1968, the National Science Foundation Linking the network with five of the National Science Foundation computers. NESFNET connected to a basic structure known as the "Super Computer" with the latest in communications science, until it became the backbone of the Internet. Many countries then established private networks And connected to the Internet This great system became known as the Internet. The Internet has become the network of networks that connect more than 200,000 networks in 150 countries around the world, and is growing with a strong demand from educational institutions, academia, research centers and companies. According to published statistics, there are 2 million users joining the Internet each Month, an average of 46 new users every minute [4] The number of Internet users in the world about 1,114 million users according to a recent statistic. - The widespread use of the Internet globally.

There is no doubt that the modern social networks have become one of the most important means of communication and the transfer of data between people and communities. For example, studies Shows that Facebook and Twitter are two of the most widely used tools used by government and private organizations to connect with people. The spread is becoming clear as each of the ten in the world has an account in the social networking site Facebook and every month 500 million users are registered on the global YouTube site. This increasing amount of social communication for all segments of society means more mass of these tools.

THE CONCEPT OF ONLINE MARKETING

Internet marketing is one of the most important new global developments that has imposed itself strongly during the last decade of the 20th century and has become one of the pillars of the new global economic order, Kotler said. The new economy focuses on the simultaneous use of the Internet. Online marketing is the key to achieving the goals of modern companies and institutions. It includes finding the needs and desires of the market under the environment and the tools that the Internet brings together in the form of electronic

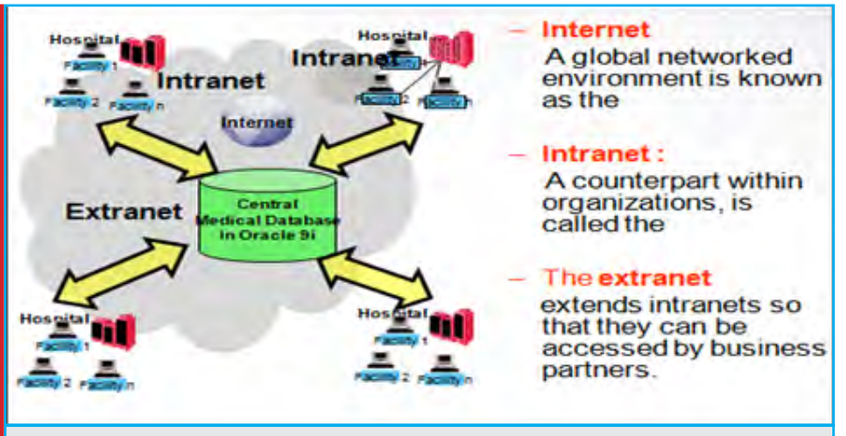


Figure 1. Internet Structure

communication technology. In other words, there is a difference between e-commerce and online marketing; e-commerce is the means of buying and selling through the Internet, while online marketing refers to the marketing aspect of e-commerce [5]. Online shopping is defined as "a form of trade between companies and consumers through electronic means."

The term e-commerce is the product of the term e-commerce (Internet), where Internet marketing is an investment of the power of the Internet in the application of principles , concepts and elements of the marketing mix (product, pricing, distribution, promotion) Is linked to large companies but is available to all users and all uses at all levels. The Internet is one of the new and important marketing channels for all products and services, and therefore companies and institutions must benefit from using alternative marketing strategies and money Meh for this new marketing channel. Here we find that there is a convergence or overlap between several concepts, namely is a broader concept: -

- Electronic marketing includes marketing operations through several forms and electronic media and modern marketing is through the Internet, one of which is marketing. A concept that includes electronic commerce
- E-commerce Sales and purchase operations through computer systems or through different network systems, and the Internet is one of them.
- Search Engine Marketing Marketing through e-mail, marketing and other virous methods. It is therefore difficult to define a clear and precise meaning of the term Internet marketing

Some of these concepts can be presented as follows: Online marketing means "utilizing expertise and expertise in the field of marketing to develop new and successful immediate strategies that enable the achievement of current goals and objectives faster than traditional marketing, as well as the expansion and growth of business in a very short time and with investment Less capital ". Online marketing may also defined as "the use of information technology to effectively link the functions provided by sellers and buyers" and Internet marketing is known as "a modern business method of research" in the need of both companies, traders and consumers alike to reduce costs and at the same time Improve goods and services and increase service delivery speed ". Online marketing may also be defined through the functions it performs, which include communicating with customers and making sales, which are an innovative model of direct marketing as well as giving content through the payment of websites either through the sale of the advertisement or the purpose of a certain amount of money for Access to it [6].

It is no secret that social networking sites are important today because of their active role in everyday life, the possibility of being marketing tools, spreading beliefs, gathering followers and supporters, as well as having fun and spending time. Regardless of who calls for the abandonment of the use of these sites because of the damage and the risks of legal and social aspects and personal embarrassments or technical security problems. But the question that arises when addressing the importance and benefits of social networking sites is the role that these sites can play in the service of teaching and teaching methods? And yes, as many say: Yes, that is only because it has become the primary tool for the exchange of information without dispute.

Websites are one of the most important technological phenomena of the present century. In recent years, the number of users has increased to astronomical figures. The proliferation of laptops and 3G phones have con-

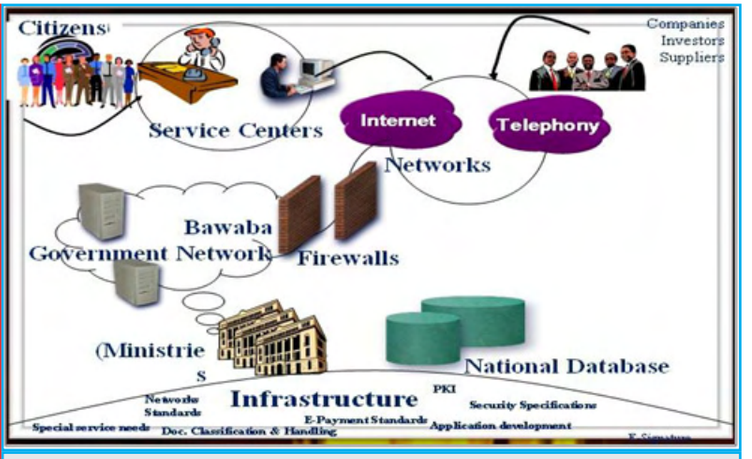


Figure 2. Social networking sites Categories

tributed to the increased social responsiveness of users. Rapid modern life has contributed to its spread. Everyone exchanges messages and conversations and shares images and videos through these networks because of his preoccupation with real social life. Psychological studies have shown that the process of storing the human mind of information or vocabulary is determined by the nature of the recipient's mental state. This idea also found its support in Greek philosophy, where Aristotle in his speech on the theory of knowledge on the need to adhere to the dimension of entertainment during the lessons. Therefore, these sites will be one of the most things that could generate a revolution in the field of education if they are employed in line with the requirements for knowledge and science. Students will be more enthusiastic, especially when it comes to using social networks in lessons that some may see as "complex."

E - COMMERCE AND ITS CONCEPT IN MODERN TIMES

E-commerce is a general term intended for any kind of business or business transaction involving the exchange of goods and services at any time via channels and so-called electronic payment gateway such as paying bills by telephone or purchasing a product or service through the Internet. The shift from traditional to online stores and virtual malls has changed customer buying habits and patterns. Some changes have been made: convincing customers and consumers that online transactions are safe and product quality guaranteed, with channels for product replacement and return, Identify the different ways available to deliver products, and introduce customers to the broad base of products, additions and deletions, which occur on the go and that the shopping as a user friendly.

E-commerce applications have appeared since the seventies of the last century The most popular application of electronic money transfers and prevalent among the giant companies, and then developed electronic data exchange, which expanded the application of electronic commerce from mere financial transactions to other transactions, increasing the use of this technology in the companies and other contributors. As well as applications that have previously appeared in telecommunication sector used in the sale of shares and tickets on private networks. With the advent of the Internet in the 1990s and its spread to millions of people, e-commerce has emerged over the Internet and its applications have been greatly developed.

E-commerce is defined as the process of buying, selling, or exchanging products, services or information through computer networks. E-commerce began in the early 1970s in the field of banking and banking operations. In the early 1980s, the exchange of electronic money transfer was the means of exchange between companies to increase the efficiency of electronic data work during the organization of electronic business and reduce the manual work. Data has been an integral part of business, and has helped to spread business widely and e-commerce has become a cheap way of doing business, a fact that can not be ignored. Previous studies indicate that 46% of large business companies have a presence or presence on the Internet, and the number has risen to 78% at the present time, which means that there is a turnout of companies in this new form of trade, e-commerce has imposed itself strongly on the world stage. Figure 3 illustrates e-commerce through the area of communication, business process, service delivery, learning, collaborator and community participant [7].

The e-commerce process between business and consumers provides the consumer with information and services that enable him to identify lessons learned from the experiences of others in how they use e-commerce concepts, especially in the development of complementary services such as booking, selling, hotel and car rental

Figure 3. E-Commerce Participants

services enabling thim to make the right buying decision so that online shopping can be defined as a form of trade between companies and consumers through electronic means. Previous studies have dealt with the Internet as a marketing tool for goods and services [10]. Some have seen it as a form of direct marketing that requires effective and direct communication between the marketing establishment "see Fig.4". [11]

In view points of the benefits that the customers reap from e-commerce: Saving time and effort: e-market is open continuously (all day and without any holiday). Customers do not need to travel or wait in line to buy a particular product, nor do they have to move the product home. Buying a product does not require more than just clicking the product, and entering some information about your credit card. In addition to credit cards there are many propper payment systems such as electronic money (E-money). Choice of choice: E-commerce offers great opportunity to visit various types of shops online, in addition, it provides customers with full product information. Besides, it is all done without any pressure from vendors. Price reduction: Many online companies sell goods at lower prices compared to traditional stores, because online shopping saves a lot of the costs spent in regular shopping, which is in the interest of customers. User satisfaction: The Internet provides direct interactive communication, enabling e-market companies to take advantage of these features to respond to customer inquiries quickly, providing better customer service and satisfaction.

On other side, regarding the benefits does a trader gain from e-commerce: More effective marketing, and more profits: The adoption of companies on the Internet in marketing, allows them to display their products and services in various parts of the world without interruption - the length of hours of the day and the year - providing companies with greater opportunity to profit, in addition to reaching more customers . Reducing company expenses: Preparing and maintaining e-commerce sites is more economical than retail or office maintenance. Companies do not need to spend heavily on promotional items, or install expensive equipment for customer service. The company does not seem to need to use a huge staff to carry out inventory and administrative work. Online databases maintain the date of sales and customer names. This enables a single person to retrieve information in the database to check the dates of sales. Communicate effectively with partners and customers: Fold e-commerce distances and cross borders, providing an effective way to share information with partners. E-commerce provides a good opportunity for companies to benefit from the goods and services provided by other companies (ie suppliers), called e-commerce from companies to businesses.

MAJOR PROBLEMS AND CHALLENGES THAT FACING ONLINE SHOPPING

Despite the huge development in technology, especially in computer and related sciences, which resulted in a change in the administrative and production systems, which was reflected in e-marketing or e-commerce, which indicates the disappearance of traditional trade, replaced by e-shopping, reducing the need for stores

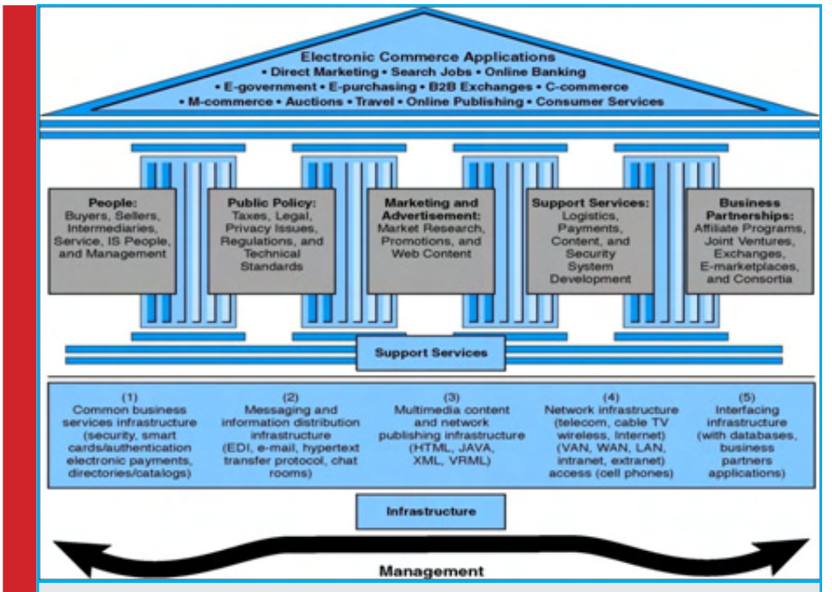


Figure 4. A Framework for Electronic Commerc

and salesmen and their cost. The researchers differed in their views on online shopping. Some views suggest that online shopping is not yet ripe for full-scale prosperity. Other views, however, suggest that online shopping will replace traditional shopping, but there is little research that supports or refutes these views. The fact that online shopping is still opaque for many consumers may be due to several factors, As a result of identifying these factors and removing them or minimizing their negative effects may have a major positive impact on increasing the number of adopters to shop online.

- How to protect the privacy of individuals, as that element is essential to ensure the user's confidence in this evolving type of shopping and the security and confidentiality of information is a key factor for the growth and promotion of this type of shopping.
- Lack of awareness is a barrier to online shopping, as is the low consumer base where there are potential discourages business efforts to create websites for consumers to shop and buy.
- The cultural and social background of the consumer who is resisting change. Online shopping requires a change in purchasing behavior, which is not accepted by shoppers. Credit cards are the most common way of paying for purchases through the Internet. Credit cards are the most common way of paying for purchases through the Internet. The little number of credit cards in some countries may limit this type of shopping.
- Problems of protection and insurance against risks and problems of protection guarantees for the movement of electronic exchanges between the parties of dealing whether sellers / buyers / banks ... etc.

The major problems and challenges that face shoppers can be summerized as follows:-

- Lack of knowledge of how transactions are being conducted on the Internet
- Lack of computers experiences in many families. Even if available, shopping and handling are unusual, especially for family members who make purchase decisions such as Parents.
- The potential theft of consumer card numbers through online handling, and thus carry cardholders the burden of buying goods or obtaining services they did not order.
- Online shopping leads to the loss of the well-known shopping pleasure of families in shopping through the direct social interaction between the seller and the buyer, and reduces the opportunities for family interaction as a result of the decline of traditional shopping opportunities, which are considered by some families as the only opportunity For having or fun.
- Some are implicated in the rush to buy goods that the individual may not need as a result of the attractiveness of the advertisement ease of purchase with credit cards, and thus the accumulation of personal and family debt.
- The possibility of fraudulent contracts and theft due to the inability to verify the identity of the sellers, and the potential for commercial fraud or theft exists, the requested commodity may not be returned or may come with different specifications.
- The inability of the consumer to see or inspect the commodity before purchasing it.
- Language is a hindrance to a considerable number of Customers who only speak Arabic.

It is noteworthy that the most tedious challenges facing non-shoppers in the Kingdom of Saudi Arabia, which is revealed in the current study is to deprive the pleasure of shopping, followed by the lack of secure internet connection to customers and the absence of payment alternatives to other than credit cards. Online shopping is a challenge for both the customer and the marketer, although there is widespread awareness and ongoing developments to eliminate these eradicate problems facing this process, but it takes a long time to get rid of them entirely . Based on the above, the importance of the study is to answer some general questions such as: What are the advantages of using social networking sites in marketing ? What are the obstacles that limit success?, what are the entities that should be assigned the responsibility of marketing through communication sites Social? And what are the reasons for the weakness of members' participation in social networking websites ?,What are the tools and means that can contribute to achieving the desired interaction of these members with those websites ?, What are the information and topics that are being asked by the members of these websites? [8]

Finally , E-commerce is primarily based on a database of information and data that flows through information media over the networks, and thus it is exposed to penetration or manipulation of this information as long as it has been possible to penetrate the information system itself in many ways. Protection of trade through the confidentiality of information This is because most of the information dealt with daily can be protected by many protection systems, but the real danger is that any business if stolen information will be at risk that may adversely affect electronic E commerce trade.

Determining the challenges of legal e-commerce requires a conceptualization of the process from begin-

ning to end in a general rather than detailed manner, and then directing the research index to draw the titles of the challenges, and then to describe the content of the challenge and the solutions to be determined. The electronic commerce in its general form, requests for goods or services in which the student is in a place other than the place where the service or the goods are required, and the answer is given to the availability of the service or the goods on line. The situation may be - as in the virtual stores - Followed by a request for a service or purchase order from the customer's browser for the site, and on the line as well, thus standing for the information website on the network, the specific means of display of the contract and its price or replacement in the case of on-line services (ie via information networks). This phase (which precedes the contract actually) raises many problems and challenges. First, the user or customer documents the existence of the site, the goods or the service. The second is the legality of what is presented in the site in terms of ownership of its material of moral nature (intellectual property problems). Third, the challenges of protecting consumers from online fraudulent activities, phishing sites, or illegal content of the services and products offered. The fourth is: the taxes on electronic commerce revenues across the line, the criteria for calculating them, and the extent to which they are being regarded as a severe and severe constraint on the growth of electronic commerce. These challenges also go with the next stages of the e-commerce activity line. Reliability and consumer protection go hand in hand with other stages of e-commerce activities.

The next stage is the conclusion of the contract, so that the acceptance and acceptance on the line also, and this is done in many ways according to the content of the business and contractual means on the site, the most famous electronic contracts on the web, and contracting e-mail via e-mail and generally, the will of the supplier or product Or the seller with the will of the customer, and conclude the agreement on the line, and here appear two main problems: - First, each party documents the status and the person and the presence of the other party, in the sense of confirming the integrity of the character of the contractor. Among the means to solve this challenge are the establishment of neutral bodies that mediate between the contractors (the authorities of the intermediate certificates) in terms of ensuring the verifying of the existence of each of them and ensuring that the information is exchanged between them real and work on-line by sending confirmation letters or authentication certificates to each party confirming the status. Second: - The contract or the legal force required by the contract, which in traditional trade guarantees the signature of the person on the contract or the request for the goods or the personal evidence in the case of the unwritten contracts of those who witnessed the material facts related to the contract, The enforcement of the parties to the obligations after the conclusion of the contract, how to be signed in this imposition, and the extent of his argument that was by electronic means, and the extent of acceptable evidence in the evidence, and mechanisms to provide evidence if it is just documents and files stored in the system ???? The e-commerce environment has its own nature, and thus the digital signature method is used to achieve the normal signature function as we will explain in the following:- The third stage is the enforcement of the obligations of the contractors, the seller or the supplier of the service obliged to deliver the sale or execution of the service, and the customer obliged to meet the price. Each obligation has its own challenge. The obligation to deliver raises the problems of default or delay or delivery of a place that fails to meet the specifications of the agreement like. those in the field of traditional business activities. The payment of the allowance or the price, raises the problem of technical payment methods such as credit card payment or the provision of the card number on the line, a challenge that arose in the technical environment and Walid, And the certificates of the parties that mediate the process of meeting the non-contractual relationship, in addition to the challenges of criminal activities in the field of the abuse of credit cards and activities of seizure of its number and the reconstruction of the card for the purpose of illegitimate [9]. In addition to these challenges, challenges can be described as general challenges related to the activity as a whole, not the stages of implementation such as the privacy of the relationship between contractors and the privacy of information exchanged between them and limiting the protection of the activity as a whole from the criminal activities of hackers of computer systems and networks, Disputes that arise between the parties to the contractual relationship, as in the Internet environment, the geographical boundaries and separations disappear, and with them the jurisdiction of the jurisdictions of the judiciary, regardless of the jurisdiction of the dispute and any law applied to them when different nationality of contractors, The common situation in the field of electronic commerce. The organizational changes brought about by e-commerce in companies have affected the structure of the market. The e-commerce market is one market in the world called the global market and includes the entire world.

This new pattern of modern trade has received the attention and attention of our leadership to its guidance, which has being approved by the Supreme Council for forming a permanent technical committee for electronic commerce at the level of specialized agents in the Ministries of Commerce, Saudi Arabia and King Abdulaziz

City for Science and Technology. An advisory team of businessmen has being formed, including a group of specialists and those who are scientifically qualified in this field, as a link and interaction with private sector institutions and institutions. The National Committee and the Consultative Group continue their efforts to accelerate the completion of the requirements for the dissemination of the concepts and methods of e-commerce in the Kingdom and to create an environment conducive to its spread and encourage investment in its technologies and practical applications. And believe in the importance of electronic commerce and the importance of the changes that will be introduced by this new revolution we find that the leadership of the representative in the Ministry of Commerce has provided and made a lot of clarification to the technical and dissemination of the necessary awareness, and so it is better to now put the most important things done by the Ministry of Commerce.

THE DIFFERENCE BETWEEN E-COMMERCE AND E-BUSINESS

There has been a lot of controversy over the definition of e-business and e-commerce, where are the more comprehensive than the other, or where is one of them falls under the other, as the change in the concept and definition and the purpose for which the use of technology appeared different terms and definitions. It is common for many that the use of the term e-commerce is only synonymous with the term e-business, but this is a common mistake that does not consider the difference between them. The line between e-commerce and e-business has become blurred. The two terms became interchangeable. E-commerce refers to the trade between companies and individuals (consumers) and its applications, while the business includes all types of trade between companies and their applications in addition to e-commerce,both terms include doing business by computer from Through the network of private or public data transmission or through the Internet or intranet, and in the next paragraph Sabin the difference between the two terms [3,4].

E-commerce is a breakthrough in the world of commerce or a new technical technique in which technology is used to change and expedite business processes, but to create markets and distribution outlets that do not comply with temporal or spatial limits. Laudon and Lauden defined e-commerce as the use of information technology such as computers and communications to automate the sale and purchase of goods and services. The concept of e-commerce, has changed and its definition has been defined after the definition was limited to the electronic link between the customer and the organization, whether consumer, organization or government. Thus, a new concept was born, focusing on external openness “outside the organization’s environment”, internal and external interdependence and integration at all levels and levels. Thus, this new principle or new term “e-business” is based on the ability of the organization to exchange information, money, goods and services in an electronic format, whether this exchange between companies or between companies and individuals.

E-business refers to beyond e-commerce. It is not only the purchase and sale of goods and services, but the provision of services to customers and cooperation with business partners and do business and internal transactions electronically. E-business is a more accurate expression of the transformation, substitution, or exchange of goods, services, information and knowledge through the use of networks and technologies that enable organizations to perform such tasks easily and smoothly [7].

We conclude from the above that the definition of electronic commerce and electronic business: E-commerce: is a new concept explains the process of selling or buying or exchanging products and services through computer networks, including the Internet. There are several views, including:

- The world of communications defines electronic commerce as a means of delivering information, services or products via telephone lines or through the Internet or through a technical means.
- In business is the process of applying technology to make transactions business automatically and quickly.
- While the services known as electronic commerce as a tool to meet the wishes of companies and consumers and managers in reducing the cost of service and raise their piles and accelerate the delivery of the service.
- In the world of the Internet, he knows of the trade that opens the way for the sale and purchase of products, services and information via the Internet

We notice that they are borderline and exclusive. Therefore, electronic commerce falls under electronic business. On other side, the electonic business can be characterised as follows:-

- E-Business: is an integrated, easy, unified, flexible, and secure way to do business in a unique way by unifying and simplifying the systems and procedures that control the core operational work.
- we can say that e-business: is e-commerce in addition to sharing information and knowledge.
- E-business is a more correct expression of the transformation, substitution, or exchange of goods, services, information and knowledge

through the use of networks and technologies that enable organizations to do these tasks easily and smoothly.

Competitive advantages linked at the micro level, meaning that the company can compete in a product or service in the global market, although there is no comparative advantage at the sector level within the country. Certainly, the multiple advantages of e-commerce such as cost reduction and market expansion are more effective And innovation for companies that use e-commerce, which enables some producers to achieve and increase the competitive advantages, and the interest in competitive advantages has increased significantly, and e-commerce is one of the main entrances of any company to increase its size in the market and then increase the Competitive advantages. Where the expansion of electronic commerce leads to structural changes in the activity of enterprises, the most important of which are:-

- **Change strategy of the establishment:-**
  The increase in the use of e-commerce in the activity of institutions leads to changes in the model and strategy of the institution as well as in its organizational structure, where the so-called e-commerce (Cyber trader) and virtual projects. It is a company without a physical presence which does not have a headquarters, but operates through the Internet in an electronic space by dealing with various companies and consumers through the international information network. This is reflected in the organizational and organizational organization of the company and the management method changes. The electronic commerce functions many administrative and technical functions, which may result in a reduction in the number of employees in the company, which necessitates the reorganization of the administrative and organizational structure in the company, Vision and less control, and the intellectual effort shifts from routine work to innovative work. The company's e-commerce offers the advantage of presence in different markets without the need to open new branches in different countries. It saves the costs significantly. This is accompanied by the rapid completion of business through e-commerce as a result of the integrated integration of the company's organizational and management process from planning to organization and recruitment, Where e-commerce provides information at a tremendous speed and on a large scale helps to accomplish the planning tasks of the company more efficiently, and this is reflected in the identification of the objectives of the company in the present and future because the mechanism of the work of electronic commerce It includes advantages that help to choose the best alternatives to the company's economic activity.
- Change in the cost of producing the goods or services
  One of the most important effects of e-commerce is to reduce the costs of the product and the consumer because of the use of electronic in trade. The low cost is reflected in increasing the profit for the product and the low price to the consumer.

Since the currency used in electronic commerce is plastic cards (electronic money) and that currency in addition to it facilitates, facilitates and even activates the dealing in the market and the availability of time and expenditure to the consumer, they are associated with the granting of credit to the consumer and then the failure to know the bank money, , But with the possibility of renewal and continuation within the framework of the total users, the potential size of credit is large and tends to be continuous. This will undoubtedly add to the liquidity of the economy and stimulate it, especially in times of recession, which may create the incentive, if sustained, to increase investment and create positive macroeconomic positive effects through double and accelerated factors.

The security aspect is one of the most important obstacles in the spread of e-commerce as expected. The use of the Internet in sales and purchase may result in security consequences such as theft of credit card numbers, which are the most used means of buying through the Internet, or theft of sensitive financial or business information during Transfer between different companies and institutions, and therefore requires the development of several security systems based on the transfer of information in a safe way to prevent others from viewing it during the transfer through the network, and also comes not to provide a legal environment and legislative e-commerce as a primary necessity for The application of these laws and procedures, especially with regard to the protection of intellectual property rights and creativity, the adoption of electronic signature and the recognition of electronic processes as a legal document, the status of manual documents. Electronic signature technology also plays a prominent role in this field. No electronic commerce can be developed without electronic signature .

The weakness of the telecommunications infrastructure is an important obstacle to the spread of the Internet and the implementation of its applications in the best way, but it is necessary to work on spreading and providing it to all users in the Kingdom, by reducing costs and upgrading the quality of services provided by specialized companies, The development of telecommunications infrastructure, the introduction of more flex-

ible legislation and laws, and the provision of greater facilities for both providers and users. The awareness and culture of dealing with the Internet, and enhancing the level of knowledge of its foundations, technologies, applications, benefits and risks in the largest possible segment of citizens is very important in the spread of e-commerce applications of all kinds, in addition to finding qualified human abilities with the appropriate competence and experience to support e-business In building a knowledge-based society, as the breadth of e-commerce is strongly linked to the existence of a society capable of using this technology well and understanding its applications.

CONCLUDED COMMENTS

Internet marketing is one of the most important new global developments that have imposed itself strongly during the last decade of the 20th century and has thus become one of the pillars of the new global economic order. Online marketing is the key to achieving the goals of modern companies and institutions. It includes identifying the needs and desires of the market under the environment and the tools that the Internet brings together in the form of electronic communication technology. It has been found that the electronic transformation affects the stage of production and technology used, which makes an increase in the competitiveness of countries that have the potential to use this technology. In addition, e-commerce plays a vital role in the provision of information, which is reflected in the knowledge of more institutions on the market conditions. It has been pointed out that the transformation of electronic banking business led to the expansion of the financial and cash market and its transmission to the network for electronic trading in securities and cash is not Only this has extended to goods and services as well.

As well as the knowledge of a large number of institutions on the market conditions and the development of tastes and trends in demand and quality, which entices new institutions to enter the production of goods and services that increase the demand for them and thus lead to increased competitiveness, and may be increased competitiveness from the point of view of production and service institutions one of the challenges of expansion In electronic commerce. But increased competition at the local and international levels leads to the benefit of consumers who enjoy wider choices and the emergence of new goods and services at lower cost and higher quality E-commerce is a unique and unprecedented way to reach all markets in the world at the same time. At the lowest cost, vendors help to overcome barriers to distance and access to a variety of distant and diverse markets, while helping buyers to enjoy the same characteristics at the same time, as well as helping to overcome time barriers. And dealing with customers 24 hours, and thus is a real application of the idea of globalization to transform the world markets into a single market does not adhere to the barriers of space and time, and thus provide opportunities and infinite possibilities to display goods and services in the markets of different countries without the limits of space or distance or time and thus Which has achieved a high increase in competition, where every trader in the economic markets on the network trying to access the highest possible quality and display at the lowest cost, ultimately benefiting the consumer of this increase in competition. The application of Arab electronic commerce and its use and enhance its role and work to increase its growth and development needs concerted efforts at the local and Arab levels, with the need to find a sophisticated infrastructure for communication and good systems for the fight with the establishment of an appropriate legal and legislative environment to provide protection and culture to its customers.

We finally concluded that E-commerce is one of the most important modern features in the knowledge economy and the main engine for it, and is the fastest growing sector in the global economy and has become a reality in the current environment and is expected to increase soon due to its effective impact on the business environment. E-commerce uses different patterns in its work, such as communication and exchange between companies (b2b) and the pattern of communication and exchange between the company and customers (b2c) that the global class of e-commerce has abolished the limits and restrictions to enter the commercial markets, some of which turn the world into a market open to the consumer regardless of location Geographical seller or buyer.

REFERENCES

[1] Ruyter Martin & kleijnen Customer Adoption of E-Service International journal of service Industry Management Vol: 2 No: 2 2001 p: 184.

[2] Vrechopoulos & Siomkos & Doukidis Internet Shopping adoption by Greek consumers European Journal of innovation Management Vol: 4 No: 3 2001 P: 150.

[3] Greenstein Shane Technological Mediation and Commercial Development in the Early Internet Access Market California Management Review Vol: 43 No: 2 Winter 2001 P: 172.

[4] Wolfin barger & Gilly Mary Shopping Online for freedom control and fun California Management Review Vol: 43 No: 2 Winter 2001 P: 139.

[5] Dema Idrok E-marketing I Anew concept MC Graw Hill New York 2012 p :11.

[6] Standing & Lin Organizational Evaluation of the Benefits Constraints and Satisfaction of Business- to-Business Electronic Commerce International Journal of Electronic Commerce Vol: 11 No: 3 2007 P: 107.

[7] Lin & Huang & Burn B2B e-commerce benefits: the link with IT maturity evaluation practices and B2BEC adoption readiness European Journal of Information Systems Vol: 16 2007 P: 807.

[8] Philip Kotler Marketing management the Millennium ed prentice- hall Inc New Jersy 2001 p: 517.

[9] David R.T, The Impact of the Internet on the Taxation of International Transaction, Bulletin for International of Fiscal Documentation, vol. 50, No 11-12-1996. pp 526-530.

[10] Sung. T, 'E-commerce Critical Success Factors: East vs. West, Technology Forecasting and Social Change, vol. 73, 2006 pp. 1161-77.

[11] Singh, M 'E-services and their role in B2C e-commerce', Managing Service Quality vol. 12, no. 6, 2002 pp. 434-46.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Streaming Data Classification with Concept Drift

Mashail Althabiti and Manal Abdullah*
Faculty of Computing and Information Technology, King Abdul Aziz University, Jeddah, Saudi Arabia

ABSTRACT

The concept of the data stream has emerged as a result of the evolution of technologies in various fields for instance: banking, electronic commerce, social media, and many others. It represents the sequence of data examples that are generated at a very high speed which can be hard to be stored in memory. Thus, it became hard to extract valuable information from the continuous data stream using traditional data mining. Data Stream Mining DSM algorithms should fulfil some requirements such as limited memory, concept drift detection, and one scan processing. Concept Drift must be tracked to avoid poor performance and inaccurate results of predictive models. It refers to the changing in the data stream distributions due to several reasons including the changes in the environment, individual preferences, or adversary activities. In this paper, we will analyze the classification algorithms handling concept drift for DSM. Also, popular concept drift datasets, data stream tools, and evaluation measures will be presented.

KEY WORDS: CONCEPT DRIFT, DATA MINING, DATA STREAM MINING, CLASSIFICATION

INTRODUCTION

Nowadays, millions of people around the world share data anywhere and anytime. The emerging technologies in telecommunications, entertainments industry, social media sites, banking services, and other applications have led to the massive growth of generated data stream. The data stream can be referred to the sequence of data examples that produced at a very high rate and arrive continuously at a potentially infinite stream. According to the "10 Key Marketing Trends For 2017" report," 90% of the data in the world has been produced in the last two years only, 2.5 quintillion bytes each day (Web-1). As a result, the massive amount of data cannot be stored for farther processing and mining. So, the data stream mining concept has emerged to extract the knowledge from the data stream and provide real-time processing. However, it has some constraints that must cope with such as and concept drift, limited memory, and one scan of the data. Concept Drift is referring to the changes

ARTICLE INFORMATION:

*Corresponding Author: maaabdullah@kau.edu.sa
Received 5th Nov, 2018
Accepted after revision 30th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/20

in data concepts over time. This may result in wrong predictions and inaccurate results. In non-stationary environments, learning a model from unstable data can result in inaccurate results and predictions. The underlying data distribution may change, so the model will not be consistent with the new data anymore. For example, predicting a customer's behavior toward shopping, where her/his preferences have been changed. Thus, this will produce wrong results based on old data. So, concept drift must be handled and tracked using detecting methods that can cope with the data stream.

Data stream mining with concept drift handling were highly studied last decade. There are many surveys studies have literature the data stream mining from different perspectives. The authors in (Gama et al., 2014) have surveyed the state-of-the-art adaptive learning algorithms with concept drift detection. They have addressed the concept drift through various applications and highlighted several evaluation techniques. In (Khamassi et al., 2016) the authors have presented general criteria to help researchers in designing their concept drift handling methods. They have categorized the existing concept drift algorithms according to these criteria. Also, 14 drift detectors have been evaluated in (Barros and Santos, 2018) using six artificial datasets and compared in term of accuracy and detection. The authors have used Naive Bayes (NB) and Hoeffding Tree classifiers to test the drift detectors.

In this study, we will present the data stream mining components. We will address the problem of concept drift in classification algorithms and highlight the exciting state of art handling methods. Besides, the most used datasets, tools, and evaluation methods will be presented. This rest of this research is organized as follows. In Section 2 we will discuss the concept of data stream mining. In Section 3, DSM components will be presented. The most used dataset and evaluation methods in data stream mining studies will be presented in Section 4 and Section 5 respectively. Section 6, will present DSM tools and conclude the study in Section 7.

DATA STREAM MINING

Learning a model is considered as an essential step in data mining and machine learning (Mittal and Kashyap, 2016). Previously, it was done in static environments where the whole datasets are available, stored and can be accessed many times. On the contrary, learning from massive datasets in non-stationary environments which has become a challenging area. The huge generation of continuous data in everyday applications has emerged the concept of data stream.

The data stream is a sequence of potentially nonstop data instances that can be read and processed only once. As technologies evolving, traditional data mining has become hard to deal with the stream of data on the Internet of Things IoT, web searches, banking transactions and many more (Gaber, 2011). Thus, the data stream mining has become an attractive research area. Data stream mining refers to the process of finding knowledge and valuable pattern in continuous, potentially infinite, and high-volume data streams. It plays an essential role in predictive modeling and decision-making. Data stream mining has serval challenges that must be overcome including the following:

- Resource constraints: the data stream is potentially infinite, huge and comes in high speed, so it is hard to be stored in a memory. Also, the processing time must be as shorter as possible (Kantardzic, 2011).
- One scan: data stream cannot be accessed randomly or many times (Kantardzic, 2011).
- Data preprocessing: Since data is continuously arriving, it is not feasible to use manual data preprocessing methods. it should be fully automated and automatically updated as data evolving (Krempl et al., 2014).
- Privacy and confidentiality: the data stream is infinite and comes in portions, so the information will not be incomplete. In this case, it is hard to judge the privacy of a model that has a data stream as input (Krempl et al., 2014).
- Concept drift: data instance may change over time.

DATA STREAM MINING COMPONENTS

The massive data stream can be generated from social media applications such as Twitter, Facebook, Pinterest (Mohanty et al., 2015). Also, the health, economic, financial industry, and many others. The process of the data stream mining involves several components as shown in Figure 1 including the streaming data as input, estimator, data mining algorithm, drift detection and the extracted knowledge as output.

Input

The data stream can be generated from different sources such as web searches, social media posts, real-time surveillance systems, banking activities, and other non-stationary environments.

Estimators

Estimation is a critical step that prepares the data stream to the knowledge extraction process. Data stream examples must be processed in real time due to its high speed. Also, it cannot all be stored in a memory. So, Estimation methods are needed to select a subset of the arriving

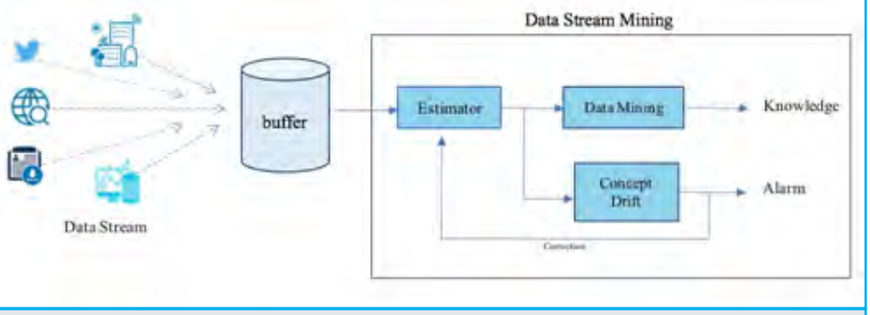


Figure 1. The Main Components of Data Stream Mining

data stream. It can be categorized into data-based and task-based techniques as shown in Table 1.

Data Stream Classification and Concept Drift

Data Stream Classification

Classification is a supervised machine learning algorithm. It uses the past data (training set) to build a model and then (2) use it to predict class labels (testing set) (Han et al., 2012). Classification algorithms in non-stationary environments must fulfill the data stream requirements regarding the processing time, limited memory and one-time scan. In the dynamic environment, some instances in streaming data may change over time because of the high velocity and limited memory, and this called concept drift. It is the changes in data distribution of the output given the input, while the distribution of the input may stay unchanged (Gama et al., 2014). For example, predicting a customer's behavior toward shopping, where her/his preferences have been changed. Thus, this will produce wrong results based on old data.

Concept Drift

Concept drift occurs between two points of time t0 and t1 when the joint distribution of x(independent variable) and y(target variable) at time t0 is not equal to the joint

Table 1. Estimation Method (Žliobaite et al., 2016).

Estimation Methods	Method type	Description	Key points
Sampling	Data-based method	An old statistical method that concerned with the probability processing a data item or not	The main obstacle with sampling is that it is not possible to determine the size of the dataset
Load shedding	Data-based method	The process of dropping a series of examples in the streaming data	It is not easy to be implemented in the data stream algorithms because the dropped data might be used in structuring the models
Sketching	Data-based method	The method of sampling the stream vertically	The main disadvantage of sketching is that of accuracy
Synopsis data structures	Data-based method	The method of converting the summary of the streaming data into data structures and use it for analysis purposes	The main synopsis data structures are frequency moments, wavelet analysis, quantiles, and histograms
Aggregation	Data-based method	The process of summarizing the data stream using computing and statistical measures	It is not recommended to be used with distributions that have high fluctuating data
Approximation	Task-based method	The process of designing stream mining algorithms for computationally hard problems	It considered a good solution for data stream mining problems
Sliding window	Task-based method	The process of analyzing recent data streams and summarizing the old versions.	It emphasizes recent data and easily understood
Algorithm output granularity	Task-based method	The process of mining the data stream, adapting resources and merging the extracted knowledge when memory is full	It performs well with very high fluctuating data distribution

distribution of (x,y) in t1 (Gama et al., 2014). It can be represented as:

$$pt0(X, y) \neq pt1(X, y). \quad (1)$$

Concept drifts may occur if there is a change in: (1) the prior probabilities of classes p(y), (2) the class-conditional probability distributions p(X,y), or (3) the posterior probabilities p(y|X).

Concept drift in the data stream may happen due to different reasons such as the changes in environment, individual preferences, or adversary activities (Zˇliobaite et al., 2016). It may happen in different forms as shown in Figure 3: (1) sudden drift: when a concept changes to another abruptly, (2) incremental drift: when there are many intermediate concepts in between, (3) gradual drift: when the concepts emerge in un suddenly way over time, and (4) reoccurring drift: when old concepts reappear after some time.

Data stream classification algorithms can be categorized into single classifiers and ensembles algorithms. Regarding concept drift adaptation, some algorithms update their classifiers continuously in the occurrence of drift or not. Others algorithms trigger changes in the classifier whenever a drift is detected (Gama et al., 2014).

Data Stream Classification Algorithms with concept drift

Data stream classification algorithms with concept drift can be classified into single classifier algorithms and ensemble algorithms.

Single classifier

Some single classifier algorithms observe and detect the drift in the data distribution by using statistical methods and keep track of the base classifier performance (Mittal and Kashyap, 2016). In case of discovering drift, it will alarm the base classifier to update it or rebuilt it such as:

- The authors in (Gama et al., 2004) have designed the Drift Detection Method (DDM) that monitors the classifier error-rate. If the error rate reaches the warning and drift level, then we can observe that a data distribution has been changed.
- DDM detector has been modified into an improved version named Early Drift Detection Method (EDDM) in (Baena-Garcıa et al., 2006). EDDM used to detect gradual drift that emerge slowly by considering the distances between the classification errors.
- Reactive Drift Detection Method (RDDM) is another modified version of DDM (Barros et al., 2017). The proposed Algorithm has overcome the problem of performance loss of DDM by discarding the older examples. It periodically recalculates the DMM calculations that determine the alarm and drift levels. Also, the drift occurs whenever the number of examples in the alarm level reached the threshold.

Other algorithms detect concept drift **using windowing techniques** by comparing the distributions the windows such as:

- ADWIN (Bifet and Gavald, 2007) detects the different types of changes using sliding windows with the most recent examples. Concept drift can be observed if the means between two sub-windows is greater than the threshold. As the window grows, the processing time becomes longer. Thus, authors have proposed a developed version called ADWEN2 to satisfy the memory and time requirements.
- Concept adapting very fast decision tree is another algorithms that use single classifier (Hulten et al., 2001). It extended the VFDT algorithm with the ability to detect the concept drift. Also, employs sliding window to keep the classifier updated with the recent instances.
- Authors in (Du et al., 2014) have proposed a window-based algorithm called ADDM where the size of the window is dynamically determined. It detects the concept drift by keeping track the entropy of the window. It reports a concept drift when the entropy is equal one. ADDM has been evaluated using seven datasets containing different types of concept drift. It showed good performance in detecting drift comparing to other methods. Also, it obtained high accuracy.
- The authors in (Liu et al., 2017) have proposed a fuzzy windowing method to adapt concept drift, named FW-DA. The proposed algorithm reports a drift when there is a significant difference between the test statistics of the current window and the old window.
- The authors in (Nishida and Yamauchi, 2007) have proposed STEPD algorithm that considers the accuracy of two windows recent and old. Drift is discovered if there is a significant difference between the two windows which calculated through a statistical test.
- The authors in (Pesaranghader and Viktor, 2016) have proposed Fast Hoeffding Drift Detection Method (FHDDM). The proposed method monitors the probabilities of correct predictions over the sliding window. It compares the maximum and the most recent probabilities and observes the change if the differences between these probabilities equal or exceed the threshold.

Ensemble Classifiers

In this approach, the algorithms use a set of classifiers where each classifier is assigned a weight and adapting to the changes by updating its components and its associated weights (Mittal and Kashyap, 2016) such as:

- DWM (Kolter and Maloof, 2003) maintains a set of experts, each of them assigned to a weight. When an instance arrives, it passed to an expert and then returned with a local prediction. DWM determine the global prediction using the local predictions and expert weights.
- The AUE2 algorithm (Brzezinski and Stefanowski, 2014) is another method that partition the data stream into chunks, and each chunk contains a set of examples. For every arriving chunk, a classifier associated with a weight will be created.
- Each classifier performance is evaluated by calculating the error rate on data chunk to determine the worst performing classifiers.
- In addition, two classifiers can be ensembled to form a detection system to detect both sudden and gradual drift (Jadhav and Deshpande, 2017). It composed of two classifiers online classifier and block-based classifier. Whenever data instance arrives, the online classifier updates itself, so any occurrence of sudden changes can be detected. While, block-based classifier work on blocks of data instances, which can observe the gradual changes. The classifiers error rate will be calculated to detect the changes. The drift can be observed if the value of the error rate is the same for the next blocks of the data stream.
- Double-Window-based Classification Algorithm DWCDS is another window-based method used to detect changes in data stream (Zhu et al., 2010). It detects the concept drift by checking the data distributions periodically. The proposed algorithm starts with generating decision trees using the data in the sliding window. If a concept drift is observed, then the model of DWCDS will be updated.
- Moreover, the authors in (Bach and Maloof, 2008) have proposed paired learner (PL) algorithm that ensemble two classifier; stable and reactive. The stable classifier used to predict based on its overall experience, while the reactive classifier predicts based on the recent window. Pl observes the distributional changes by comparing the performance of these two classifiers.

All the mentioned algorithms are summarized in Table 2.

Output

This component represents the knowledge and valuable pattern extracted from the data stream.

DATASETS

Several well-known datasets have been used to evaluate the effectiveness of the classification algorithms in detecting Concept Drift. Datasets can be real or artificial where contains one type of drift or various types. Table 3 shows the most used dataset in data stream mining studies with the presence of Concept Drift.

EVALUATION MEASURES

The following list presents the well-known evaluation measure for classification data stream algorithms:

- Accuracy score: It is calculated by dividing the number of correct predictions by the total classifier's predictions (Han et al., 2012).
- Recall: It refers to as the true positive rate (Han et al., 2012).
- CPU Time: It measures the total runtime of the CPU in training and testing the classifier (Dhaliwal and Bhatia, 2017).
- Memory: It measures the total memory consumed to run the classifier and store the running statistics (Dhaliwal and Bhatia, 2017).
- Kappa Statistic: It measures the homogeneity among the classifiers (Dhaliwal and Bhatia, 2017).

The concept drift detection can be assessed through different measures such as:

- The probability of true change detection: It measures the algorithms ability to discover drifts when they occur (Gama et al., 2014).
- Delay time of detection: It measures the time would be passed before the change is detected (Gama et al., 2014).

DATA STREAM MINING TOOLS

The most popular tools used in data stream environment are listed below:

- Weka: it provides a set of data mining and machine learning algorithms. These algorithms can be implemented directly on datasets through Weka GUI or Import Weka Java library (Web-1).
- MOA: is a project developed in University of Waikato, New Zealand. It provides an environment to deal with data stream, run experiments, and implement data stream mining algorithms (Bifet et al., 2010).
- SAMOA: Scalable Advanced Massive Online Analysis is an open source tool provides the well-known data stream and machine learning algorithms (Morales and Bifet, 2015).
- Apache Storm: an open source platform for processing infinite streams of data. It is scalable and fast which make it suitable to produce immediate analytics, and perform online machine learning (Web-6).

Table 2. Classification Algorithms with Concept Drift.

	Algorithm	Classifier	Type	Estimator	Dataset	Key points
1	FHDDM (Pesaranghade r and Viktor, 2016)	Naive Bayes (NV) and Hoeffding Tree	Single classifier	Slide window	Sine1, Mixed, Circles, Airlines, Poker Hand, and Electricity	The detection delay is shorter than other detectors
2	EDDM (Baena-Garcıa et al., 2006)	Decision tree and two nearest-neighbourho od learning algorithm	Single classifier	Window	4 Artificial Datasets (SINE1, CIRCLES, GAUSS, MIXED and SINE1G) and 1 real dataset	It can detect slow gradual drift and deal with noisy datasets
3	DDM (Gama et al., 2004)	Neural network, decision tree and perceptron	Single classifier	Window	8 Artificial Datasets and 1 real dataset	It detects sudden changes and gradual changes (changes that do not emerge very slowly)
4	DWM (Kolter and Maloof, 2003)	Incremental Tree Inducer (ITI) and NV	Ensemble classifiers	Not available	Stagger and Sea	According to the performance changes, the classifiers are added
5	PL (Bach and Maloof, 2008)	Naive Bayes	Ensemble classifiers	Slide window	Malware detection dataset, meeting scheduling dataset, electricity prediction dataset, and two synthesis dataset including Stagger and Sea	The number of the trained learners used are less than other ensemble methods
6	DWCDS (Zhu et al., 2010)	Random Decision Trees	Ensemble classifiers	Slide window	SEA, HyperPlane, KDDCup99, Yahoo shopping data and LED	It detects drift better then single window-based algorithms.
7	AUE2 (Brzezinski and Stefanowski, 2014).	Hoeffding Tree	Data stream is Ensemble classifiers	partitioned into chunks	Synthetic datasets generated by the MOA tool and 4-real datasets (Elec, Poker, Airline, and COV)	It consumes less memory comparing to other ensemble approaches. It detects different types of drift including sudden, gradual, recurring.
8	ADWIN (Bifet and Gavald, 2007).	Naïve Bayes	Single classifier	Slide window	Electricity Market dataset and synthetic dataset	ADWIN works only for one-dimensional data
9	Ensemble classification system (Jadhav and Deshpande, 2017).	J48, Naive Bayes, and Random Forest	Ensemble classifiers	Data stream is partitioned into fixed blocks	Census income and Spam email datasets	It detects both sudden and gradual drift. It handles missing values
10	CVFDT (Hulten et al., 2001)	Hoeffding Tree	Single classifier	Slide window	hyperplane and web data	CVFDT can keep its model up-to date with streaming data that contains concept drift
11	ADDM (Du et al., 2014)	IB1, j48, NNge, and SVM	Single classifier	Slide window	Five artificial datasets (Gauss, Mixed, Stagger, Sine1, and Sine1g) (Elist and Elec2).	ADDM used Hoeffding bound to determine the sliding window. In the evaluation, ADDM has lost upon one out of seven datasets
12	STEPD (Nishida and Yamauchi, 2007).	IB1 classifier and Naive Bayes	Single classifier	Slide window	Five artificial datasets (STAGGER, GAUSS, MIXED2, CIRCLES, and HYPERP)	It can discover sudden and gradual drift with the presence of noise
13	FW-DA (Liu et al., 2017).	DDM and ECDD	Single classifier	Slide window	SEA, Elec, Airline, and Spam	FW_DA performed well in detecting and adapting concept drift
14	RDDM (Barros et al., 2017)	Naive Bayes	Single classifier	Window	Agrawal, Mixed, Sin, Led, Airlines, pokerhand, and Electricity	RDDM has the higher accuracy among the others methods in detecting

Table 3. Datasets for DSM with Concept Drift.

	Dataset Name	Type	#instants	#Attribute	Key points
1	Census Income (web-2)	Real	48842	14	• It has different independent variables including name, marital status, education, occupation, and many others. These variables are used to predict the person's income which represents the dependent variable. • it includes only gradual drifts.
2	Sine1 (Gama et al., 2004)	Artificial	-	2	• It involves sudden concept drift • it has two features x and y, each feature distributed in zero and one. • It uses [y = sin(x)] to draw the curve. The data is labeled to positive and negative according to its position to the curve.
3	Elec 2 (Gama et al., 2004)	Real	45,312	8	• It consists of five features used to predict target variable whether it's up or down. • It is collected from the Australian Electricity Market of Australia at 30-minute intervals from 1996 to 1998.
4	Airline (Web-3)	Real	539,3837		• It includes the flight information such as the departure date, time of flight, destination, distance, and many others. • It used to predict if a given flight will delay.
5	Cover type (Web-4)	Real	581, 012	54	• It includes information of four wilderness areas in Colorado including Elevation, Aspect, Slope, Soil Type, and others variables. • it used to predict the forest cover type.
6	Stagger Generator (Du et al., 2014)	Artificial	240	3	• The three features are shape, size, and color. • it contains sudden drift.
7	Sine 2 (Gama et al., 2004)	Artificial	-	2	• It involves two features x and y, each feature distributed in zero and one. • It uses [y < 0.5 + 0.3 sin(3πx)] to draw the curve. The data is labeled to positive and negative according to its position to the curve.
8	SEA Generator (Street and Kim, 2001)	Artificial	-	3	• It is used to generate data stream containing sudden drift.
9	LED Generator (Brzezinski and Stefanowski, 2014)	Artificial	-	24	• The 24 attributes used to predict the seven-digit showed over the LED display.
10	Mixed (Gama et al., 2004)	Artificial	-	4	• It contains sudden concept drift. • The example is labeled as positive if two of the three conditions are fulfilled: v, w, y < 0.5 0.3 sin(3πx). If not, it will be negative.

CONCLUSION

Concept Drift is one of the main challenges of DSM. It must be detected and handled to avoid inaccurate results of learning models. In this research, we have discussed the concept of the data stream. The DSM components including the input/output, estimation methods, and classification algorithms with concept drift have been presented. Also, we have highlighted the most used DSM tools, datasets, and evaluations measures in data stream experiments.

REFERENCES

[1] Bach, S. H. & Maloof, M. A. Paired Learners for Concept Drift. Proceedings of the 8th IEEE International Conference on Data Mining 2008 Pisa, Italy.

[2] Baena-Garcia, M., Campo-Ávila, J. D., Fidalgo, R., Bifet, A., Gavalda, R. & Morales-Bueno, R. 2006. Early Drift Detection Method. Fourth international workshop on knowledge discovery from data streams, 6, 77-86.

[3] Barros, R. S. M., Cabral, D. R. L., Jr, P. M. G. A. & Santos, S. G. T. C. 2017. RDDM: Reactive drift detection method. Expert Systems with Applications, 90, 344-355.

[4] Barros, R. S. M. & Santos, S. G. T. C. 2018. A large-scale comparison of concept drift detectors. Information Sciences, 451-452, 348-370.

[5] Bifet, A. & Gavald, R. Learning from Time-Changing Data with Adaptive Windowing. Proceedings of the 2007 SIAM International Conference on Data Mining, 2007. 443-448.

[6] Bifet, A., Holmes, G., Kirkby, R. & Pfahringer, B. 2010. MOA: Massive Online Analysis. Journal of Machine Learning Research, 11, 1601-1604.

[7] Brzezinski, D. & Stefanowski, J. 2014. Reacting to Different Types of Concept Drift: The Accuracy Updated Ensemble Algorithm. IEEE Transactions on Neural Networks and Learning Systems, 25, 81-94.

[8] Dhaliwal, P. & Bhatia, M. P. S. 2017. Effective Handling of Recurring Concept Drifts in Data Streams. Indian Journal of Science and Technology, 10.

[9] Du, L., Song, Q. & Jia, X. 2014. Detecting concept drift: An information entropy based change-detector using an adaptive sliding window. Intelligent Data Analysis, 18, 337-364.

[10] Gaber, M. M. 2011. Advances in data stream mining. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 2, 79-85.

[11] Gama, J., Žliobaite, I., Bifet, A., Pechenizkiy, M. & Bouchachia, A. 2014. A survey on concept drift adaptation. ACM Computing Surveys, 46, 1-37.

[12] Gama, J. O., Medas, P., Castillo, G. & Rodrigues, P. Learning with Drift Detection. 17th Brazilian Symposium on Artificial Intelligence, 2004 Brazil. 286-295.

[13] Han, J., Kamber, M. & Pei, J. 2012. Data Mining Concepts and Techniques, Amsterdam, Elsevier/Morgan Kaufmann.

[14] Hulten, G., Spencer, L. & Domingos, P. Mining time-changing data streams. the seventh ACM SIGKDD international conference on Knowledge discovery and data mining, 2001 San Francisco, California. 97-106.

[15] Jadhav, A. & Deshpande, L. 2017. An Efficient Approach to Detect Concept Drifts in Data Streams. 2017 IEEE 7th International Advance Computing Conference (IACC). Hyderabad, India.

[16] Kantardzic, M. 2011. Data Mining: Concepts, Models, Methods, and Algorithms, john Wiley & Sons, Inc.

[17] Khamassi, I., Mouchaweh, M. S. & Hammami, M. 2016. Discussion and review on evolving data streams and concept drift adapting. Evolving Systems, 9, 1-23.

[18] Kolter, J. Z. & Maloof, M. A. 2003. Dynamic weighted majority: a new ensemble method for tracking concept drift. Third IEEE International Conference on Data Mining. Melbourne, FL, USA, USA: IEEE.

[19] Krempl, G., Žliobaite, N., Brzezinski, D., Hüllermeier, E., Last, M., Lemaire, V., Noack, T., Shaker, A., Sievi, S., Spiliopoulou, M. & Stefanowski, J. 2014. open challenges for data stream mining research. SIGKDD Explorations, 16, 1-10.

[20] Liu, A., Zhang, G. & LU, J. 2017. Fuzzy time windowing for gradual concept drift adaptation. 2017 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE). Naples, Italy: IEEE.

[21] Mittal, V. & Kashyap, I. 2016. Empirical Study of Impact of Various Concept Drifts in Data Stream Mining Methods. International Journal of Intelligent Systems and Applications, 8, 65-72.

[22] Mohanty, H., Bhuyan, P. & Chenthati, D. 2015. Big Data A Primer, Springer.

[23] Morales, G. D. F. & Bifet, A. 2015. SAMOA: Scalable Advanced Massive Online Analysis. Journal of Machine Learning Research 16, 149-153.

[24] Nishida, K. & Yamauchi, K. Detecting Concept Drift Using Statistical Testing. International Conference on Discovery Science, 2007. Springer, Berlin, Heidelberg, 264-269.

[25] Pesaranghader, A. & Viktor, H. L. Fast Hoeffding Drift Detection Method for Evolving Data Streams. ECML PKDD 2016 Machine Learning and Knowledge Discovery in Databases 2016 Italy. Springer, Cham, 96-111.

[26] Street, W. N. & Kim, Y. A Streaming Ensemble Algorithm (SEA) for Large-Scale Classification. Proceedings of the seventh ACM SIGKDD international conference on Knowledge discovery and data mining, 2001. 377-382.

[27] Zliobaite, I., Pechenizkiy, M. & Gama, J. A. An overview of concept drift applications. Big Data Analysis: New Algorithms for a New Society, 2016. Springer, Cham.

[28] Zhu, Q., Hu, X., Zhang, Y., Li, P. & Wu, X. 2010. A Double-Window-Based Classification Algorithm for Concept Drifting Data Streams. 2010 IEEE International Conference on Granular Computing. San Jose, CA, USA: IEEE.

Web sites

Web-1: Ten Key Marketing Trends for 2017 and Ideas for Exceeding Customer Expectations. [Online]. Available: http://comsense.consulting/wpcontent/uploads/2017/03/10_Key_Marketing_Trends_for_2017_and_Ideas_for_Exceeding_Customer_Expectations.pdf [Accessed 23-12 2018].

Web-2: UCI Machine Learning Repository: Census Income Data Set [Online]. Available: https://archive.ics.uci.edu/ml/datasets/census+income [Accessed 21-12 2018].

Web-3: Elena Ikonomovska's Web page [Online]. Available: https://kt.ijs.si/elena_ikonomovska/data.html [Accessed 3/11/2018].

Web-4: UCI Machine Learning Repository: Covertype Data Set [Online]. Available: https://archive.ics.uci.edu/ml/datasets/covertype [Accessed 28/11 2018].

Web-5: Weka 3 - Data Mining with Open Source Machine Learning Software in Java [Online]. Available: https://www.cs.waikato.ac.nz/ml/weka/ [Accessed 3/11/2018].

Web-6: Apache Storm [Online]. Available: http://storm.apache.org/index.html [Accessed 3/11/2018].

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Influence of Using Arabic Handwriting Books in Improving Handwriting of Third Primary Year Students in the Department of Education of Bisha Governorate, Saudi Arabia

Abdullah Shamlaan Shbreen
Ministry of Education, Kingdom of Saudi Arabia

ABSTRACT

This study aims to:- Recognize the influence of using Arabic handwriting book in improving handwriting of third primary year students in the Zuhair Kenya School located in Bisha Governorate. The researcher used the quasi experimental method. The study sample consists of (60) students from the school divided into two equal groups: The first one was experimental and was taught by using Arabic handwriting book in improving handwriting of (30) students, and the second one was the control group consisting of (30) students and was taught in the normal way. The researcher tested both groups (both experimental and control) and the results have shown huge differences between the students, who studied the handwriting book especially (experimental group). As this handwriting book has improved and affected students' handwriting according to a strategy of how to improve handwriting. As a result of the study, researcher suggests a number of recommendations such as:- Studying the influence of using a strategy of improving the skills of Arabic handwriting supported by a computer programs for improving handwriting of first primary year students, and - Studying the influence of an experimental program based on using the strategy of cooperative learning in improving Arabic handwriting for primary school students.

KEY WORDS: HANDWRITING BOOK- PRIMARY SCHOOL-EDUCATIONAL DEPARTMENT OF BISHA GOVERNORATE-MINISTRY OF EDUCATION- TEACHING METHOD - ARABIC HANDWRITING

ARTICLE INFORMATION:

**Corresponding Author: assq.bisha@gmail.com*
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/21

INTRODUCTION

Arabic language based on four major arts:

Art of speech, listening, reading and writing. These arts cannot be separated from each other in any way as each one highly affects the other. Besides, there is a firm integration between these four arts, so speaking doesn't come without listening, writing cannot be without reading, reading can't be without listening, nor speaking without listening. These four arts are related to each other with an integral and interactive system. Arabic handwriting is an original art by which the Islamic cultural inheritance and history has been written and kept. It has been evolved as a way of communication, and moving thoughts. It became more artistic and full of figures of speeches which reflect Islamic Arab culture and identity.

Based on that, art of writing (handwriting skill) is an important science and art in the same time, as the learner starts to learn reading and writing at first, then other skills. The importance of Arabic handwriting expressed as an effective instrument for teaching in general and teaching Arabic language in particular. However, handwriting is also considered one of the most major skills in teaching Arabic language and an instrument for students in all school subjects and works that require writing.

The researcher believes that we shall take into our consideration the specialized teacher of Arabic language and who have a clear handwriting, which may be able to solve this problem with this new method. As a specialized teacher, he takes upon his shoulders clarifying at least Naskh script in an applicable and simple way by using the handwriting book and guiding students to improve and decorate handwriting.

Literature Review

- Study No. [1] was aimed at:

*Identifying the influence of using writing processes of first primary year students' handwritings and their attitudes towards hand writing. The study sample consisted of (21) students with various levels of handwriting, as it included students with high, medium and low level. However, students have been tested for identifying their writing level. They also had interviews to ask why they write? After that, they were trained in full school year for writing by using writing processes introduction. Moreover, they have been tested and findings have shown the efficiency of writing processes in improving writing skills and spelling for study respondents, in addition to increasing their desire towards writing positively.

- Study No. [2] was aimed at:

*Identifying the efficiency of teaching Arabic handwriting curriculum (105 Arab) in developing thehandwritingperformance for students of Teacher Training College in Mecca.

The Researcher used the performance test for recognizing the efficiency of teaching Arabic handwriting curriculum (105 Arab). Researcher has also chosen the study sample including (130) students from Teacher Training College in Mecca, who registered in Arabic handwriting methodology (105 Arab) in both branches: literary and science.

Significant study findings: The experimental change proved its efficiency in improving and developing the Arabic handwriting skills for science-branch students more than the literary one.

- Study No. [3] was aimed at:

Recognizing the efficiency of developing handwriting skills program; Identifying students' attention and their behaviors at school hall.Study sample consisted of (13) children who have been chosen randomly from Australian civilized students and have been divided into two groups: experimental and control. The test has been applied after and before as an instrument of the study.

Significant study findings: improving the performance in the experimental group compared to the control group of developing handwriting skills, students' attention and their behaviors in school hall.

- Study No. [4] was aimed at:

Surveying opinions of primary school teachers about their educational practices in the classroom. Most of the participating teachers (72%) took an eclectic approach to writing instruction, combining elements from the 2 most common methods for teaching writing: process writing and skills instruction. A random sample of primary grade teachers (N = 178; 97% female) from across the United States was surveyed about their classroom instructional practices in writing.

Significant study findings: Although 90% of the teachers reported using most of the writing instructional practices that were included in the survey, there was considerable variability between teachers in how often they used specific practices.

The time, which students spend at school is insufficient for learning writing in this stage; Provide better balance between time spent writing, learning writing strategies, and teaching writing skills;

Place more emphasis on fostering students' motivation for writing;

Develop stronger connections for writing between home and school; make computers a more integral part of the writing program; and Improve professional development for writing instruction in teacher education programs.

– Study No. [5] was aimed at:

*Identifying efficiency of the proposed program for developing Arabic handwriting skills and methods and its relation to grasping the written scripts by six primary school students.

Study sample consisted of (157) students, (79) male student and (78) female student.

Significant Findings of the Study:

* Identifying the most important skills and methods of Arabic handwriting for six primary school students;

* Recognizing the reality of Arabic handwriting skills for male and female students; and

* There are no statistically significant differences between the performance of male and female students in Arabic handwriting skills and methods, and grasping the written script.

– Study No. [6] was aimed at:

*Identifying the position of Arabic handwriting in Islamic civilization. However, the problem lied in the special position of Arabic handwriting in Muslim life; was it a coincidental, relating to Islamic religion or there is different reason? To achieve that, we used the historic and analytical descriptive method using primary and secondary observation and internet.

Significant study findings: Arabic handwriting has been at the forefront in Islamic civilized arts and became sacred due to its relation to the Holy Quran and harmonizing with Islamic civilization features.

Study Problem

The researcher found that there are students, who don't write properly according to the rules of handwriting subject. He found that through his work as a teacher for third primary year at Zuhair Kenya primary school in Bisha governorate and through observing the handwriting of second primary year students. The handwriting subject along with all arts were combined in one subject, as students in this age needs to be taught the correct handwriting rules. This study tries to answer the following question:

"What is the influence of using Arabic handwriting books in improving handwriting of third primary year students in the Zuhair Kenya primary school in Bisha governorate?" in addition to verifying the validity of hypotheses as follows:

There are statistically significant differences at (0.05) level between the average degrees of experimental and control groups in the post measurement students" handwriting".

Study Methodology

According to the nature of this study, the researcher used the quasi-experimental methodology for identifying the influence of using Arabic handwriting book in improving handwriting of third primary year students in Bisha governorate. Study community consists of (1165) of all third primary year students, second semester in Bisha governorate in 1437-1438 H. By using random choosing, the Zuhair Kenya primary school has been selected.

Study sample consists of two groups; the first group is experimental which is taught by using an Arabic handwriting book of (30) students, and the second group is control which is taught by using the normal way of (30) students. Therefore, the total amount of study sample is (60) students. Study sample includes (20) students from the Zuhair Kenya primary school as a survey sample for verifying the accuracy and credibility of the study instrument. The study includes two instruments; attainment test of students' handwriting and Arabic handwriting book for improving student handwriting. Finally, researcher makes sure of the validity and credibility of the measurement instrument.

Numerical Findings

The study aims to answer the study question; "What is the influence of using Arabic handwriting books in

Table 1. Shows that

Variable	Control Group N = 20		Experimental Group N = 20		(T) Values	Significance Level
	M	A	M	A		
Test of students handwriting	21.27	4.13	21.30	4.29	-0.019	0.98

* There is no statistical significance differences at (0.05) level between the average degrees of experimental and control groups of pre measurement of students' handwriting before using the proposed Arabic handwriting book, which indicates that there is an equivalence between both research groups (both experimental and control groups) before applying the proposed Arabic handwriting book.

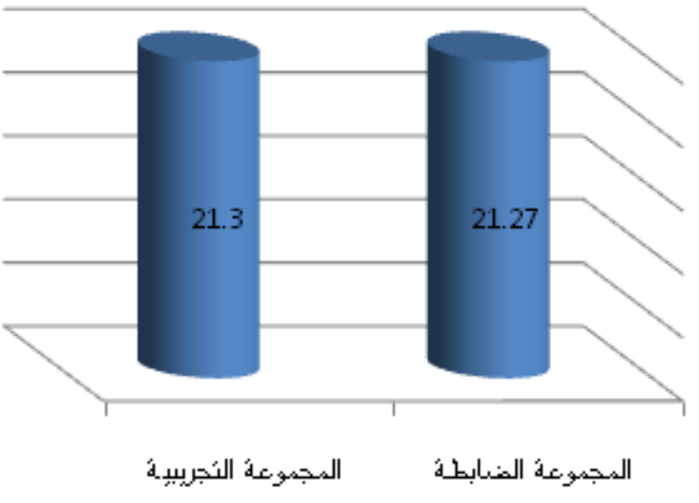


Figure 1. The difference between the average degrees of students from (both experimental and control groups) of testing students' handwriting before applying proposed Arabic handwriting book.

improving handwriting of third primary year students in the Zuhair Kenya primary school in Bisha governorate?" it also aims to test the initial hypothesis of; "There are statistically significant differences at (0.05) level between the average degrees of experimental and control groups in the post measurement students".

T.test has been applied to the independent samples for calculating arithmetic means and Standard deviations of the test related to ranking students' handwriting. Then, **T.test** values and its statistical significances between the average degrees of research groups in their pre applicable for the test. Data has been processed through statistic programs packages called (**SPSS**). **The related results were as follows:**

Table No. (1), shows **T.test** values and statistical significances levels of the two groups individuals (experimental and control groups) of the test of students handwriting before applying Arabic language book.

Figure No. (1) Shows the difference between the average degrees of students of both experimental and control groups regarding testing students' handwritings before using proposed Arabic handwriting book program.

(T) Values and its statistical significances were calculated between the average degrees of the two study groups in the post application of the test.

Significant study findings are as follows:

Table No. (2); (T) values and statistical significances levels of group individuals (both experimental and control) of the test regarding students' handwriting before applying the Arabic language book.

In light of these results concluded by the researcher, the following study hypothesis must be accepted:

"There is a statistical significance differences at (0.05) level between the averages degrees of the experimental

Table 2. Shows that

Variable	Control Group N = 20		Experimental Group N = 20		(T) Values	Significance Level
	M	A	M	A		
Test of students handwriting	22.95	4.07	26.90	2.32	-3.76	0.01

* There are statistical significance differences between the averages of experimental and control groups of the test related to students' handwritings. These differences attributed to the favor of the experimental group. (T) Value of test reached (-3.76), according to its statistical significances value at (0.01).
* This means that students of experimental group who studied Arabic handwriting program were better than students of control group, who studied according to the normal way.

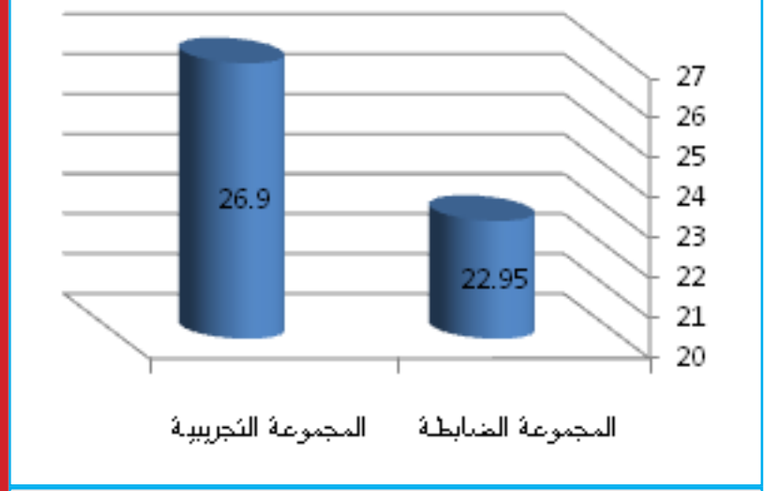


Figure 2. The difference between the average degrees of (both the experimental and control groups) of the test related to students' handwritings after applying the Arabic handwriting book program.

and control groups in the post measurement of students' handwriting".

Figure No. (2) shows The difference between the average degrees of (both the experimental and control groups) of the test related to students' handwritings after applying the Arabic handwriting book program.

Practical significance (η) could be noticed from the following equation:

$$\eta^2 = \frac{T2}{T2 + FD}$$

Table No. (3) shows the gain percentage of the representational activity and the modified gain percentage progress and practical significance (η) and (η2) for individual of experimental group in the pre and post measurement, of the test of students handwritings.

After analyzing table No. (3) results, we concluded:

1- (η2) value is 0.88, which means that, the total variance percentage of sample individuals degrees, which are attributed to the influence of Arabic handwriting book is 88%. This is a very large amount of variance explained by Arabic handwriting book.

2- Practical significance value (η) is 0.94, which means that, Arabic handwriting book highly affected students' handwriting with a percentage of 94%. All these percentages refer to the clear influence of Arabic handwriting book.

Researcher explains how Arabic handwriting book has an influence on students' handwriting, as this book is based on assigning the students to write from three lines to six lines maximum. The skill is based on (30) degree divided into three themes as follows:

Writing on the central line, appropriate height of the character and enough spaces between characters and words with 10 degrees for each one of them. This way improved handwriting according to a strategy based on understanding how to improve handwriting.

Findings, Recommendations and Suggestions Summary

The study concluded that there are statistical significance differences between average degrees of experimental and control groups of the test of students' handwriting.

Table 3. the gain percentage of the representational activity and the modified gain percentage progress and practical significance (η) and (η^2) for individual of experimental group in the pre and post measurement, of the test of students handwritings.

Changing	Experimental group				T	Significance Level	η	η^2
	Pre		Post					
	M	A	M	A				
Test of students handwriting	21.30	4.29	26.90	2.32	-12.03	0	0.94	0.88

These differences attributed to the favor of the experimental group, while (T) value of test reached (-3.76), which is a statistical significance value at (0.01).

*This means that students of experimental group who studied Arabic handwriting program were better than students of control group, who studied according to the normal way.

In light of these results concluded by the researcher, the following study hypothesis must be accepted:

"There is a statistical significance differences at (0.05) level between the averages degrees of the experimental and control groups in the post measurement of students' handwriting".

The study recommends, upon its findings, to raise awareness of those responsible persons for the educational process to consider using the Arabic handwriting book in improving handwriting skills. The study also recommends including events and procedures in using Arabic handwriting book with variant levels and training teacher on using development strategy of Arabic handwriting skills.

REFERENCES

[1] Storholt, S. (2001). Implementing a process approach to writing with first grade students. MA, Volume 40-02 of Dissertation Abstracts International.

[2] Attar, Abdullah. (2004). The Effect of Teaching Arabic handwriting curriculum (105 Arabs) in developing handwriting Performance of the Students of the Teacher Training College in Makkah Al Mukarramah. Master Thesis, Umm Al Qura University.

[3] Jessica MeGarrigle, Alison Nelson, A. (2006). Evaluating a school skills program me for Australian indigenous children: Apilot study. University of Queensland, Australia, Occupational therapy international 2006, 13(1).

[4] Graham and Cutler. (2008). Primary Grade Writing Instruction: A National Survey. journal of Educational Psychology Copyright 2008 by the American Psychological Association. 4(100), 907–919.

[5] Sheikh Eid, Ibrahim Odeh. (2009). The effectiveness of a proposed program in the development of Arabic handwriting and its literature and relation to the understanding of the handwriting of the sixth primary years students of the basic education in Palestine, unpublished PhD thesis, League of Arab States, Institute of Arab Research and Studies.

[6] Mohammed, Younis Abdel Rahman. (2009). Arabic handwriting in Islamic civilization. Unpublished PhD thesis, Faculty of Fine and Applied Arts, Sudan University of Science and Technology.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

General Framework to Apply Knowledge Management to Student Guidance in General Education in the Kingdom of Saudi Arabia

Abdulla Mohamed Abdulla Alyateem[1] and Abdelrahman Abeid Alqarni*[2]

[1]*Ministry of Education Saudi Arabia*
[2]*Information Science Department King Abdulaziz University Jeddah Kingdom of Saudi Arabia*

ABSTRACT

The study aims to provide a proposed general framework to apply knowledge management to student guidance in general education in the Kingdom of Saudi Arabia at the long term. Based on studying the theoretical literature of the study subject, examining submitted knowledge management models in general and in the education field in particular, concluding the findings of this study that aims to discover the influence of Knowledge management applications on supporting student guidance and finally clarifying the relationship between Knowledge management applications and student guidance. The researchers developed their proposed model by combining (Lee & Kim) model with (Nonaka, I. & Takeuchi) model. The researchers also developed their model based on viewing different models and findings concluded in literature reviews and the studies conducted by them in addition to the recommendations of (focus group) which was conducted in the Kingdom of Saudi Arabia. The researchers conducted their study based on the content analysis method and the style of (focus group). The (focus group) has adopted the proposed framework provided by the researchers.

KEY WORDS: GENERAL EDUCATION- STUDENT GUIDANCE- KNOWLEDGE MANAGEMENT- (NONAKA, I. & TAKEUCHI) MODEL- (LEE & KIM) MODEL- KNOWLEDGE MANAGEMENT MODELS

ARTICLE INFORMATION:

*Corresponding Author: alqarni333@yahoo.com
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/22

INTRODUCTION

The educational field, as many different professional fields, may suffer from waste and continuous loss of knowledge due to many reasons whether professional ones such as; retirement or resignation, or natural ones such as; diseases or death. Such reasons may negatively affect the educational and professional work with the continuous loss of knowledge and educational expertise without benefiting from it and transmitting the same to the following generations of the profession of education.

By considering the student guidance profession, as one of the most important educational professions, and its knowledge and professional expertise, we realize that it is subject to loss of knowledge and expertise resulting from the above stated reasons like many other educational fields. This case requires hard working to stop these losses and find out means to benefit from the available knowledge and invest the experience of the continuous professional development in the field of student guidance.

Therefore, knowledge management and its processes and applications can be regarded as an important way and effective means to perfectly invest in knowledge, experiments and guiding experiences. Then, knowledge management may be transferred, published, organized and stored in order to make the best use of it.

In this study, the researcher developed a general framework to apply knowledge management to student guidance in the general education in the Kingdom of Saudi Arabia. The study will discuss the study problem, literature reviews, study methodology, content analysis, applying the style of focus groups and finally how to develop the general framework as one of the outputs of the study.

Literature Reviews

Study No. [1] sought to recognize the percentage of the second secondary school students in secondary schools in the city of Ta'if who have a high violent attitude, and the effect of an existing program to prepare information for social knowledge on reducing violence among them. The study was conducted on a sample consisting of 363 students in second secondary school in the city of Ta'if in the Kingdom of Saudi Arabia. This study was based on experimental and descriptive methods. The study concluded that the percentage of the students who have violent attitude was 42.2% and the guiding program has effectively reduced this violent attitude among students largely. This study recommended to recognize the basic psychological, social and cognitive needs of adults, avoid using disappointing words and behaviors and determine the students' rights and duties. It also suggested to conduct researches about a means that depend on preparing information for social knowledge in dealing with behavioral problems.

This study agrees with the current study in clarifying the crucial and important role of preparing information and knowledge in reducing valance among the student. This can be regarded as a try to use information and knowledge in the field of student guidance and an incentive to apply knowledge management to student guidance.

Study No. [2] aimed to use Data mining techniques in dealing with the educational problems and deviations among adults. Adolescence is the time during which people develop and form their crucial values, personality traits, and beliefs. Hence, as deviant behaviors occur during adolescence, it is important to guide adolescents away from such behaviors and back to normal behaviors. Moreover, although there are various kinds of deviant behavior, most of them would either directly or indirectly affect youths' academic learning progresses. Therefore, many researchers have endeavored to explore the issues of juvenile delinquency. In this study, we focus on providing methods that could assist counseling officers in discovering symptoms and pre-symptoms of youth delinquency. The study proposes a framework for mining associations from "memo-type" records and guiding notes. In addition, we apply this approach to retrieve associations among deviant behaviors from the counseling records stored in databases. The contributions to adolescent counseling are as follows: (1) A keyword tree of deviant behaviors is constructed and verified; (2) Preparing behavioral groups extracted from records and guiding notes according to general sequence and classification in terms of the types of deviant behaviors. Finally, (3) an information system is recommended to help junior counselors performing counseling and guiding works. Consequently, without experienced consultants, the proposed framework could discover valuable knowledge from consulting records effectively and many efforts are therefore saved. This study concluded a general framework to benefit from the previous deviant behaviors data in predicting and treating processes to help young people in order to live a normal life, provide necessary guidance, explain all procedures in this regard, and verify the sufficiency of this proposed method. The contributions to adolescent counseling are in the following two sides:

(1) A keyword tree of deviant behaviors is constructed to classify the data records. This keyword tree was verified to be true to the percentage of 94.5%. It was also flexibly classified.

(2) The processes of predicting deviant behaviors by mining in guiding data have contributed in discovering deviant behaviors through the proposed framework with the percentage of 94%. In addition, about 96.7% of the

classified groups have furnished valuable information that contributed in reducing deviant behavior without refereeing to experienced consultants. All that helped students to refrain from committing deviant behaviors and played an important role in preventing serious crimes.

This study agrees with the current study in supporting the idea of accumulated data mining and searching in order to predict the deviant behaviors of students. This way can be regarded as a way to deal with knowledge management because it handles accumulated data, knowledge and experiences. Data mining proved to be effective indicating the benefits of knowledge management in this field.

Study No. [3] aimed to discover The Effect of a Counseling Supervision Program -Based on the Skill Development Model- on Raising the Professional Self- Efficacy Level among Counselor Trainees in Jordan. The study sample consisted of (60) psychological counseling fourth and third year male and female students at Yarmouk University who are registered in the course of psychological counseling skills and techniques and training fields. Those students were randomly divided into two groups; the experimental group, which was trained by the counseling supervision program-based on the skill development model, and the control group, which was dealt with according to the normal teaching methods. The study showed that the professional self- efficacy level among the experimental group individual was less than the level of the individuals of the control group. The study also showed that there are static significant differences in the behavioral field attributed to the interaction between the group and gender and academic year and gender and finally interaction between the group, gender and academic years. The study also showed that there are static significant differences in the cognitive field attributed to the interaction between the group, gender and academic year. It also showed that there are static significant differences in performance averages on the professional self-efficacy level in general attributed to the group and interaction between the group and gender and academic year and gender and finally interaction between the group, gender and academic years. The study recommendations:

- Developing training programs according to different supervisory models to raise the professional self- efficacy level among counselor trainees and employed educational counselors and apply it to identify its effect on raising the professional self-efficacy level;
- Studying the characteristics of counselor trainees in order to be considered when developing programs for them;
- Studying the difficulties facing counseling supervisors in solving the problems, which the counselor trainees suffer from in order to mitigate its impact;
- Spreading the idea of executing and applying the training program on psychological counseling students to improve the level in practicing counseling work; And
- Generalizing the counseling program on counseling supervisors in different directorates of education in order to acquire the practical and theoretical supervisory experience.

This study agrees with the current study in depending on cognitive program that improves the performance in the field of counseling and highlighting the role of this cognitive program in raising the professional self- efficacy level to improve its quality and the quality of counseling service in general.

Study No. [4] aimed to realize the superiorities and difficulties of Application Knowledge Management for Elementary School Teachers and offer the solutions. The analysis of this study considers that the superiorities for elementary school teachers in application knowledge management establish commonly the concept of knowledge management and school teachers can form professional groups to share knowledge. Besides, in the difficulties of application knowledge management, the main problems are insufficient study hours and scanty content planning; schools don't have enough budget and apparatus to enrich information equipment; teachers are insufficient for information accomplishments and capacity; the school organization ossifies and the teachers settle in present situation; teachers have deficient sense of trust in application knowledge management and so on. According to the analyses above, researchers present four strategies as following to enable the application knowledge management results:

1. Establish a reasonable further education system to enhance the teachers' willing to take advanced courses, and promote teachers to obtain knowledge.
2. Distribute educational expenditure properly to enrich schools information network equipments, and promote the way of teachers sharing knowledge.
3. Encourage teachers to strive the abilities and accomplishments of information science and technology to enable teachers to develop the function of knowledge application fully.
4. Mold innovative organization culture to avoid rigid organization and promote teachers to innovate knowledge and abilities in application knowledge management.

This study agrees with the current study in clarifying the superiorities and difficulties of Application Knowledge Management and offers the solutions. This makes it easy

for the current study in outlining the superiorities that will be adopted and the difficulties that must be avoided or at least dealt with and solved.

Study No. [5] aimed to realize the reality of Knowledge management applications in supporting the Student guidance in the department of education for the region of BISHA from schools principals and educational guides' point of view. The survey method was used through the questionnaire, which was formed from Likert scale for the two samples of the study that has relation with the applications of knowledge management in BISHA education. The findings of this study identified the reality of the Applications of knowledge management in the field of the Student guidance in general education in the department of education for the region of BISHA, the instrument was subject to check and examination and proved to be truthful and effective. The study community was formed from schools principals and student guidance in education schools in BISHA, the study sample was formed from (200) members distribution, (100) schools principals and (100) student advisors. This study showed that the first of these applications was (Importance of knowledge management) with a percentage of 72.00% in student guidance in general education in BISHA. Then, (Knowledge acquisition) with a percentage of 71.00% in student guidance in general education in BISHA; then (Knowledge participation) with a percentage of 66.00% in student guidance in general education in BISHA; then (Realizing knowledge management concepts) with a percentage of 64.67% in student guidance in general education in BISHA; then (Knowledge Publish) with a percentage of 63.67%; then (Maintaining and organizing knowledge) with a percentage of 61.33% in student guidance in general education in BISH, then (Knowledge application) with a percentage of 61.00 % in student guidance in general education in BISHA. Finally, (Knowledge generation) came the least one with a percentage of 60.33% in student guidance in general education in BISHA. In general, we found that the responses of the study samples about the application of knowledge management were (2.98), i.e. the applications of knowledge management in general in student guidance for general education in BISHA with the percentage of 66.00%.

This study agrees with the current study in explaining the reality of Knowledge management applications in supporting Student guidance, which may contribute in developing the proposed general framework on application basis.

Study Problem

Student guidance is regarded as a fertile environment for knowledge and experiences and is one of the most important educational and pedagogical fields. Student guidance deals with different educational and pedagogical problems related to students. That was explicitly provided for in the organizational guide issued by the ministry of education and pedagogy (Currently the Ministry of Education). This organizational guide stated that the functions of the student guidance are to study the social, economical, healthy and behavioral cases and psychological and educational problems and to prepare treatment plans for such problems. Workers in student guidance must acquire experiences and knowledge- as seems logical- through executing the functions of student guidance or fieldwork in the field of education and pedagogy. Such experiences and knowledge will be subject to loss in case that there is no effective management. They also must be shared with these field-affiliated persons and other categories related to the educational work in order to be key factors to achieve the objectives of education and pedagogy. Therefore, this study aimed to provide a proposed framework to apply knowledge management to the field of student guidance in the general education in the Kingdom of Saudi Arabia.

Study Methodology

This study is based on reviewing the intellectual production and using the content analysis method through studying the intellectual production, which is related to the study subject, through a theoretical framework, the literature reviews and knowledge management models. The study also uses the style of (Focus Group) to introduce the proposed general framework as an output of this study. This general framework depends on combining and developing many previous models as well as benefitting from the findings of this study and the literature reviews and enhancing their credibility. The style of (Focus Group) is search aims to recognize the agreed upon opinions by some carefully selected experts.

Applied Framework

Through applying the content analysis method, the researcher has found, through his study, two models, which can be combined and developed in a proposed general framework to apply knowledge management to student guidance in general education. These two models are: (Lee & Kim) model and (Nonaka, I. & Takeuchi) model. But, the researcher has changed the name of the second stage of (Lee & Kim) model from "Propagation Stage" to a new one "Building and spread stage" according to what the researcher considers proper for the subject and objectives of the proposed model. The following table No. (1) shows (Lee & Kim) model:

In the second stage of this general framework, Nonaka Model [7] was combined with this model because it aims to transform, document, store, organize, share and exchange knowledge. Nonaka Model [7] also

Sr.	Knowledge Management Stages	Stages Activities
1	Initiation Stage	- Building Infrastructure - Building Human Relations - Reward Systems - Organizational culture management - Communication technology - Building databases - Obtaining proposed ideas and opinions
2	Propagation Stage	- Justifying Ideas - Making justification procedures and policies - Using information technology in treating and analyzing ideas to be justified - Controlling knowledge and arbitration tools - Obtaining the justified knowledge and arbitrating it
3	Internal Integration Stage	- Integrating and knowledge financing according to the market requirements - Structuring knowledge and drawing its map - Using search engines and its strategies - Applying technology in performance measurement systems - Obtaining funded and integrated knowledge
4	External Integration Stage	- Knowledge management competency - Mesh networks - External sources - Cooperation Management - Online conference and video conference - Emails - Sharing Knowledge systems - Unification subjects - Obtaining basic and networking knowledge

aims to apply publications and availability policies and obtaining knowledge continually. The researcher used (Figure No. (1) Nonaka, I. & Takeuchi model) in the first four procedures of this stage in the proposed model and added two other necessary procedures. These two other processors are documenting and sharing knowledge.

Study Findings and Outputs

The researcher built his proposed model by combining (Lee & Kim) model with (Nonaka, I. & Takeuchi) model. He benefited from different models, findings of this current study and literature reviews and the recommendations of (Focus Group) conducted on Wednesday corresponding to 10/11/2016. This focus group aimed to deal with the strategic general framework submitted by the researcher to apply knowledge management to student guidance in general education. The focus group approved the model furnished by the researcher and recommended to find a model to be applied to the student guidance according to the status quo through the find-

	Tacit	*Tacit*	
Tacit	Socialization [I & I] - Brain storming - meeting	Externalization [I & G] - video taping - knowledge map	*Explicit*
Tacit	Internalization [I & G & O] - training - mentoring	Combination - repositories - cop	*Explicit*
	Explicit	*Explicit*	

Figure 1. Nonaka, I. & Takeuchi model [7]

ings of this study and the recommendations of the focus group. The focus group also recommended documenting guiding knowledge and experiences through building a directed model to record these knowledge and experiences in guiding knowledge container in order to be spread and used in the field of student guidance in the department of education for the region of BISHA. The focus group also recommended creating a database of educational field direction and guidance experts in order to facilitate the process of contacting them to get their consultations and developing procedures and documenting practices of student guidance in the department

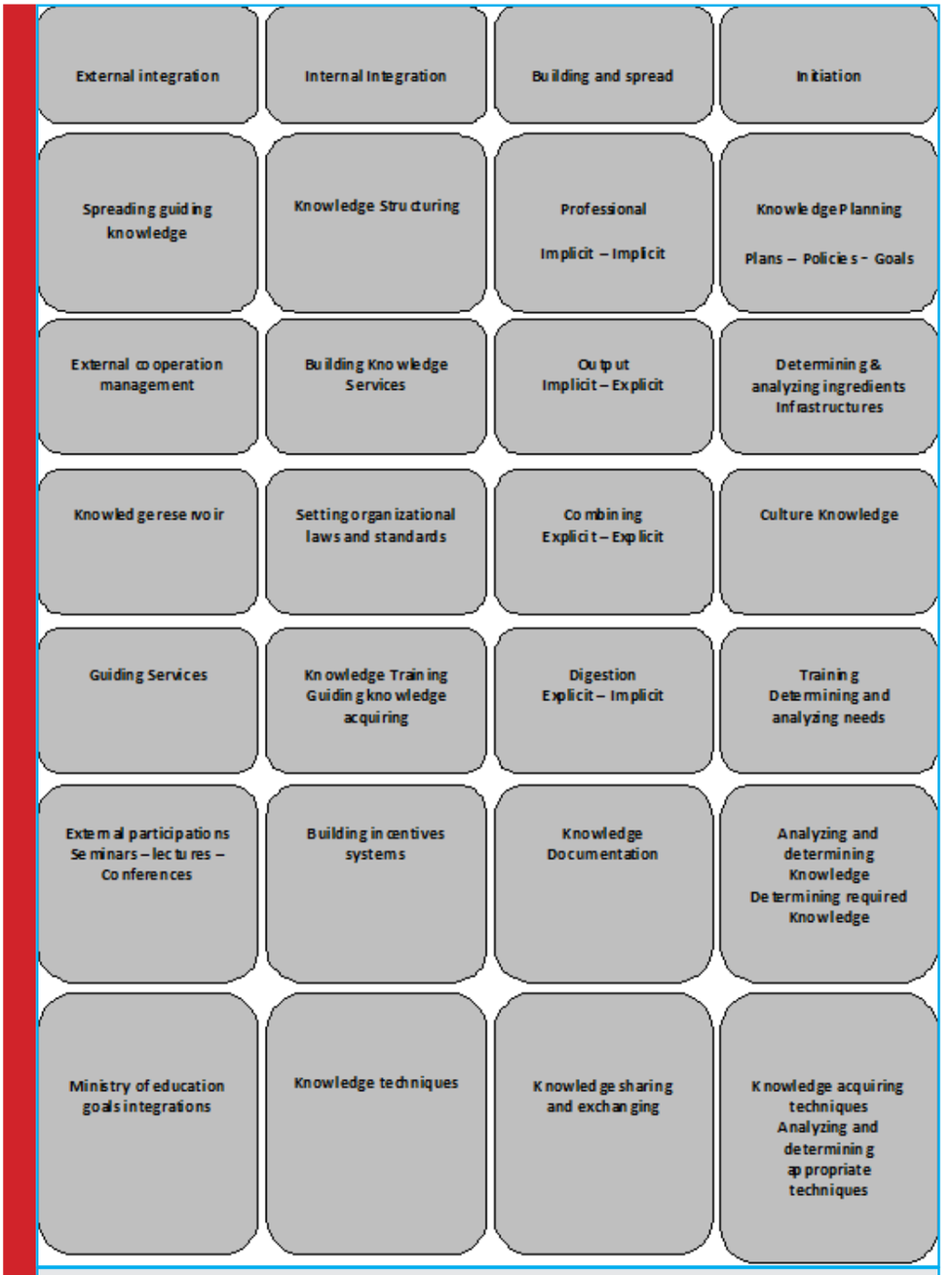


Figure 2. Detailed plan for the strategic proposed model to apply knowledge management to student guidance

of education for the region of BISHA. Finally, the focus group recommended developing student guidance community of practice in the educational in the department of education for the region of BISHA.

Proposed General framework of applying knowledge management to student guidance in the general education in the kingdom of Saudi Arabia:

First: the objectives of the Strategic proposed model to apply knowledge management to student guidance:

This proposed model seeks to achieve the following:

- Stopping the loss of guiding knowledge and experiences in the educational field in general education.
- Applying the successful experiments in the field of student guidance in general education.
- Spreading the cognitive Culture in the educational field.
- Contributing in applying knowledge management in the educational field.
- Contributing in solving educational and pedagogical problems in the educational field.
- Establishing the culture of sharing and exchanging knowledge among individuals in the educational field in order to serve the educational and pedagogical goals.
- Building and defining the best ways and instruments to spread guiding knowledge in the educational and pedagogical field.
- Establishing internal and external integration in applying knowledge management to student guidance in general education.
- Building consulting services in the field of guiding knowledge in order to serve the goals of student's guidance in general education.
- Making continuous incentive system to support sharing, exchanging, acquiring and applying knowledge.

Second: Stages of applying knowledge management to student guidance

First stage: initiation

This stage is the first preparatory stage of this model. This stage aims at planning, defining ingredients, spreading the knowledge and training culture, identifying training needs and required knowledge, its sources and the techniques used to acquire knowledge. This stage includes the following:

1- Knowledge Management planning through the following procedures:

- Studying the current situation and the maturity level of Knowledge management applications in the field of student guidance regarding general education in Bisha.
- Developing general, strategic and secondary plans that aim to get knowledge and make use of it.
- Drawing the policies that organize the works of Knowledge management on students guiding field (participation policy- Organization policy- storage and copyrights policies- knowledge warehouses policy).
- Building the objectives related to applying knowledge management to all applied stages.
- Approving balance sheets that are related to applying knowledge management to student guidance.

2-Determining the ingredients of applying knowledge management as follows:

- Determining the ingredientsand infrastructure of applying knowledge management to student guidance.
- Analyzing the ingredientsand infrastructure of applying knowledge management to the educational field.
- Making the plans that provide the ingredients of applying knowledge management to student guidance.
- Determining the necessary human resources for achieving this application.
- Determining the procedures, facilities and processes of the flexible organizational structure.

3- Spreading knowledge culture through the following procedures:

- Determining the knowledge culture level in the educational field.
- Determining and building the required cultural content to raise the knowledge awareness in the educational field.
- Determining the required training programs in raising the knowledge awareness.
- Spreading the knowledge culture and choosing the appropriate publishing techniques in the educational and pedagogical field and conferences, as well as cooperation with other organizations.
- Encouraging individuals to education through testing and observing.
- Managing unofficial meetings to reduce tensions of official relationships.

4-Training through the following procedures:

- Analyzing the training needs in the field of applying the guiding knowledge management and its experiences to the educational and pedagogical field.
- Building training programs to fulfill the needs of the guiding knowledge management field.
- Attracting the specialized training efficiencies in the field of knowledge management in education.

5-Analyzing and determining knowledgethrough the following procedures:

- Analyzing the guiding knowledge provided in the educational and pedagogical field.
- Determining the required knowledge in the area of guiding knowledge in the educational and pedagogical field.
- Choosing appropriate classifying systems for guiding knowledge provided in the educational and pedagogical field.
- Determining the sources of guiding knowledge inside and outside the educational and pedagogical field.

6-Determining the techniques of acquiring knowledge:

The researcher determined a group of the techniques of acquiring knowledge as follows:

- Determine the sources of guiding knowledge which provide the field with experiences and knowledge.
- Analyzing the techniques that control the sources of experiences and knowledge and stopping its waste.
- Building a documentation system right away for the educational field.
- Determining the techniques which facilitate the process of acquiring knowledge and experience.
- Training on the techniques of acquiring knowledge and experience in the educational and pedagogical field.

Second stage: Building and spread

The second stage of the model includes the following:

1- Building process: transforming the guiding knowledge from implicit to implicit through the following procedures:

- Brainstorming by focusing and discussing ideas about a problem in a group that includes both experienced and other inexperienced persons.
- Holding meetings to deal with a topic in order to take decisions concerning the work through learning from the experienced persons, introducing and discussing new initiative.
- Holding Informal side meetings with the aim of exchanging and sharing knowledge.
- Knowledge cafes and informal gathering of the categories of employees within the organization system directly face to face or indirectly through social media networks.
- Social media: is a technological innovation, which based on web applications No.2 whether internal within the organizations scope (known as internal networks) or external through public means such as: Twitter, Facebook, Whatsapp groups, emails, or text messages whereby knowledge and experiences are transferred and exchanged.

2- Output process: transforming the guiding knowledge from implicit to document explicitly through one of the following:

- Video records for meetings, seminars, training courses and lectures by using video.
- Making knowledge maps through brainstorming to particular definitions related to a particular field, then drawing a conceptual map to such definitions and knowledge and connecting them to one another.
- Recording documentary reports for knowledge outputs of meetings, seminars, Knowledge cafes in order to record their works and document the discussed knowledge.
- Studying guiding cases that deal with behavioral symptoms or educational problems through analyzing and solving problems.
- Noor programs through recording emergency guiding cases in it along with suitable treatment ways and immediate procedures that are taken, which constituted documentation for it.
- Direction and Guidance unit through its mission that aims to solve difficult educational or behavioral problems, which are referred by schools and considered to document and solve these problems.

3- Combining process: Transforming Guiding Knowledge from explicit to explicit through the following:

- Knowledge reservoirs, which are related to student guidance. These Knowledge reservoirs are used to collect guiding knowledge that can be exchanged with others internally or externally.
- Conferences: Any conference must work properly and according to clear objectives based documented outputs, through the conference books that include discussed topics and its documented inputs whether by paper or television and then converting it to books or general reports, whether paper or televised.

4- The process of digestion (acquiring): transforming the guiding knowledge from implicit to explicit through the following:

- Training on student guidance and development of staff of guidance professionally through using the guiding knowledge and presenting it as a training content for them.

- Continuous direction for staff during the workflow in order to support the guidance processes and raise the level of performance in a documented explicit way through directed readings or circulars, guidance letters or TV documentary programs.

5-Knowledge Documentation Process: guiding knowledge documentation process is carried out through the following:

- Practicing guidance cases and recording it in Noor program with treatment plans.
- Studying the guiding cases, its causes and methods of treatment.
- Transferred treatment cases in guidance units and its treatment plans.
- Documenting educational forums related to student guidance.
- Documenting educational conferences related to student guidance.
- Documenting the directed visits by supervisors and school principals to student advisors.
- Documenting knowledge cafes reports that gather the student guidance-affiliated persons.
- Documenting exchangeable visits reports between student advisors.

6- Sharing and exchanging Knowledge: sharing and exchanging Knowledge is carried out through the following:

- Supervisory field visits by school principals and educational supervisors.
- Mutual visits between advisors.
- Knowledge cafes that include student guides-affiliated persons.
- Educational forums related to student guidance.
- Conferences related to student guidance.
- Social media (twitter-face book-wiki-YouTube...etc)
- Training programs which depend on brainstorming.
- Side meetings between student guidance-affiliated persons.

Third Stage: Internal Integration

Knowledge activities are being dealt with in this stage as daily activities. This stage focuses on integration of knowledge and the knowledge activities, which mean that the organization staff get used to these activities in a way that reflect on the organization level and its accumulated knowledge. This internal integration stage includes the following:

1-Structuring Guiding knowledge, which includes the following:

- Drawing knowledge maps that refer to determining the sources of knowledge in order to make the knowledge storage available through determining the following:
  a) Counseling fields including (behavioral, educational, social and health fields)
  b) Human Resources including (Student- Teacher- Manager- Guide- Parent- Supervisor)
  c) Sources of Knowledge
  d) Services of Knowledge
  e) Techniques of Knowledge
- Storing information and knowledge represented in knowledge reservoirs, databases, information centers and electronic environment of the organizational memory.
- Retrieving knowledge and information through recovery systems via user interfaces for guide inquiry and the aim lies in Retrieving and accessing knowledge.

2-Building guiding knowledge services that include the following:

- Services of current awareness of all updates in student guidance field and each area related to anyone works in student guidance as fitting to them.
- Services of selective broadcast of Knowledge after classification the people, who work in the area of student guidance, knowing their requirements of knowledge and providing them with these requirements.
- Counseling services that ensure the consultation for the people, who work in the area of student guidance and others.
- Services of exchanging knowledge in a way that facilitates transferring and exchanging process by using relevant appropriate new techniques.
- Research knowledge services, which is mainly related to scientific researches and innovative experiments related to the student guidance area.
- Services of databases, which facilitates and organize obtaining knowledge easily from different databases especially those related to the student guidance area.

3-Enacting laws and standards of knowledge in student guidance. These laws and standards include the following:

- Laws of sharing and exchanging knowledge
- Laws of developing sources of knowledge
- Laws of spreading knowledge
- Standards of measuring the individuals' performance in knowledge area

- Standards of measuring the organization performance in applying knowledge management
- Standards of measuring the quality of knowledge services

4-Training on the skills of guiding knowledge. These skills include the following:

- Skills of acquiring knowledge
- Skills of sharing and exchanging knowledge
- Skills of spreading knowledge
- Skills of dealing with knowledge databases
- Skills of dealing with knowledge reservoirs
- Skills of scientific research

5-Building the system of incentives which support managing the guiding knowledge through the following

- Scientific research
- Sharing and exchanging knowledge
- Developing professional knowledge
- Training during providing the services

6-Techniques of guiding knowledge management

- Databases
- Digital libraries
- Knowledge reservoir
- Social media
- Noor program
- Official educational websites
- Emails
- Systems of organizing and classifying knowledge

Fourth Stage: External Integration

This stage is the last stage of the proposed model for applying knowledge management to student guidance, which includes the following:

1-Spread the guiding knowledge: this operation includes the following procedures:

- Spread through magazines and educational courses
- Spread through conferences and specialized seminars
- Spread through scientific researches published in scientific magazines
- Spread through education forum specialized in students guidance
- Spreading successful guiding experiments

2-External cooperation management; this external cooperative management is carried out through the following:

- Concluding agreements about guiding knowledge with specialized institution and organizations
- Joining to international organizations specialized in guidance and direction
- Sharing knowledge with organizations and institutions through databases and knowledge reservoir
- Mutual workshops between organizations in fields of guiding knowledge

3-Guiding knowledge reservoir: Guiding knowledge reservoir is built through the following:

- Organizational polices for knowledge reservoir
- Choosing a good system for managing the content (system D- space is preferred)
- Choosing the suitable classification for the knowledge reservoir content
- Choosing a normal and advanced search system inside the reservoir
- Developing a system for developing the collections of the knowledge reservoir
- Developing a system for intellectual property rights

4-Providing counseling services in guidance field: the counseling services are provided in the guidance field through the following:

- Establishing a committee of experienced guiding counselors
- Building an advanced communication and connection system that guarantee achieving high quality services
- Using knowledge techniques in counseling field

5-External participations: includes the following:

- Regional and international conferences in fields of student guidance
- Seminars specialized in the field of student guidance
- Training courses specialized in student guidance field
- Study programs provided by universities in student guidance field

6-Integration with the objective of education: it is carried out through integrating with the following:

- Education vision and objectives in order to support and achieve them
- Integration with the objective, training plans and scholarships related to education
- Student guidance objectives in order to support and achieve them
- National strategic objective for transforming to knowledge society
- The objectives and plans that aim to build knowledge economy

REFERENCES

[1] Abo Elmaaty, Walid Mohamed. (2014). "The impact of an extension program based on information processing of social knowledge", Journal of Educational Sciences, Volume 26, A (2) P. 311-334, Riyadh.

[2] Liu, Y.-C., & Hsu, Y.-C. (2013)." Predicting Adolescent Deviant Behaviors through Data Mining Technologies". Educational Technology & Society, 16 (1), 295–308.

[3] Al Sharifin, Ahmed (2001). "The Effectiveness of a Supervisory Program based on the Knowledge Model in Reducing the Performance Concern of Trainees in Jordan", Jordan Journal of Educational Sciences, 7 (3) 2011. P. 233-251.

[4] Chen, Zhen-Gang and Others (2009). "The Superiorities and Difficulties of Application Knowledge Management for Elementary School Teachers". Proceedings of the 9th WSEAS International Conference on Multimedia Systems & Signal Processing.

[5] Alyateem, Abdullah Mohammed & Alqarnib, Abdulrahman (2016). "The reality of Knowledge management applications in support of the Student guidance in the department of education in the region of BISHA". International Conference on Change, Innovation, Informatics and Disruptive Technology ICCIIDT'16, London- U.K, October 11, 12 2016.

[6] Lee, Jang-Hwan & Kim, young. (2002) "A Stage Moder for Organizational Knowledge Management: a Conceptual Framework". Korea Advancec Institute of Science and Technology.

[7] Nonaka, I. & Takeuchi, H. (1995), The Knowledge Creating Company, Oxford: Oxford University Press. 21-23.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Information and Knowledge Conceptions and Connection: Analytical Study

Abdullah Mohammed Abdullah Elyatem
Ministry of Education, Kingdom of Saudi Arabia

ABSTRACT

This study aimed to deal with the defined information from other perspectives, and new search bases about knowledge, its conception and connections with information, data and wisdom, then introducing the research point of view about it through a sound scientific approach. Based on the study subject and type, the Content Analysis method was chosen to achieve the study objectives through analyzing literature reviews that discussed this study subject.

INTRODUCTION

In the last few years, there was an expansion in the use of "Information" and "Knowledge" terms. The overlap between these two terms and other remaining sciences has caused many bases to define these two conceptions and according to identifying these concepts, the connections and classifications, which have changed and varied, will be determined.

There are some bases which explain the concept on a on a documentary basis (Library Science facility), and there are conceptual bases which were created according to the investments studies of experiences and decision making in the administrative field. Problem of classification and qualitative division of "Information" and "Knowledge" was also created. There were also overlaps between the formal classifications with regard to preservation and the qualitative classifications according to the type of "Information" and "Knowledge".

In this study, the researcher aims to:

- Highlight these concepts broadly and in a more comprehensive way than previously made according to his point of view. The researcher also builds connections between Data, Information, Knowledge and Wisdom on these concepts and defines classifications according to the type not the followed preservation form.

Study problem:

The study problem is totally related to the researcher study and his knowledge of many literatures reviews concerning knowledge, concepts and their connections.

ARTICLE INFORMATION:

*Corresponding Author: aalyateem@hotmail.com
Received 3rd Nov, 2018
Accepted after revision 19th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/23

The researcher has concluded, through many observations that the researcher found about the concept, connection and the bases that these concepts are based on, that it is necessary to discuss Knowledge from other perspectives and new research bases, and then introducing his relevant point of view through a sound scientific approach.

Methodology

Based on the study subject and its type the method of "Content Analysis" was chosen to achieve the objectives of the study through analyzing literature reviews that discussed the same subject.

Analytical Framework

This Study methodology in content analysis will be applied in analyzing literature reviews that dealt with knowledge and information as follows:

Information

The information has a major role at both the individual and community levels, because it is the element that cannot be excluded from any activities. Information is the raw material of scientific searches and the fundamental basis to make the right decision. In addition, the one who gets the right information at the appropriate time has the sense of competitiveness and leadership in any field, in a busy world based on science in everything and does not leave any room for improvisation and randomness.

According to [2] the word (information) acquired 11 meanings and three of which were abandoned or historical as follows:

- Shaping a particular thing.
- Motivation, Reinforcement or Revitalization
- Training and Achieving discipline and directing

Whereas the current meanings are:

- Delivering or receiving information
- Things that we receive or get from media.
- Knowledge spread by others or obtained by studying, researching or directing
- Awareness of specific incident or situation
- Facts or available numbers for broadcasting or getting benefits from them
- Reporting against particular person or party
- Officially charging somebody of a particular crime
- Digital quantity that measures uncertainty in the results of experiments
- Information: is what changes the knowledge status of the recipient in a given subject.
- There is a difference between information as a fundamental phenomenon and symbols that carries such information.

Study No. [3] defines information as processed data to have meaningful meaning, ability to change knowledge status of the recipient and help us to answer the questions of who? When? What? Where?

Study No. [4] defines Information as the thing that changes the knowledge status of the recipient (reader, viewer, listener or whatever sense is receiving by) in a given subject.

Shawky [5] defined information as formulated data in a mmeaningful manner to be a base for decisionmmaking.Knowledge is the main base of the ability to create ththoughts and achieving high levels of quality and technical crcreativity. In addition, it is regarded as a necessary action to actively perform administrative activities efficiently. based on that concept of knowledge, all information owned by any organization in its internal systems, skills and mental abilities of the workers is forming in total a source of knowledge to the organization, in case it is scientifically and logically used, which necessarily reflected upon the organization performance to distinguish it from any other competing organizations. [6]

In other words, knowledge is considered the main base for today's organizations and an administrative, meaningful and modern method to cope with the requirements of the age. In addition, knowledge is the most important source in generating richness, achieving individuality and creativity in light of given thoughts through which a numerous intellectual concepts have been raised. [12]

Knowledge Concept

In relation to the definitions of knowledge; study No. [1] defined it as a mixture of concepts, ideas, thoughts, rules and pprocedures which guide actions and decisions; In other wwords, It is a mixed information with experiments, facts, rules and values that work altogether as a unique mixture that permits the individuals and organizations to create new situations and manage the criteria of changes.

Study No. [7] defined it as the thing that expresses the ability of individuals inside an organization and that is reflected upon the organization as a whole, understanding, performance and doing the work effectively.

Moreover, knowledge is defined as a mixture of contextual experience, skills, abilities and information which are cumulative to the workers and business organizations. [8]

Knowledge is also defined as those ideas and concepts that the organization reach and which is used to take an effective manner towards achieving goals. [9]

Characteristics of Knowledge

Knowledge has characteristics and features that distinguish it from any other activities and its characteris-

tics have been diversified according to the differences in point of views related to the researchers and to those who concerned with this field to get the expected benefit from it.

Study No. [10] added that what really distinguish knowledge is the intangible standardizations. Whereas, knowledge is an intangible product to the extent that it cannot be subject to trade as a commodity, on the contrary, it is sufficiently standardized to be a subject of competition. Thus, it is widely used in trading. This intangibility standardization is the main concern of several organizations that depend on knowledge.

Study No. [11] added five characteristics that distinguish knowledge from other intellectual and human activities as follows:

1. Cumulativeness: As the knowledge remains right and competitive in this current stage and it is not necessary to remain the same in the next stage, which means that knowledge is changeable by adding the new knowledge to an old one.
2. Organization: The generated knowledge is organized in an order that enable the beneficiary person to reach it and pick the required part from it.
3. Searching for techniques: Reasoning and causing aim to satisfy the human need of searching and reasoning for everything and knowing the causes of phenomena because we can control it in a better way.
4. Comprehensiveness and Certainty: Comprehensiveness of knowledge is not only applied to the phenomena that fall under research only, but also applied to the minds that receive the same. The fact asserts itself on the others when it appears and it is capable of being transferred to all people. Certainty does not mean that knowledge is constant but means that it based on convincing and compelling evidences; however it does not mean that is not variable.
5. Accuracy and Abstraction: the accuracy means expressing the facts mathematically.

Classification of knowledge

Study No. [12] divided knowledge into four kinds as follows:

- Unknown Knowledge: is represented by the innovative knowledge discovered through experimentation, search and discussion.
- The fundamental main knowledge: is regarded as the fundamental level of required knowledge by all organizations.
- The advanced knowledge: is the knowledge that gives the current organization the competitive sense.
- Creative Knowledge: is the knowledge that allows the owned organization to change the working method of the educational sector that the organization is belonging to.

Study No. [9] Divided knowledge into two fundamental types:

a) Implicit knowledge

Study No. [13] defined knowledge as: the knowledge that is indivisible among the persons because it includes what is hidden inside the person himself which mean technical knowledge, cognitive knowledge and behavioral knowledge.

Implicit knowledge is composed of the following:

- Facts, fixed data and mental patterns
- Points of views, forms, images and concepts
- The provisions, expectations, general hypotheses and beliefs
- Strategies of thinking and the methodological approaches. [15]

b) Explicit knowledge

Study No. [14] defined as: the knowledge that can be transferred and reported to others on a formal or programmed way through educational or traditional pedagogical processes.

Knowledge Characteristics:

- It can be expressed.
- It can be shared.
- Guiding the personal and institutional behaviors. [15]
- It can be reached and stored.

Analytical Overview of Knowledge

The researcher is analyzing now concepts and connections of knowledge in terms of its existing case and the conclusion of the researcher concerning the concepts and connections.

The current perspectives of knowledge:

Many specialists of knowledge and information spoke about the connection between data, knowledge, information and wisdom. Most opinions spot the light on the subject of periodic and transition from one term to another according to meaning and the influential degree upon the audience.

Therefore, it was stated that data is a group of meaningless things. It means that we cannot infer from those things on a clear meaning while standing alone. It happens when we mention the meaning of any cultural or scientific effect, for example: we see letters and numbers individually but when connecting these codes, let-

ters and numbers in a particular way we can observe a clear connection leading to a clear meaning. This process is called speaking about information. So that, the definition of information is all things that contributing in changing the audience acknowledge and thinking. Information is a group of acknowledgment that reflects a special meaning.

For the acknowledgment, the audiences define it as a meaning. We refer to it as information which is transferred to experience by the audience. This said experience is developed to be a source of practicing, fluently.

When the recipient connects a group of knowledge considering particular subject or field, it reaches to the wisdom stage for making the proper decision. This meaning of knowledge derived from the lateral meaning of wisdom culminating in putting things in their right positions to ensure the right decision. This cannot be achieved unless with the existence of acquired knowledge in order to reach this stage.

On that basis, the pyramid of experience was suggested. It may also be called the pyramid of knowledge or the pyramid of wisdom as the following figure No. (1):

Figure No. (1): Pyramid of knowledge

As we observe the above stated pyramid of experience, the base is the data which was created by particular relation and lead to particular meaning. This meaning is called information. If we practice this information, it will be experience or acquired knowledge. In the case of collecting and accumulating the said knowledge with others in the same area, the recipient will achieve the level of wisdom and the ability of making a proper decision are the right time.

Notes on The current perspective of knowledge:

According to the former meaning and clarification, here you have some observations on the particular arrangement of meaning as follows:

1. Data cannot be judged by the absence of its meaningful meaning. Any code, number or letter ...etc does not give a meaning in itself as per the said concept which is a sort of information or accumulating knowledge, from the first person who put these letters, code or number in use. For example, the letter (C) is created for specific purpose to do a specific role and it differs from the letter (B). The former letter contributes in solving a lot of problems in the series of alphabet. The same thing applied to creation of the points, which solve the ambiguity of the letter similarity, for example (B- C-W- D- H- X). These letters and number are considered as accumulating knowledge to reach to the concept that we adapt nowadays.
2. Taking into consideration the definition of the information, which is defined as everything that change the knowledge case of the recipient. This definition is very general and does not achieve the supposed measurement of the change, so how we can judge information. “How we are going to judge knowledge according to inaccurate way?” The matter of judgment is differing from one person to another, consequently it great differences will be occurred. From one point of view, it helps to change the recipient perspectives and makes him gaining acknowledgment while from other it helps with nothing. Thus, if we analyze the cause of this variation and contrary which taking place among views, we will find that the recipient is the reason without considering the information itself.
3. The criterions of moving from one term to another among the four terms are different. Therefore, data that relates to a certain case and changed the cognitive state of the recipient is called information. According to another criterion, we find that the information which was practiced and formed an experience is called knowledge. While knowledge that contributed in making good decision is called wisdom.

Along these lines, there are three different criterions:

The first one is: criterion that form a change in the cognitive state.

The second one is: practicing information that forms experience.

The third one is: collecting knowledge that led to making good decisions.

Moving between related terms shall not be based on different criterions, while these criteria are related to the different cognitive case of the recipient among individuals according to their individual differences.

4. Considering classifying of knowledge by the predominant basis of specialists, classifying to Potential (implicit) knowledge and explicit (apparent) knowledge. This classification based on the form of existence or in other words, the knowledge storage place from the explicit content such as: books, tapes, memories and Semiconductor memory...etc. in relation to explicit knowledge, to storing implicitly in minds such as: experience, skills and others from knowledge regarding implicit knowledge.

This classification does not determine the type properly due to logic reason, which means that there is no explicit knowledge without being implicit basically that, was converted to be explicit one and documented in a form of preservation forms of knowledge. Therefore, knowledge content is unified, however if we want to classify it, it will be considered formal classification.

5. When applying administration to knowledge which called (Knowledge management), we deal with two

forms due to the predominant classification of knowledge whether implicit or explicit. There is a management for explicit and implicit knowledge. Considering explicit knowledge, we concluded that the explicit knowledge management is such a perfect match of information management with its processes, storing systems, regulatory systems and classifications. In fact, explicit knowledge is just documented information subject to information in terms of characteristics and content.

There is a difference between explicit knowledge and implicit knowledge that cannot be dealt with in a structured and documented framework, which could not be stored and retrieved without documenting and converting it to explicit one. According to its normal implicit form, it's ruled by a set of procedures that move it from implicit to implicit one or converting from implicit to explicit one according to Nonaka Model. Therefore, we realize the problem and the overlapping of information and knowledge in many ways, the most important one is that the explicit knowledge is just documented information.

6. According to the said terms and expressions, we found out that the number of acquired and accumulating knowledge enable the person to gain wisdom and make proper decision. In fact, this stage should be called according to the common concept "decision stage" this is attributed to the wisdom which is absolutely right and accurate matter considering making the proper decision as per its lateral definition. The accumulating knowledge which helps us to make a decision cannot be 100% correct. Correctness consists of many levels; there is the right and the most correct one. All of them depend on the accumulating knowledge. However, it is out of prudent to choose the right decision while having more suitable one. The ability of accumulating knowledge does not necessary mean to make the right decisions, in some cases we might make wrong ones whether in part or whole. If it is a fate to express the meaning of wisdom as a periodic term for the pyramid of knowledge, the decision stage must be prior the former stage, if there is a correct decision, it will be undergo the wisdom stage. The wrong decision will be classified under the frame of accumulating knowledge to learn from the mistakes, it cannot be excluded as a reason of acquiring knowledge.
7. Final notes should have been in the first. But we made this to mention the partial notes, because this observation is related to the concept, subject and objective of knowledge. Upon the common concept, knowledge is information, which gains experience by practicing and grouping it towards a particular subject leading to achieving knowledge. There is an important question looming on the horizon: "Can we consider the knowledge as an outcome to information practice?" Obviously, the answer is "No." In fact, the knowledge is existing and it may appear in its original reflection as a sort of isolated knowledge. For instance, the knowledge of identifying the element of the Earth or the number of planets ... etc, this kind of knowledge is born from early years. With the process evaluation, this knowledge is discovered as long as modernized time and given amendments. The point is this knowledge was anonymous; however, it was discovered. Also, there is a kind of knowledge which was not existed and coming up later; it was formed by integration of others. This process creates a new sort of knowledge, which is open to development and amendment. For example, the invention of car or plan; both of them enjoy with the integration of physics, chemistry, mathematics and human skills in order to create this new kind of knowledge.

Proposed vision based on the application of the study methodology:

We will offer now a vision based on the previously discussed maters about knowledge, its concept, and relations along with information and data:

1. The concept of knowledge should be reconsidered; in fact, all that exists is an existing knowledge, whether it is alone or integrated with another, it is considered as a new knowledge.
2. Classifying knowledge should be as follows:

a- Genuine knowledge (natural): is a knowledge that exists without human intervention both discovered or still unknown, this knowledge is divided into two types:

- Genuine knowledge (discovered): Genuine natural knowledge that is discovered for example water consists of hydrogen and oxygen.
- Genuine knowledge (unknown): original natural knowledge but has not been discovered such as stars.

b- Productive knowledge (created by human): knowledge that did not exist but human intervention contributed in its presence, and it is compound but the difference between it and its predecessor is that the composition is resulting from human act for example: inventions of cars, planes and so on.

3. Defining Knowledge as a general and comprehensive conception that include information and data,

in all its forms and types. This knowledge can be classified to information, data or experience but in the light of its type, as knowledge not isolated cases.

4. Decisions should be added as an output of the interaction between information, data and experiences, it does not necessarily mean that it is correct but it falls under the wrong and right decisions with their different degrees.
5. Wisdom is not knowledge in itself but is a result of knowledge due to investing knowledge in taking the appropriate decision
6. According to the new conception, the definitions will be as follows:

A- Data: is a meaningful initial knowledge contributes with others in forming a specific meaning that cannot be reached in its absence or in its isolated existence.

B. Information: is knowledge arising from the formation of other information or data or both together according to a specific relationship that aims at achieving specific meaning forming knowledge.

C. Knowledge: is the data, information and experience that are formed around a particular subject so that it can be defined and described in a manner that enables it to be invested scientifically or practically.

7. The researcher suggests the following figure (2) as a form describing the relationships between terms related to knowledge:

Figure (2) knowledge and its connections

REFERENCES

[1] Jarjis, Jassim Mohammed, Kloo, Sabah Mohammed, (2000). Introduction to Library and Information Science. Sana'a, Contemporary Thought House.

[2] Kassem, Hishmat (1990), "An Introduction to the Study of Libraries and Information Science". Cairo, Gharib library.

[3] Ackoff, R. L. (1989), "From Data to Wisdom", Journal of Applies Systems Analysis, Volume 16, 1989 p 3-9.

[4] Kassem, Hishmat, (2007), Introduction to the study of libraries and information science, Volume No. 2, Cairo: Dar Ghraib for printing, publishing and distribution.

[5] Shawky, Salem (2001), Information Systems and Computer, Alexandria: Alexandria Center for Cultural Documents and Libraries.

[6] Yassin, Saad, Al-Rifa'i, Ghaleb (2002), "The Role of Knowledge Management in reducing Credit Risk: A Field Study", Paper presented to the Fourth Annual International Scientific Conference, Al-Zaytoonah University, Amman, 28/04/2004, Jordan.

[7] Lucier, Charles, and Janet Torsiliari, Why Knowledge Fail: a CEOs Guid to Managing, strategy and Business 4th Quarter, 1997,No9.

[8] Najm, Aboud Najm (2005). Knowledge Management: Concepts, Strategies and Processes, Cairo: Al-Warraq Publishing house, First Edition.

[9] Al-Sawy, Yasser (2007) "Knowledge Management and Information Technology", Dar Al-Sahab for Publishing, Kuwait.

[10] Winch, G. and Schneider, E. (1993). The strategic management of the architectural practice Construction, Management and Economics, 11: 467-473.

[11] Zakaria, Fouad (1988). Scientific Thinking, Knowledge World Books Series. Kuwait. Third edition.

[12] Hamoud, KhudairKazem (2010), Knowledge Organization, edition No. 1, Amman: Dar Safa for Publishing and Distribution.

[13] Abu Fara, Yousef (2004). The Relationship between the Use of the Introduction of Knowledge Management and Performance, Journal of the Jordanian Association, vol. 4, No. 43, p. (67-94).

[14] Fared, Palcom (2011). "The Role of Knowledge Management in Human Resources Development", "Intellectual Capital Conference in Arab Business Organizations in Modern Economies", Algeria.

[15] Al-Masharfa, Huda Mohammed Abdullah (2012). "Knowledge Management role of Principals of Secondary Schools in Developing Creativity of Their Teachers in Gaza Governorates and Ways to strengthen it": Master Thesis, Palestine.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Student Engagement Effectiveness in E-Learning System

Nisreen A Alzahrani[1] and Manal A Abdullah[2*]
Information Systems Department, King Abdul Aziz University, Jeddah, Saudi Arabia

ABSTRACT

Selecting important features in an e-learning environment is crucial for predicting student academic performance. E-learning offers personalized and uninterrupted connections and communication between students and other learning contexts. The increasing proliferation of smart technologies has enabled students to acquire and connect to learning materials and instruction anytime, anywhere. Obviously, the student's interaction behaviors in e-learning environment have been widely considered. In fact, the interaction in the e-learning system and its impact on students' performance is subject to discussion and interest. This study, for the most part, focusses on two targets: the first is to find critical factors that affect student's outcomes in the e-learning system for illustration and the second is more tied, building a well-performed prediction model. The main contribution is twofold: to highlight some experimental visions in the influence of a set of variables using features selection techniques and to propose a prediction model involving the most relevant features applying K-fold Cross Validation method. Different variables effect on model performance and correlations between the input and the target output are discussed in detail using student data provided by the Learning Management System. The recommended method is, then, compared with another popular machine learning methods. The results exposed that, the student with greater engagement in the e-learning system leads to significantly higher performance; however, students who get low in the course tend to interact less frequently. Furthermore, study results indicate that some prediction techniques such as the Random Forest method have considerable advantages in student performance prediction reached up to 80% of accuracy. Other students' features that may be effective in the e-learning system are also discussed.

KEY WORDS: DATA ANALYSIS, DATA FEATURES ENGINEERING, EDUCATIONAL DATA MINING, E-LEARNING, RANDOM FOREST, STUDENTS' PERFORMANCE PREDICTION, STUDENTS' BEHAVIORS

ARTICLE INFORMATION:

*Corresponding Author: maaabdullah@kau.edu.sa
Received 10th Nov, 2018
Accepted after revision 31st Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/24

INTRODUCTION

With the tremendous developments taking place in today's world, many of the concepts governing human beings have changed. The concept of learning has been greatly influenced by technology development. The incident in information and communication technology; where emerged a large group e-learning term. The e-learning system allows learners to take the lead in finding their own learning requirements, determining learning goals and resources, selecting and applying learning approaches, and assessing learning consequences, [1]. Learners can control their learning process based on their interaction with the system. In order to get most benefits from the system, educators have to know to which level does the students' interaction behavior affect their performance and if there are other factors might play an important role in their learning progress. This research highlights the most important features of affecting students' outcomes and explain in detail each feature by applying two types of selected features techniques. Moreover, this study builds Student Performance Prediction Model (SPPM) using K-Fold Cross-validation method in three classifiers: Decision Tree, Random Forest, and Gradient Boosting Machine. The value of using "K-Fold Cross-validation method is that all the examples in the dataset are eventually used for both training and testing and it results in a less biased or less optimistic estimate of the model skill than other methods, such as a simple train/test split" [2].

The main goal of this approach is to classify students based on their interaction with the E-learning system which is approximated on the basis of Learning Management System LMS of student's activity. By modelling other variables, a deeper understanding of the domain can be gained and useful relationships can be discovered. Also, it is possible to use the proposed model to "fill in" unidentified but essential information. Afterward, SPPM can be used as an indicator for features affected student's performance. Class level of each student is predicted from two datasets provided in LMS: one with only student interaction behavioral features and the other one with all selected variables. Our experiment was run on data collected from different courses and for a student with different backgrounds, with a sample of 480 different records. The goal in this paper is to apply selected features techniques before building the model to present the effectiveness of a set of student features in E-learning system, then building the proposed prediction model. The rest of the paper is presented as follows: Section 2, particular information about E-learning system and classification methods for prediction are provided. Section 3, reviews the associated works. Section4 describe the materials used in this study. Section 5 details of tools and methodology are present. Section6 results are illustrated and analyzed. Finally, in Section 7 the paper is concluded.

BACKGROUND

In recent years online learning is considered to be a paradigm of distance learning, which has long been a part of the American education system, and it has become the biggest sector of distance learning [3] [4]. One of the reasons for having a lot of discussion about e-learning is the obvious benefit and its impact on our educational system in general. Furthermore, e-learning has become effective in educating students, useful in professional development, cost-effective to combat high education costs, and possible of providing a world-class education to anyone anywhere with a broadband connection [3] [5] [6] [7].

In E-Learning system, classification has been widely used in order to find a trend in which factor might affect the learning progress. It is considered to be one of the common processes for machine learning which are used in building effective models that categorized the dataset cases according to a class (label). The classification has sub-process including dividing data into 70% or 80% as a training dataset to build the model, then 30% or 20% are remained to be tested by the generated model [8]. For Educational Data Mining, Classification is used for predicting students' outcomes. Some classification methods are described in the following:

- Repeated k-fold Cross Validation technique -in some situation called Resampling Method (RM)- is used to compare between two or more different bioanalytical methods [2], more importantly, it optimizes the performance of the model as it divides the data set into a number of the fold (k). For example, if we use 5 fold cross validation so it splits the data into five partitions uses four of them to train the model and the last one is a test partition. Then, this process is repeated many times for each chosen classifier method to get more stable results.
- Decision Tree model has a structure similar to a natural tree in terms of branches, leaves, and roots but it is an inverted tree with the root at the top. Student's performance is classified then represented by leaves whereas branches characterize unions of selected features that lead to classifications. Thus, a series of nodes and branches are ended by a leaf. The predicted class level is defined by tracing the path of nodes and branches to the ending leaf [8].
- Random Forest model is developed by aggregating trees and can be used for classification if the type

of the predicted variable is categorical otherwise it can be used for regression. One of the most significant advantages of RF is that it can deal with a large number of attributes and avoiding overfitting. It also helps with features selected based on importance as the predictor variables randomly sampled as candidates at each split and the number of variables tried at each split (mtry) is a square root of the total number of features in the model as each node split using the best among a subset of predictors randomly chosen at that node [9]. Then it chooses best split at each node of variables tried at each split.

- Gradient Boosting Machine(GBM) is also combined a number of trees as Random Forest does but the difference between them according to [10], "is that it incrementally improves the model by weight those cases that badly predicted before and give them a higher weight so to construct the new base-learners to be maximally correlated with the negative gradient of the loss function, associated with the whole ensemble in simple implementation way, which allows one to experiment with different model designs".

LITERATURE REVIEW

A number of studies have been investigated in performance prediction in E-learning System or at a university level. The recent research in [11] a students' behavior is connected with 151 models and 111.256 students and the results prove the importance of learning environment design in predicting and understanding student behaviour and performance in online and blended environments, so it links the learner academic enhancement with a well-designed learning environment. The primary indicator of this study is that the academic retention affected by the learner activity on Virtual Learning Environment. An Important study in [12] determine which factors predicted learner satisfaction and academic outcomes, the findings, indicate that the prediction of student satisfaction and their academic outcome affected by learners' behavior, which is measured by their social presence. Researchers in study [13] found that "students using PeerWise—an online pedagogical tool that recently created which enables students to be more active such as writing, sharing, answering, discussing and rating multiple choice questions with little to no input from the instructor—had better learning outcomes and improved perceptions of learning as well as motivation to learn".

In research [14], a set of ML classifiers are implemented for two reasons: to predict the students' outcome in e-learning courses and to determine the impact of the several features involved in the generated model. Estimating students' behavior and performance when using an LMS, Content Management System (CMS) or Virtual Learning Environment (VLE) imply the potential need for improving the virtual courses in the e-learning environment. Course information such as "log-files" stored in the system databases and could be mined by educators using data mining classification methods (e.g. Decision Trees, Regression, Neural Networks, Naïve Base, etc.) to extract the most significant relationships and patterns, with the main scope of determining the association between students' knowledge levels, e-learning portal usage times and students' grades [15]. The author in the study [16] used Bagging, Boosting and Random Forest (RF), to predict students' academic performance. In addition, the results shown in their study indicates that there is a strong relationship between student's behaviors and their academic achievement. Moreover, a logging data which taken from the e-learning platform to predict students' final grades using a combination of classification algorithms based on features selection, is presented in [17].

The study in [18] "determines the association between student's demographic features, qualification on entry, aptitude test scores, performance in first-year courses and their overall performance in the program. This study identifies an optimal set of admission indicators, which have the potential of predicting student's performance". To sum-up, many scholars have been investigated to find the pattern that enhances students' outcomes in their learning progress in e-courses. However, there is very little researches that highlight the effectiveness of student behavior and parent engagement features during the learning process and its impact on student academic success. This study will concentrate on the effect of student engagement and the role of their parent involvement in the e-learning system.

MATERIALS OVERVIEW

The Dataset used in this study, is collected from learning management system (LMS) called "Kalboard 360" as a case study (see http://www.ibrahimaljarah.com [1]) that is multi-agent and use a state-of-art technology to facilitate learning. The dataset contains 480 observations (student records) with 17 variables. These variables are categorized into four major groups: (1) Demographic variables such as place of birth, nationality and gender. (2) Academic background variables such as educational stage, grade level and section. (3) Interaction behavioral variables such as raised hand, visited resources, making a discussion on specific topic and announcement view. (4) Parent involvement variables such as answering survey, school satisfaction and parent who responsible for the student [1]. The target label that we want to predict

Table 1. LMS Dataset Description

No	Attribute	Description
1	Gender	Student's gender (nominal: 'Male' or 'Female')
2	Nationality	Student's nationality (nominal:" Kuwait',' Lebanon',' Egypt',' Saudi Arabia',' USA',' Jordan',' Venezuela',' Iran',' Tunis',' Morocco',' Syria',' Palestine',' Iraq',' Lybia")
3	Place of birth	Student's place of birth (nominal:" Kuwait',' Lebanon',' Egypt',' Saudi Arabia',' USA',' Jordan',' Venezuela',' Iran',' Tunis',' Morocco',' Syria',' Palestine',' Iraq',' Lybia")
4	Educational Stages	Student's educational background (nominal: "Lower level', 'Middle School', 'High School")
5	Grade Levels	Student's grade (nominal: "G-01', 'G-02', 'G-03', 'G-04', 'G-05', 'G-06', 'G-07', 'G-08', 'G-09', 'G-10', 'G-11', 'G-12 ")
6	Section ID	Student's classroom (nominal: "A','B','C")
7	Topic	Course topic (nominal:" English',' Spanish', 'French',' Arabic',' IT',' Math',' Chemistry', 'Biology', 'Science',' History',' Quran',' Geology")
8	Semester	School semester (nominal:" First',' Second")
9	Responsible Parent	Parent who responsible for student (nominal: "Mom','Father")
10	Raised hand-	Times a student raises his/her hand on classroom (numeric:0-100)
11	Visited resources	Times a student visits a course content(numeric:0-100)
12	Viewing announcements	Times a student checks the new announcements(numeric:0-100)
13	Discussion groups	Times a student participate in discussion (numeric:0-100)
14	Parent Answering Survey	If parent answer the surveys (nominal: "Yes', 'No")
15	Parent School Satisfaction	Parent's school satisfaction (nominal: "Good' ,Bad")
16	Student Absence Days	Total absence days (nominal: "above-7, under-7")
17	Class	Final grade (nominal : 'H' for high, 'M' for medium, 'L' for low).

is Class which denote to the student's performance level and it is categorized into three classes 'H' indicates high performance, 'M' indicates medium performance and 'L' indicates low performance. More detailed is shown in table 1.

Statistical Summary:

In this section, we take a look at each group of features summarizing the most important one for better understanding. Based on the demographic variables: as shown in figure 1, the dataset consists of 36% males and 64% females. The students come from a different background but the majority of them come from Kuwait and Jordan as 36% and 37% sequentially, the remaining 29% of students come from 14 other countries. The data set includes the school attendance feature as the students are classified into two categories based on their absence days: 60% of them are under 7 and 40% of them their absence days above 7 days.

Regarding student's parent related attributes as seen from the figure 1: below 61% of the parent are satisfied with the school and 39% are not. Another parent related feature, there are 44% of them are answered the survey and the remaining are not. The target variable that we want to take into our consecration named 'Class' and the students are divided into 3 categories based on their performance as 44% of them are in the medium level, 30% in the high level and 26% of them are in the low level.

METHODOLOGY

The primary objective of this research is to determine whether the students' engagement and parenting behavioral in e-learning systems have a significant impact on their performance or not and to find out if there are any other features played important role in enhancing students' performance. To achieve that, A Student Performance Prediction Model (SPPM) is proposed using R language [2] and based on enhanced features selection and combined more trees using fivefold cross validation to avoid overfitting and examine three classification methods: Decision Tree (DT), Random Forest (RF) and Gradient Boosting Machine(GBM) for measuring the unknown performance taken from new data sets (test data). In order to improve the quality of features (or students' attributes) and to optimize the performance of SPPM, the proposed model build through two stages.

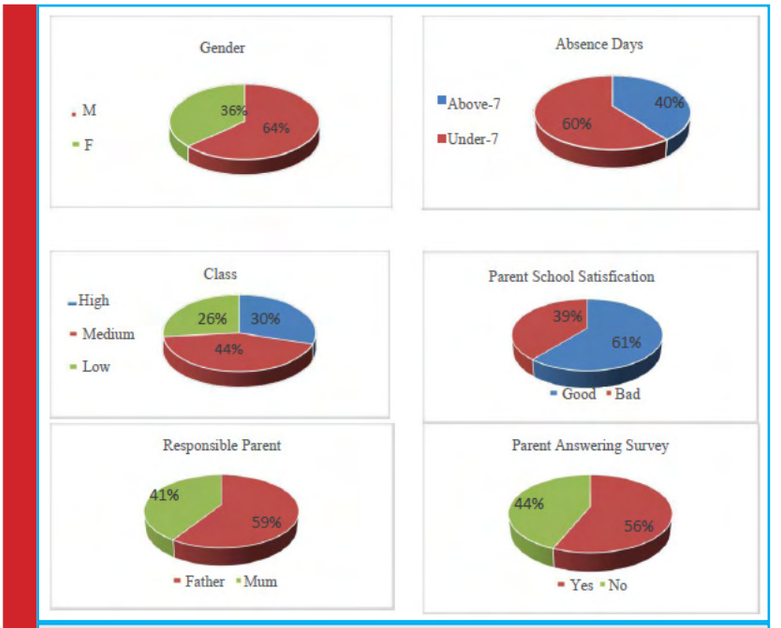


Figure 1. Individual Feature Visualization

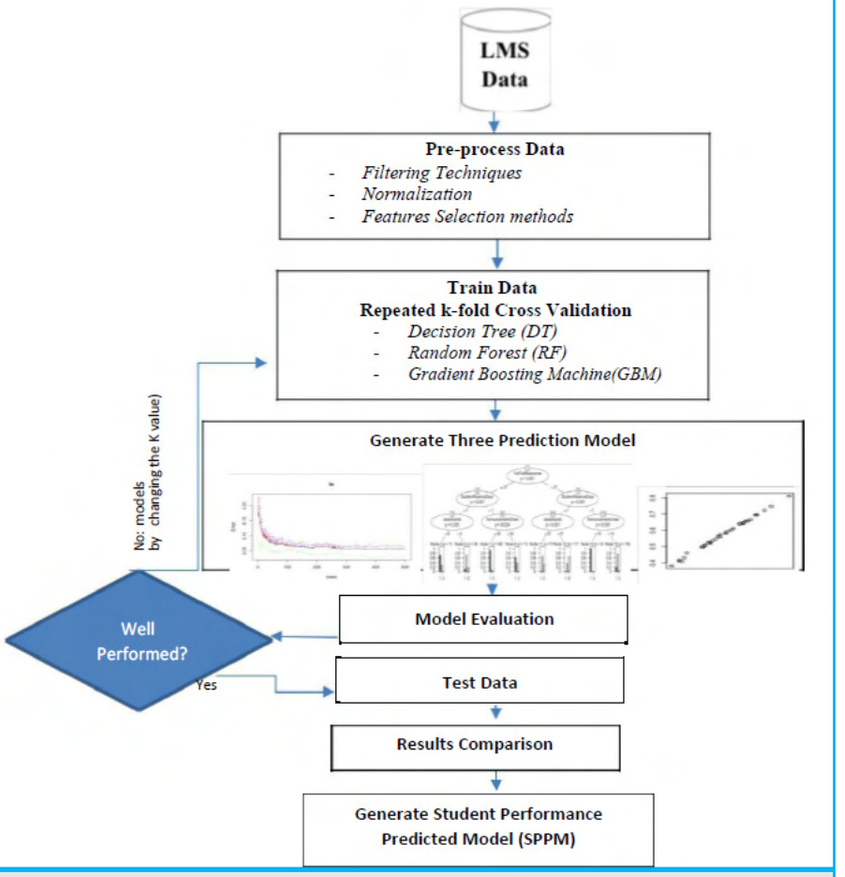


Figure 2. SPPM Student Performance Predicted Model

The first one is selecting the importance students' attributes by applying three types of correlation measures: Contingency Table Analysis is used to determine the association between the categorical variables and two correlation methods in R language is applied for other numeric variables. These measures are used to improve SPPM classification accuracy and speed up the classification.

The second stage is applying repeated k-fold Cross Validation techniques on the data set as shown in figure 2. The performances of the three different models is generated and compared using six different evaluation metrics.

Data Pre-processing

Data comes from LMS could not be directly apply into machine learning methods. Data preprocessing is very important step before doing so, it transforms the row data into a suitable shape to be used by a particular machine learning algorithm. Data preprocessing used in this study includes data filtering, normalizing and feature selection.

Data Filtering and Normalizing

In order to minimize the impact of errors in the data set on succeeding analyses the filters are presented as psedu code and implemented in R language. This study utilized filtering techniques to make sure that the data set is ready for the model. In the data set we take out 7 variables which are not considering to be a predictor variable because they are out of the scope of our study and not our focus. These variables are: Place of birth, Nationality, StageID, GradeID, Topic, Semester, SectionID. Then, normalization to 0 - 1 scale is performed over attributes such as gender, Relation, Student Absence Days, Parent Answering Survey and Parent School Satisfaction and store them as a factor. The class attribute is the target dependent variable of the study and it has three classes: '1' represents weak students, '2' represents middle level students and '3' represent high-level students.

Features Selection

One of the most effective steps in getting better results is to build a model based on the most relevant features. In this section we apply two correlations techniques in order to choose the most relevant attributes that will affect the model. Regarding categorical predictor's variables we applied the **Goodman and Kruskal's tau** [3] measure as shown in figure 3. As we can see, there is a diagonal K values indicating the number of classes associated with each variable. The off-diagonal elements contain the forward and backward tau measures for each variable pair. In our model we want to decide the association between each independent variable and the target variable. The most obvious feature from this plot is the fact that the variable Student Absence Days is nearly predictable (τ('Class',' Student Absence Days')=0.47) from class and this forward association is quite strong but not enough for predicting.

Unfortunately, this approach indicating one variable that is highly correlated with the target variable so that the Contingency Table Analysis [4] as another correlation approach is provided. In figure 4 we provide 5 bar charts from Contingency Table Analysis to utilize the relationship between each variable and the predicted variable.

As we can see in figure 4 only 14% of the female students are getting low mark but the chance on getting low mark is increased in male side by 8%. Figure 5 confirms the previous results shown in figure 3 of the strong association between the students' absence days and the students' performance. It shows that only 96% from the students who has less than 7 days of absence get high marks while 91% of the students who has been absent more than 7 days get low mark.

In figure 6 we can see a strong relationship between parents who did not answering the survey and the stu-

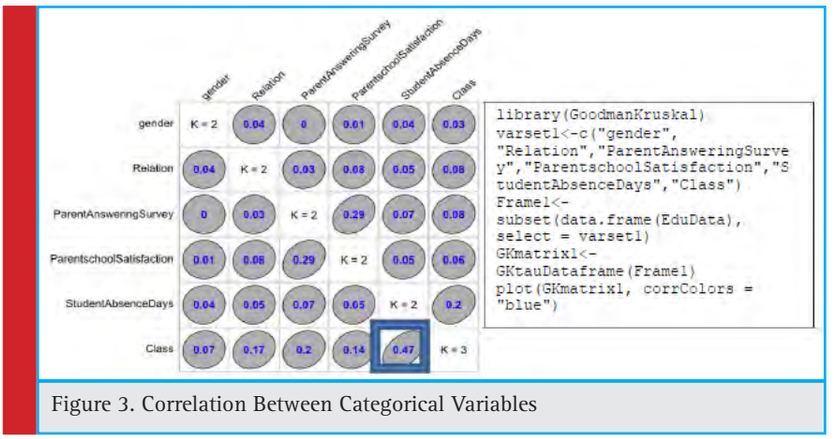


Figure 3. Correlation Between Categorical Variables

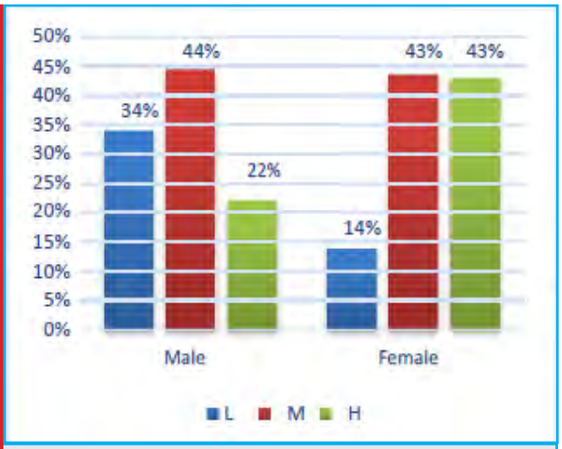


Figure 4. Relationship Between Gender and Class Level

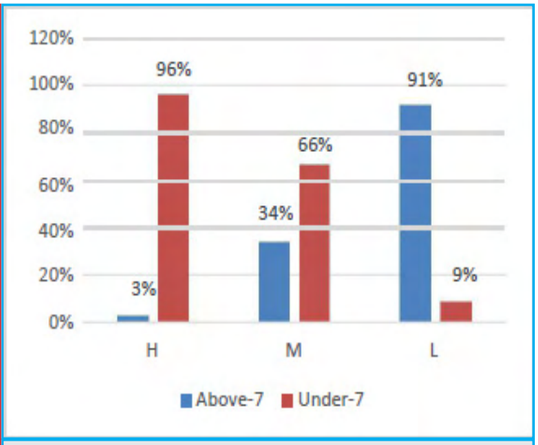


Figure 5. Relationship Between Student Absence Days and Class Level

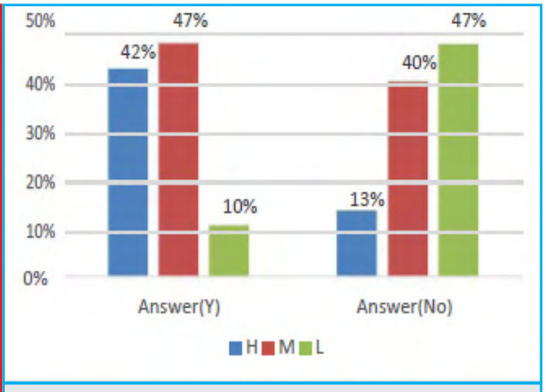


Figure 6. Relationship Between Parent Answering Survey and Class Level

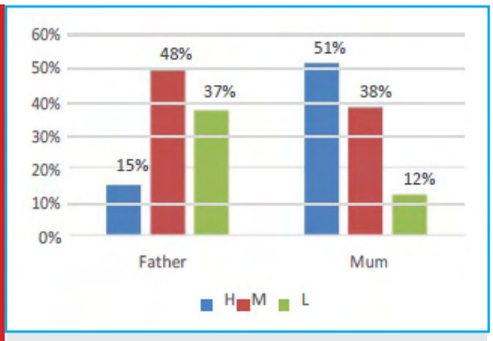


Figure 7. Relationship Between Responsible Parent and Class Level

dents' grade level as 47% of them are fall in low level and only 13% of them getting high mark. Moreover, in figure 7 indicates that the 'Relation' variable has impact on the predicted grade level as only 12% of the students get low marks who their mother is the responsible parent. The students visualized in figure 8, demonstrates the hidden impact of the parent school satisfaction variable on the predicted variable. The parent who has a good background in the school effects the final students' academic performance. All the previous graphs are representing the relation between the categorical variables and the object variable but to measure the correlation between the numerical variable which are the most important features in this study to examine their impact on the students' academic performance we applied correlation plot function in R language for all numerical features as shown in figure 9.

As we can see getting dark blue color in some squares and light one on the other, the darkness color indicating the high correlated relation between the variables. Obviously all behavioral attributes are high correlated with the predicted variable as all of them getting more than 0.60 value excepting 'Discussion' variable which

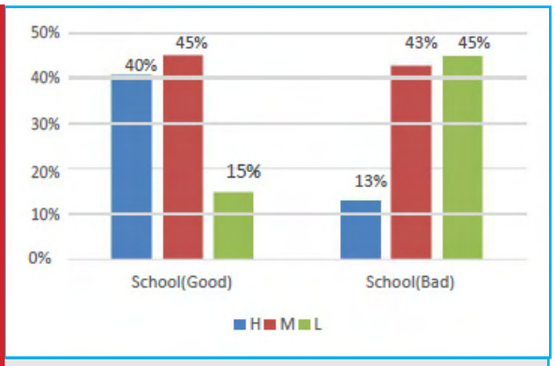


Figure 8. Relationship Parent School Satisfaction and Class Level

Table 2. Correlation Between Numeric Variables

Raised hands	Raisedhands	Vis ITed Resources	Announcements View	Discussion	Class
	1.0	0.69	0.64	0.34	0.65
Vis ITed Resources	0.69	1.0	0.59	0.24	0.68
Announcements View	0.64	0.59	1.0	0.42	0.53
Discussion	0.34	0.24	0.42	1.0	0.31
Class	0.65	0.68	0.53	0.31	1.0

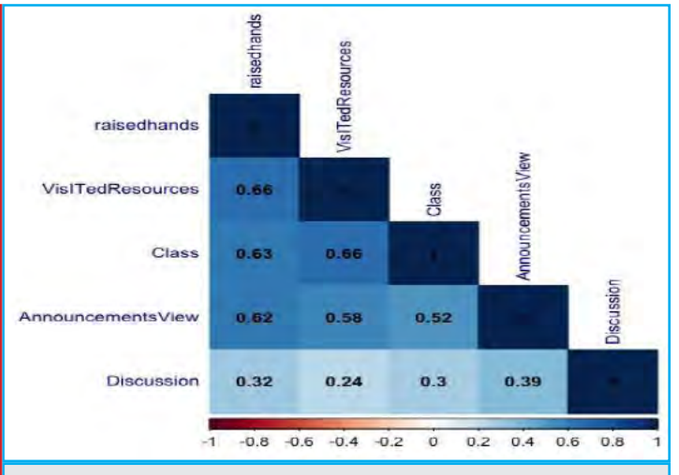


Figure 9. Correlation Between Numeric Variables

is a good indicator that this variable has less impact on the students' performance. The total information shown in the table 2 about the value associated with each relationship are obtained using 'cor' function in R language. As we can see from both table 2 and figure 9 the most significant variables are 'VisITedResources',Raisedhands', 'AnnouncementsView ' and 'Discussion ' has the lowest impact among the other behavioral attributes. This is a significant indicator that students' academic performance will be affected by their interaction with the E-learning System mainly by three factors: raising hands to gather or ask for an information, visiting the resources provided in the system for enrolled course and viewing their uploaded announcements

In Table 3, we calculate the average value of each students' behavioral feature for all students with each class individually using the equation ! Σ" as n is the total number of observations with specific class and x is the sum of features for that class A,B,C and D as A referring to raised hands, B referring to Visited Resources, C referring to Announcements View and D for Discussion feature. As we can see in figure 10 the average participation for each student with class level 'H' is 64% while the percentage getting lower for whom with class 'M' or 'L'.

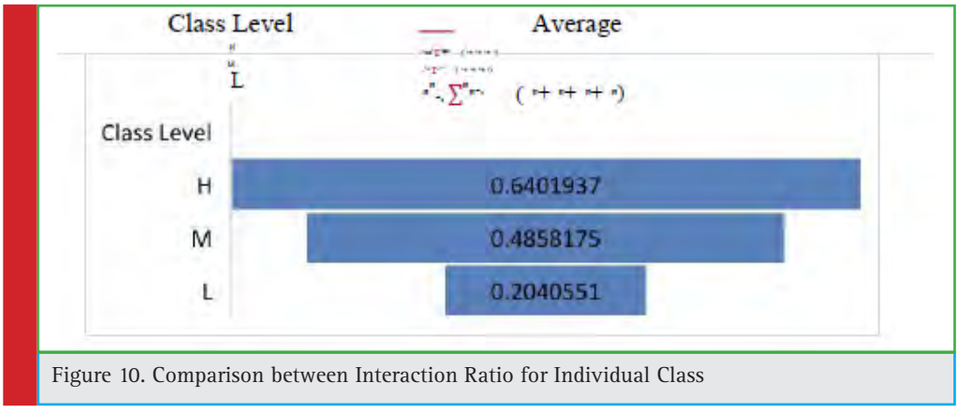


Figure 10. Comparison between Interaction Ratio for Individual Class

Table 3. Comparison of Prediction Accuracies for Dataset I

Criterion	Accuracy		Kappa
	Validation Data	Test Data	
Decision Tree	0.67	0.64	0.44
Random Forest	0.98	0.74	0.59
Gradient Boosting Machine	0.77	0.73	0.59

Student Performance Prediction Model (SPPM)

In this study, Student Performance Prediction Model SPPM is developed using data mining techniques for classification and predicting the level of the students' performance in E-learning system (LMS). A generated classifier model makes use of a learning algorithm in finding a model that best defines the impact of two groups of features: students' behavioral and parent engagement attributes on the students' performance level. *[5]* We implemented SPPM based on LMS datasets after minimizing its variables to be only 9 variables including the target one which is selected based on features selection techniques as mentioned in section 4.1. The resampling method or so called cross-validation is the machine learning method used in R language to build our model; the structure of that model was shown earlier in Figure 1.

The algorithm has been trained on the datasets of size consisted of 480 observations. The predictors variables divided into two groups one regarding students' behavioral features such as raised hands, view announcements, visited resources, discussion and students' absence days and the second group is regarding parent involvement features such as relation, parent school satisfaction and parent answering survey. We used fivefold cross validation and repeat this process ten times to achieve better results. In the following, we briefly present the four well known machine learning techniques that we used in this study: A Repeated k-fold Cross Validation techniques is applied for three classification methods: Decision Tree (DT), Random Forest (RF) and Gradient Boosting Machine(GBM), and compare between them in order to observe the best results in the study.The resampling

Table 5. Comparison of Prediction Accuracies for Dataset II

	Accuracy		
Criterion	Validation Data	Test Data	Kappa
Decision Tree	0.64	0.61	0.44
Random Forest	0.98	0.80	0.76
Gradient Boosting Machine	0.81	0.77	0.69

methods is implemented two times: the first time, we build SPPM model on Dataset I including only students' behavioral variables and the second time on Dataset II including all selected variables. In addition to the accuracy measure, we used other evaluation techniques and methods to evaluate the results obtained in Section 5. The results and their evaluations are included in the next section (Analysis and Results) of this paper, where we used Specificity and Sensitivity as other measures.

ANALYSIS AND RESULTS

Datasets used in this study contains the students' behavior, their parent engagement features, other information regarding topics been studied, students' education background and the performance level of the specific topic. as described in Section 3. In order to identify a subset of variables that could improve the accuracy of all classifiers, we selected those features that were given by the feature selection techniques mentioned in Section 4.1.2. The students' behavior features and their parent engagement features have been used to predict the students' overall performance at the end of the degree.

As mentioned earlier, there is no classifier better than other as the outperform of the classifier depends on several factors, one of the most important one is the attributes. For instance, The accuracy of Decision Tree reached 64 %, while the accuracy of Gradient Boosting Machine reached 73% which is not good comparing to Random Forest method. When we apply the classifiers on the Dataset I which includes only students' behavior features as shown in table 3 the Random Forest method outperformed among the other classifiers as it reached 74% accuracy. While the accuracy of SPPM increases

Table 4. Comparison of Three Predictions Measures for Dataset I

Criterion	Balanced Accuracy			Specificity			Sensitivity		
	Class	Class	Class	Class	Class	Class	Class	Class	Class
	'L'	'M'	'H'	'L'	'M'	'H'	'L'	'M'	'H'
Decision Tree	0.83	0.63	0.69	0.84	0.63	0.93	0.82	0.63	0.44
Random Forest	0.89	0.69	0.77	0.90	0.74	0.88	0.87	0.68	0.63
Gradient Boosting Machine	0.89	0.73	0.78	0.93	0.75	0.88	0.84	0.70	0.67

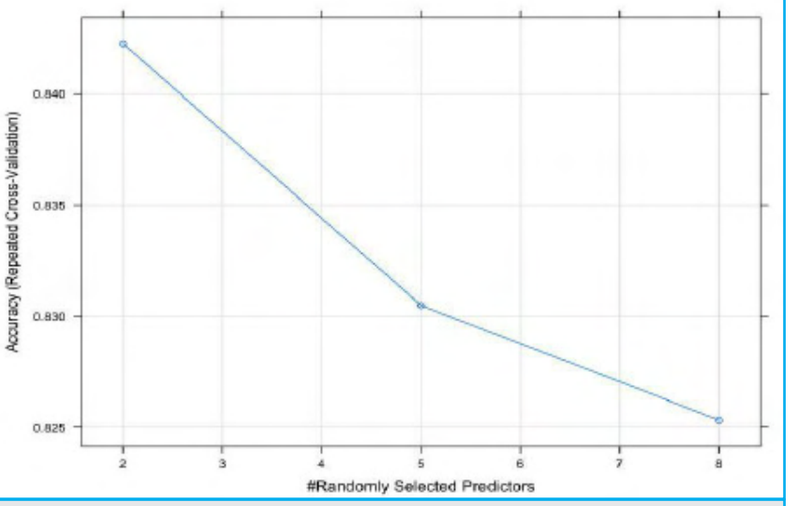


Figure 11. Accuracy Rate versus 'mtry'

Table 6. Comparison of Three Predictions Measures for Dataset II

Evaluation Measures	Balanced Accuracy			Specificity			Sensitivity		
Methods Used	Class 'L'	Class 'M'	Class 'H'	Class 'L'	Class 'M'	Class 'H'	Class 'L'	Class 'M'	Class 'H'
Decision Tree	0.84	0.58	0.81	0.76	0.86	0.81	0.92	0.30	0.81
Random Forest	0.92	0.77	0.82	0.91	0.81	0.92	0.92	0.75	0.74
Gradient Boosting Machine	0.88	0.76	0.85	0.94	0.81	0.88	0.82	0.71	0.81

by 6% using Random Forest algorithms on Dataset II as shown in table 5 with 'mtry'=2 as graphed in figure 11. In addition, we found that the parent engagement case has a significant impact on the students' performance.

Summing up, from the 3 models obtained on both Dataset I and Dataset II with k=6, the highest accuracy is obtained using Random Forest method. By looking at the accuracy of each class, we can notice that students with class 'L' or 'H' getting more prediction balanced accuracy compared to class 'M' for all classifiers on both datasets as shown in table 4 and table 6. The reason for that might be related to the difficulty of defining the students who will gain 'M' class without using any assessment features such as their results on assignments, midterm exam, quizzes or any other assessment.

Additionally, in Decision Tree ,Random Forest and Gradient Boosting Machine model the fraction of the students with class 'H' correctly identified by the test dataset is 44% and getting higher in identifying students with class 'L' which means that might be because the dataset we used is unbalanced. Another reason for that, is students behavioral features and parent engagement features consider to be a good indicator of students academic performance however, they are not enough to predict the performance without other assessment features.

CONCLUSIONS

This research presented the effectiveness of students' interaction behavior in e -learning system and used machine learning classification techniques to predict a students' performance. In this paper, three classifiers are applied:(Decision Tree, Random Forest, and Gradient Boosting Machine) with K-fold Cross Validation and found that the Random Forest classifier gives the best results when used with students' dataset II (behavioral and parent engagement attributes). A student performance predicted model (SPPM) is built, and the results show that the approach of using features selection techniques is very efficient and accurate in predicting student's performance as well as help in proper identification of student at risk of attrition. Mostly, this study benefits the understanding the great impact of social case in predicting student's performance by applying the resampling techniques. The results may help the educators to obstacle the low performance issue, by determining students that may be less interactive and send announcements to enhance them to be more active. The accuracy of our proposed model (SPPM) using behavioral features and parent engagement features achieved up to 6% improvement compared to the results when removing parent features, and it achieved up to 80%

accuracy using Random Forest method. The most effective behavioral features on our SPPM are visited resources, raised hands and the number of absence days. For future work, it is better to try more classifiers, and working with the balanced dataset or testing a different E-learning sources.

REFERENCES

[1] E. Abu Amrieh, T. Hamtini , I. Aljara, "Mining Educational Data to Predict Student's academic Performance using Ensemble Methods," International Journal of Database Theory and Application, vol. 9, no. 8, pp. 119-136., 2016.

[2] "The R Project for Statistical Computing," The R Foundation, [Online]. Available: https://www.r-project.org. [Accessed 01 10 2018].

[3] R. Pearson, "The GoodmanKruskal package: Measuring association between categorical variables," 12 04 2016. [Online]. Available: https://cran.r-project.org/web/packages/GoodmanKruskal/vignettes/GoodmanKruskal.html. [Accessed 01 12 2018].

[4] I. StatSoft, "Electronic Statistics Textbook.," StatSoft. WEB, Tulsa, OK, 2013.

[5] R. Asif, M. Agathe , M. Mahmood, "Predicting Student Academic Performance at Degree Level: A Case Study.," International Journal of Intelligent Systems Technologies and Applications, vol. 7, no. 1, pp. 49-61, 2014.

[6] H. M. Hill, " Chromatography in a regulated environment," in Handbook of Analytical Separations, vol. 4, Huntingdon, Cambridgeshire: Huntingdon Life Sciences, 2003, pp. 373-411.

[7] L. Breiman, "Manual on setting up, using, and understanding random forests," 2002. [Online]. Available: https://www.stat.berkeley.edu/~breiman/Using_random_forests_v4.0.pdf. [Accessed 05 12 2018].

[8] J. L. Knowles, Self-directed learning: A guide for learners and teachers, New York, NY: Association Press, 1975.

[9] S. R. Safavian, D. Landgrebe, "A Survey of Decision Tree Classifier Methodology," IEEE Systems, Man, and Cybernetics Society, vol. 21, no. 3, pp. 660 - 674, 1991.

[10] B. Rienties and L. Toetenel, "The impact of learning design on student behaviour, satisfaction and performance: A cross-institutional comparison across 151 modules," Computers in Human Behavior, vol. 60, pp. 333-341, 2016.

[11] J. B. Arbaugh, "System, scholar, or students? Which most influences online MBA course effectiveness?," Journal of Computer Assisted Learning, vol. 30, no. 4, pp. 349-362, 2014.

[12] S. J. Bartley, J. H Golek, "Evaluating the Cost Effectiveness of Online and Face-to-Face Instruction," Educational Technology & Society, vol. 7, no. 4, p. 167–175, 2004.

[13] J. Evans, I. Haase, "Online business education in the twenty-first century: an analysis of potential target markets.," Internet Research, vol. 11, no. 3, p. 246–260., 2001.

[14] C. De la Varre, J. Keane, M. J. Irvin, "Enhancing Online Distance Education in Small Rural US Schools: A Hybrid, Learner-Centred Model.," Asynchronous Learning Networks, vol. 15, no. 4, p. 35–46., 2011.

[15] C. Gratton-Lavoie, D. Stanley,, "Teaching and learning principles of Microeconomics online: An empirical assessment.," The Journal of Economic Education, vol. 40, no. 1, p. 3–25, 2009.

[16] J, Lorenzetti, "Academic Administration - Running a MOOC: Secrets of the World's Largest Distance Education Classes," Magna Publications., 2013.

[17] S.B., Kotsiantis; C.J. , Pierrakeas; P.E., Pintelas"Predicting Students' Performance in Distance Learning Using Machine Learning Techniques.," Applied Artificial Intelligence, vol. 18, no. 5, pp. 411- 426, 2004.

[18] I. Ionita, "Data mining techniques for e-learning," Journal of Applied Computer Science & Mathematics , vol. 10, no. 2, 2016.

[19] Manyika, J.; Chui, M.; Brown, B.; Bughin, J.; R. , Dobbs; C., Roxburgh; A. Byers , "Big Data: The Next Frontier for Innovation, Competition, and Productivity," McKinsey Global Institute, 2011.

[20] P. Golding, S. McNamarah, "Predicting Academic Performance in the School of Computing & Information Technology (SCIT)," in 35thASEE /IEEE Frontiers in Education Conference,, 2005.

[21] E. Abu Amrieh, T. Hamtini and I. Aljarah, "Mining Educational Data to Predict Student's academic Performance using Ensemble Methods," International Journal of Database Theory and Application , vol. 9, no. 8, pp. 119-136, 2016.

[22] J. Parris and M. Feeley, "An Assessment of the PeerWise Student-Contributed Question System's Impact on Learning Outcomes: Evidence from a Large Enrollment Political Science Course," 1 Sep 2012. [Online]. Available: https://poseidon01.ssrn.com. [Accessed 12 2018].

[23] A, Bissacco; M-H, Yang; S, Soatto, "Fast human pose estimation using appearance and motion via multi-dimensional boosting regression," in IEEE Conference on Computer Vision and Pattern Recognition, Minneapolis, 2007.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

Random Tree Data Stream Classifier with Sliding Window Estimator and Concept Drift

Ebtesam Almalki[1] and Manal Abdullah[2]*

[1]*Faculty of Computer and Information Technology FCIT University of Jeddah Jeddah, Saudi Arabia KSA*
[2]*Faculty of Computer and Information Technology FCIT King Abdul-Aziz University KAU Jeddah, Saudi Arabia KSA*

ABSTRACT

Today there is massive applications that generate high volume of stream data like telecommunication systems and others. In this context, it is required to convert these data to valuable knowledge. Storing data stream to local storage and mining them can be considered as resource consuming process. Mining data streams means extracting valuable information and knowledge from continues data. This paper develops Adaptive sliding window random decision Tree (ASWRT). This model can learn adaptively from the changing data especially real time data that's related to the wireless sensors networks. The results of this research based mainly on the idea of data segmentation. This technique is one of the primary tasks of time series mining. This task is often used to generate interesting subsequence from a large time series sequence. Segmentation is one of the essential components in extracting significant patterns from time series data which may be useful in identifying the trend and changes in the prediction. The segmentations at ASWRT is mainly depending on mean and variance. The random decision tree has been employed as incremental builder for the tree for the purposes of classification. Other components to improve accuracy has been employed like sliding window-based algorithm and concept drafting detectors. ASWRT has achieved high accuracy and time performance over huge volume of data stream. These data generated by built-in random generator in MOA package. It achieved accuracy of 98.75% at time of 17.20 second in general.

KEY WORDS: BIG DATA; DATA STREAM; STREAM MINING; CONCEPT DRIFTING, SLIDING WINDOW

ARTICLE INFORMATION:

**Corresponding Author: maaabdullah@kau.edu.sa*
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/25

INTRODUCTION

Due to the high informatic evolution, there is a huge volumes of data stream these data collected from different resources like sensory data, transactional, and web data. These data generated in continuous manner as data stream. This type of data requires to be analyzed online as they arrive without storing them and wasting high amount of memory. Big data can be constructed from data streams. Big data is defined as large and complex data sets where traditional data processing are inadequate to process. Challenges in big data include many issues, such as analysis, capture, search, sharing, storage, visualization, querying, updating, and information privacy. The term "big data" often refers simply to the use of predictive analytics, user behavior analytics, or certain other advanced data analytics methods that extract value from data. Big Data can be static on one machine or distributed and it can also be dynamic (stream). Data stream is considered as an ordered sequence of instances that can be read only once or a small number of times using limited computing and storage capabilities. Data stream is continuously changing based on time and this is considered as big challenge in the field of data stream mining. Stream mining is the process of extracting knowledge structures from continuous, rapid data records.

A data stream can be collected from computer network traffic, phone conversations, ATM transactions, web searches and sensor data. Data stream real time analytics are needed to manage the data currently generated at an increasing rate. In the data stream model, data arrive at high speed, and algorithms that process them must do so under very strict constraints of space and time. Consequently, data streams pose several challenges for data mining algorithm design like using of limited resources (time and memory). The data stream mining model can be implemented using many tools depending on the environment. This research will focus on MOA (Massive Online Analysis). MOA is a software framework that can be used to implement and run the streaming algorithms. It can be considered as open source framework for data stream mining. It has many of machine learning algorithms classification, regression, clustering, outlier detection, concept drift detection and recommender systems and tools for evaluation, [2].

The process of designing data stream mining model is subjected to several conditions like results accuracy, amount of space consumed by the model and time consumed in learning this model. These conditions are mainly interdependent where the time adjustment and space used by the algorithm may reflect high change in accuracy. In addition, storing more pre-computed information, such as look up tables, an algorithm can run very fast at the expense of space consuming. The more time an algorithm has, the accuracy can be increased. In data stream environment, the developer should take care of time and space due to the high speed and the huge volume of data. In this research, a novel model has been developed which considered the memory space and time constraints by adopting the concepts of data estimation and concept drift. Due to speed of the input data, some changes may happen to the data. These changes happened due to some problem in the networking, synchronization or accumulative error by time passing. These changes would affect the classification negatively and would cause misanalysis of data. Data estimation is abstraction of data and also it is considered as the step of preparing and packaging the input data stream in order to facilitate the process of classifier, while concept drift is the process of detecting the change in the data stream and inform the estimator to refresh data and consequently the classifier will perform some actions in the presence of drifting.

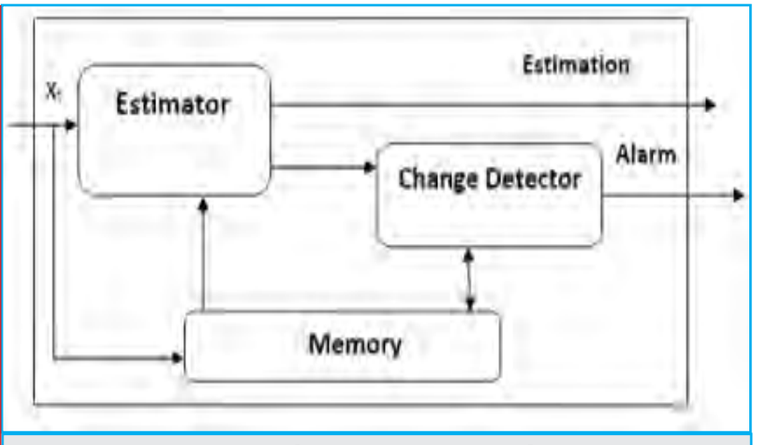


Figure 1. General framework [Mala & Dhanaseelan, 11]

The rest of this research is organized as follows: first of all, some related works will be discussed, after that the general structure and all components of ASWRT proposed model will be explained and discussed. Finally, the model will be tested and analysed depending on several criteria as can be seen later

RELATED WORK

Concept drifting means a change in the statistics of the data which happens due to different factors such as network synchronization or cumulative error done by the estimators. To avoid the effective of the concept change, there were many algorithms and models related to the subject of concept drifting. Last in [10] introduced a classification for a system incorporate the info fuzzy network (IFN) for OLIN (On Line Information Network) classification. OLIN input is continuous stream data, and the model is responsible for building a network. This network mainly depends on a sliding window as estimator of the most recent data. The system continuously will changes the window size and all statistical variable recomputed depending on the current rate of concept drift. OLIN uses the statistical ratio of the difference between the training model and the accuracy of the current model to measure the concept stability. OLIN will adjusts the number of examples between model reconstructions continuously. OLIN also generates a new model for every new sliding window depending on the content of the window. This approach ensures accurate and relevant models over time and therefore an increase in the classification accuracy. However, OLIN algorithm has very important disadvantages which is the high cost of creating new model each time.

Hulten, et.al have come up with Concept-change Very Fast Decision Trees CVFDT. It is considered as an algorithm extension for VFDT to deal with concept change over decision tree. This algorithm allows to the model to learn in the same time of determining the concept change. This sycron can be achieved by continuously monitoring the accuracy of old decisions with respect to the content of the sliding window of data [1]. At [2] the researchers proposed model for building incremental decision tree by adopting the sliding window and using change detector. The window has been built linearly, depending only on the average of inputs. The main advantage of using a change detector is that it has theoretical guarantees, and this guarantee can be extended to the learning algorithms.

DATA STREAM MINING FRAMEWORK

In the field of stream mining, mostly all algorithms adopted one or more of the following components [2]: windows for keeping the most recent values; mechanism to control the distribution change; and finally method for keeping updated estimations for some statistics of the input. These three modules are considered as the basis for answering three of the most important questions in stream mining.

- What should be remembered or dropped
- When to do the model refresh, and
- How to do this refreshing.

Three components are essential to prepare data streams for stream mining process. As shown by figure 1, X_t is a stream of bits representing data to be classified. Estimator is the component of the model that's responsible for computing all the statistics on the input data and preparing data inside the window. The last component is the detector which is responsible for detecting the place of drifting. The idea at this research is done by basing the mining algorithm on sliding window. The next two subsections detail concepts of estimator and concept drift.

Estimators

The estimator is considered as numerical value of unknown parameter by applying some formula on limited population samples. High volume and open-ended data streams need processing methods [7] presents a series of designed criteria. The most important of these criteria are:

1. The consuming time needed by the mining algorithm to process each data record in the stream must be small and constant
2. Smallest main memory wasting
3. Due to the nature of data stream, it should be a single pass algorithm, since streams cannot be hold for long time.
4. The model availability.
5. The model must show updated results at any point in time, it must keep up with the changes of the data.

The above criteria are important to build an adaptive learning model, but the first two criteria can be considered as the most important and hard to be accomplish. Although many algorithms have been done on scalable data, most algorithms still require high amount of main memory in proportion to the actual data size. Their computation complexity is much higher than linear with the data size. So, they are not equipped to cope with data stream [6].

The best way to avoid wasting memory is to use estimator that estimates the behavior of the data stream depending on limited data. There are many types of estimators according to its purposes like liner estimators, blue line estimators [3] and Gaussian estimator [12]

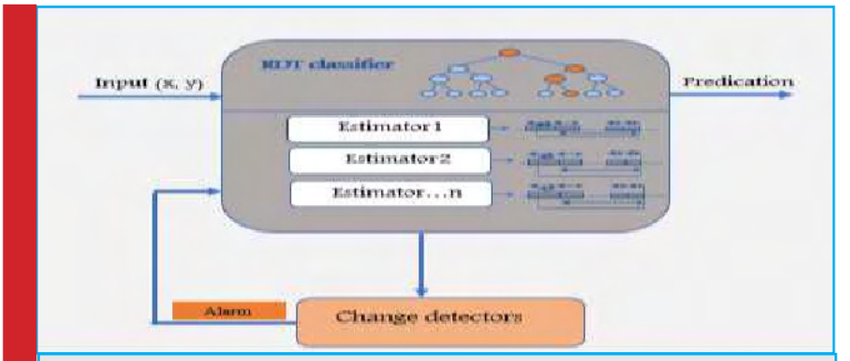


Figure 2. Adaptive sliding window Random Tree (ASWRT)

Change Detectors

Traditional stream classification algorithms developed to find classes that are suitable for all points since the beginning of data. These types of algorithms do not reflect the important issues that's related to the concept drifting. Concept drift can be considered as critical problem in online learning. This problem is caused when a model based on old data cannot correctly reflect the current state of the data. Concept drift describes a gradual change of the concept where concept shift happens and when a change between two concepts is more abrupt. Distribution change [8], also is known as sampling change or shift or virtual concept drift [1]. It refers to the change in the data distribution. Even if the concept stays the same, the change may often lead to rebuild the current model as the model's error rate increased. Stanley [13] has suggested, from the practical point of view that it is not essential to differentiate between concept change and sampling change since the current model needs to be changed in both cases. Change detection is not an easy task, since a fundamental limitation exists in [5], the design of a change detector is a compromise between detecting true changes and avoiding false alarms.

ASWRT: ADAPTIVE SLIDING WINDOW RANDOM TREE

This research proposes a general method for building incrementally random decision tree based on keeping sliding window of the last instances on the stream. In order to clarify the idea, we should specify how the following requirements should be done:

- Place a change detector related to every node that's make an alarm if some change happened at that's node.
- Manage the process of creation and deleting of nodes in the tree
- Maintain estimator of the relevant statistics of every node that's related to the current sliding window.

Adaptive Sliding Window Random Tree ASWRT is a model performing data stream classification. It is based on three data stream components that's mentioned earlier. The first component is the estimator and it is responsible for preparing and estimating the statistics of the input data. Second component is the classifier, the classifier here is random decision tree that's build incrementally depending on the coming streams. Last component is the detector to keep the data updated and consistent. Figure 2 shows ASWRT model.

In general, the input to this algorithm is a sequence $x_1, x_2, \ldots, x_t, \ldots$ of data items whose distribution varies over time in an unknown way, the range of input values is [0,1] values or real value that can be rescaled later by the model. The complete transaction that's happened inside the model is depicted in algorithm 1.

From the architecture, an estimator uses mean and variance of the inputs to estimates the desired statistics. Then it prepares data into bucket inside the window. A copy of the window will be send to the classifier and another copy to the change detector in order to detect the changes in the concept of data. If a change is detected, the last added buckets will be removed from the window and the affected added subtree will also be removed.

Algorithm 1: Adaptive Sliding Window Random Tree (ASWRT)
Input: stream xt generated by random tree generator
Output: classified input, accuracy of classification and Time

Call Estimator
preparing data in buckets depending on some criteria see algorithm 1

Call change detector
Determine whether change in statistics occur or not and making alarm to the estimator if the change in concept occurred see algorithm 3

Call DM algorithm
Making the classification depending in the data that's produced by cooperating of Estimator and detector, in order to determine time and accuracy of classification the next steps should be followed:

1. Train the model over prepared set of data which is training set
2. Test the model using deferent data set to check the time and accuracy of the model

ASWRT Estimator

The process of building and reducing the sliding window depends on some statistical distribution computation especially mean μ and variance σ. The idea here is done by segmented all elements of data stream into buckets by algorithm 2. For each bucket Bi, a time stamp should be maintained. ASWRT model will be responsible about determining the following information which are: how many elements enter the bucket, the mean of these bucket and the variance. The mean of the elements in the bucket (μ_i), and the variance of the bucket (Vi). The actual data elements that are assigned to a bucket are not stored.

As shown with figure 3, the window will be initialized at particular time stamp and it has a fixed size. Inside the window, data will be segmented to number of buckets with elements (ni). Now let the most recent element denotes xt, so xt elements are inserted to the window. This element has time stamp t. So, at this time, the estimator has several cases. The first case is when xt = μ1 & σ1, this means that the arrived element has the same distribution parameter as of the current bucket. So, estimator extends the current bucket B1 to include xt. Otherwise, create a new bucket for xt. The most recent bucket becomes B1 and set new variance and mean for this bucket as σ1 = 0, μ1 = xt, n1 = 1. The old bucket will be incremented by 1 (Bi+1). The second case, if the oldest bucket Bi has timestamp greater than N, actual window size, then delete the bucket. Bucket Bi−1 becomes the new oldest bucket. Maintain the statistics of Bi−1* (instead of Bi*). The third case is occurring when connecting with Adaptive Sliding Window ADWIN change detector. In this case if change detected, then ASWRT drops the first bucket from the head of the window Bi-1.

Algorithm 2: Estimator of ASWRT
Input: xt the new arrived element
1. If $x_t = \mu_1$, then extend bucket B_1 to include x_t, by incrementing n_1 by 1.
2. If $x_t ! = \mu_1$ then create another bucket for x_t. The most resent created bucket becomes B_1 with σ2 = 0, μ1 = xt, with size n_1 = 1. An old bucket B_i becomes Bi+1.
3. "If the previous bucket which is B_m has timestamp greater than the time stamp of N, the bucket will be deleted. Bucket B_{m-1} becomes the new oldest bucket. Maintain the statistics of Bm−1 instead of Bm, which can be calculated by the statistics of the previous deleted bucket B_m and the statistics of current oldest bucket which is B_{m-1}. the calculation in the next step.
4. If two buckets have been combined then the statistics of the new combined bucket will be as follow:

$$n_{i,j} = n_i + n_j;\ \mu_{i,j} = \frac{\mu_i n_i + \mu_j n_j}{n_{i,j}};\quad V_{i,j} = V_i + V_j + \frac{n_i n_j}{n_{i,j}} (\mu_i - \mu_j)^2$$

5. if there is an alarm detected by the detector the drop the B_i and recalculate the statistics of B_{i-1} depending on previous Bucket statistics
Output: ordered sequence of bucket inside window with its statistics see figure 3

ASWRT Detector

In the proposed ASWRT model, ADWIN change detector [8] is adopted to detect the concept drift. The sliding window is adopted here to reduce the stale in data. In the window model the data stream will coming in continuous manner, only the most reacent part of data will be used for making the predications. The process of discounting the size of the window only happened by

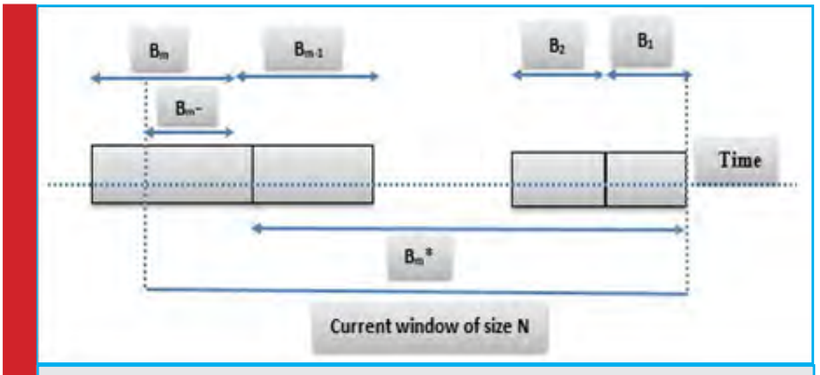


Figure 3. Visual explanation for the estimator steps

fixed parameters, that's why the results of the estimators vary according to this parameter. In this case every data elements are associated with weights that decrease over time. Here, only the last N elements arrived are considered relevant for answering queries, where N is the window size [2].

ADWIN model is an adaptive sliding window algorithm that has an estimator with memory and change detector and is considered as a parameter-free adaptive sliding window. This means no fixed parameter for the window size [12].

Results and Analysis

At this section, results of ASWRT will be shown depending on specific methodology. This methodology depends on the process of adjustments of the parameters that can affect the time and accuracy. Time is considered as the most important signal about the goodness of the model due to the nature of streaming environment as well as the accuracy. ASWRT will considered as good model in data stream mining if it satisfies high accuracy in minimum time.

The experiment here will be done depending on many steps. These steps is determined by adjusting the parameters of classifier and analyzing the impact of this adjustment. The adjustment will be performed depending on the following parameters

1. Number of attributes.
2. Number of instances.
3. Number of classes.

The results of testing ASWRT model start by adjusting the first parameter which is the number of instances and the other parameters is adjusted to the default values. These default values are shown in table 1

Table 1. The Experiment Default Values

Experiment parameters	Default values
Number of instances	500,000
Number of classes	3
Number of attributes	10
Number of passes	1
Model Random seed	1
ADWIN thresholds	0.05
First leaf level	3

Impact of increasing the number of instances on ASWRT

At this section, ASWRT will be examined by adjusting the number of instances to see their impact on the accuracy and time. The number of instances in this experiment ranges from 100,000 to 1,800,000 instances, while the other values have its default values. It is observed that the accuracy of classification is increased from 92.60% at 100,000 instants to 98.88% at 1,800,000 instants, as shown in figure 4. It can be noticed that the accuracy becomes constat after 1,400,000 instants. The time result records 3.3s at 100,000 instants and 18.8s at 1,800,000. We can also witness that the constant test time, along with the increase of instances. Figure 4 and 5 show strongly increasing in accuracy and slightly linear increase in train and test times.

Impact of increasing the number of classes on ASWRT

In this section, the results of ASWRT has been shown with respect to the number of classes. The number of attributes and instances will be of the default values. Increasing number of classes shows an inverse relationship to the performance of the algorithm. ASWRT increases the number of classes from 2 to 8 classes. Here the number of attributes are 10 attributes, which is the default number for this parameter. The accuracy of classification is decreased from 95.51% at 2nd classes to 88.63% at 8th classes. Figure 6 and figure 7 show accuracy and time when increasing number of instances.

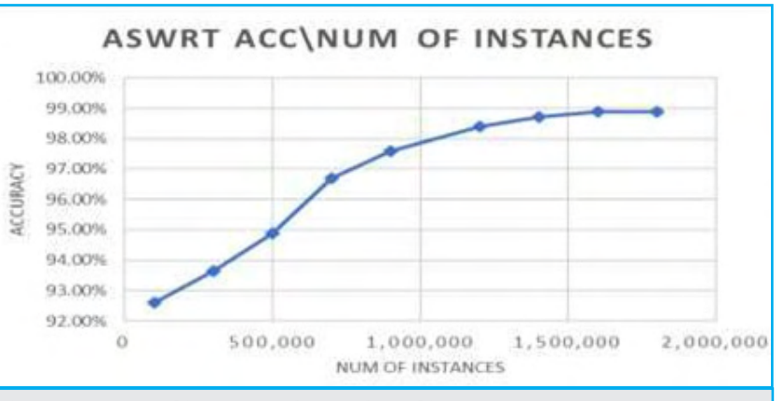


Figure 4. Impact of increasing the number of instances on accuracy

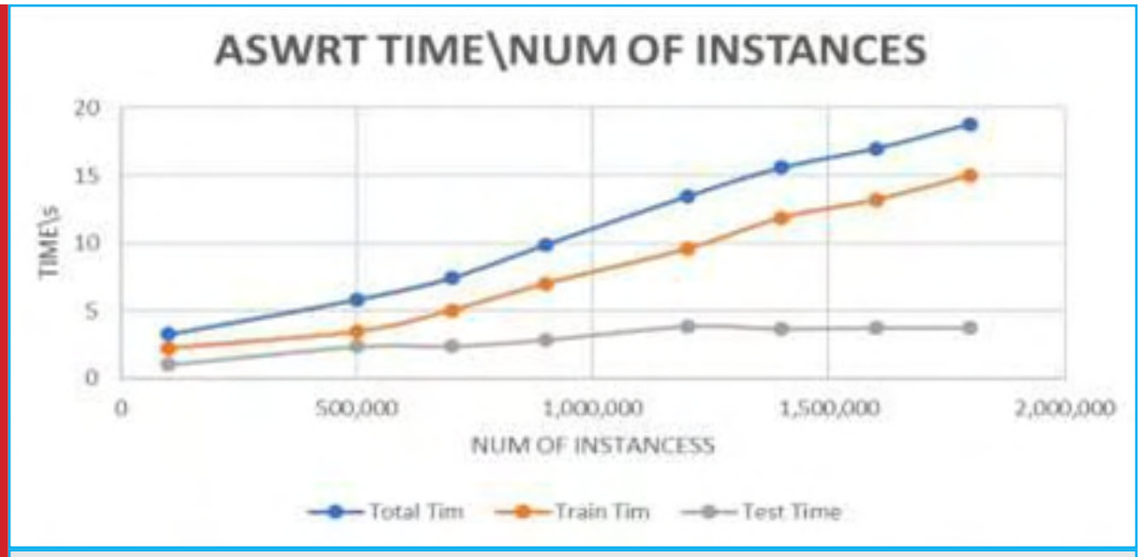


Figure 5. Impact of increasing the number of instances on time

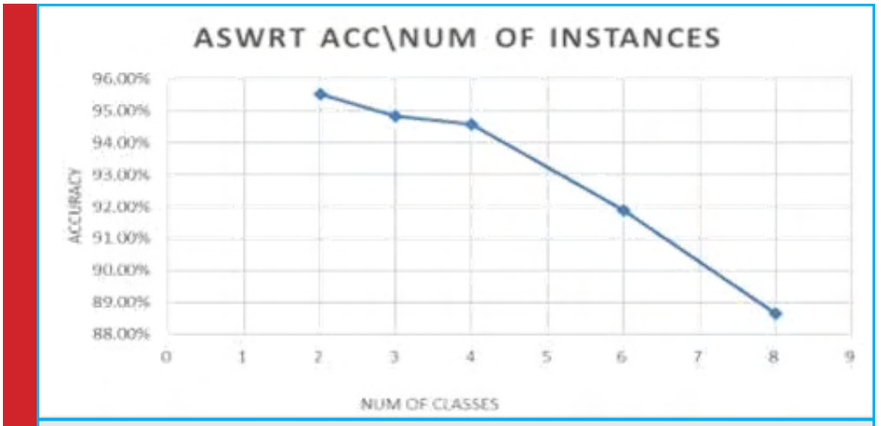


Figure 6. Impact of increasing the number of classes on accuracy

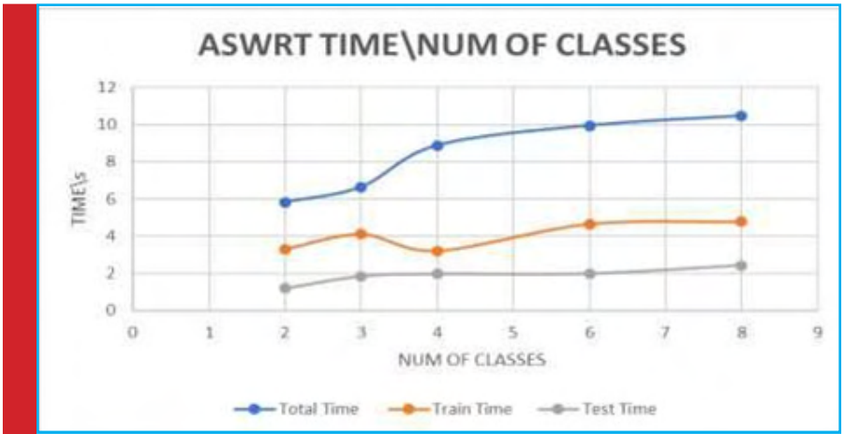


Figure 7. Impact of increasing the number of classes on Time

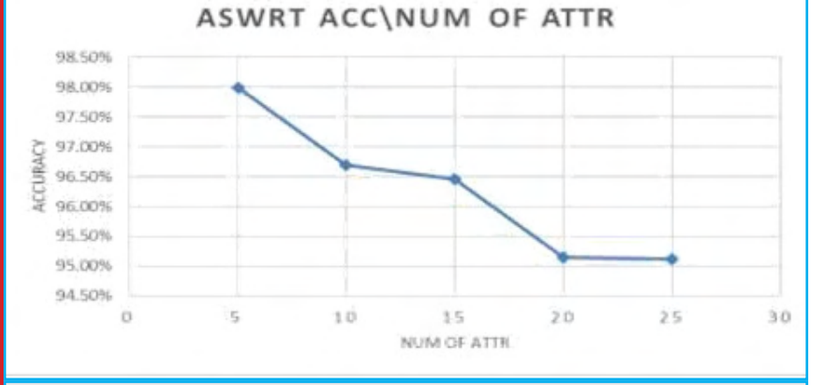


Figure 8. Impact of increasing the number of attribute on accuracy

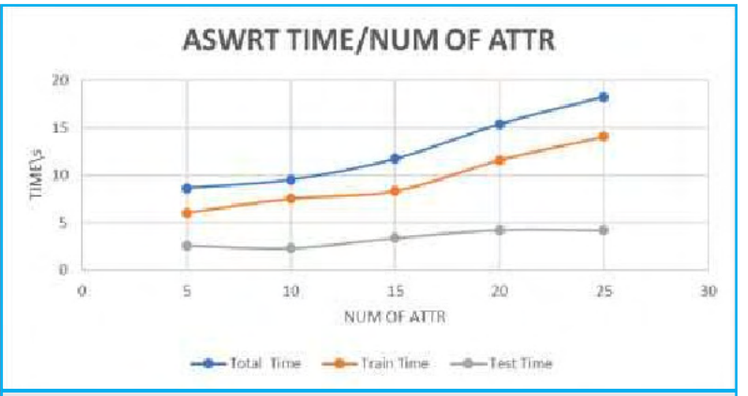


Figure 9. Impact of increasing the number of attribute on time

Impact of increasing the number of attributes on ASWRT

In this section, the impact of increasing the number of attributes on the proposed model are studied. All other values adjusted to the default values. The model records accuracy of 98.78% at 5 attributes and 93.70% at 25 attributes the results of accuracy and time are shown in figure 8 and 9. ASWRT records high accuracy even if the number of attribute increased to 25 attributes. This result is considered as positive indicator about the quality of the model.

Table 2. The Result of Comparing ASWRT with Similar Works

Model	ACC (%)	Total Time(s)	Kappa stat (%)
ASWRT-ADWIN	95.793%	8.42s	91.369%
ANB-DDM	73.704%	6.77s	49.527%
AHT-ADWIN	88.43%	6.70s	83.652%

COMPARING ASWRT WITH OTHER MODELS

A comparison will be made between ASWRT model and other models to see its performance related to state of the art models. These models adopt linear estimator for estimating all statistics of the input and using ADWIN and DDM change detectors [8]. The DDM module will manage errors that's produced by the learning model in the step of prediction. It will compare the statistics of two sub windows: the first window contains the actual data, while the second will contains only the data from the beginning until errors increases. Their method does't store these windows in stored in memory .They consider the number of errors in a sample of examples is modeled by a binomial distribution .when the number of errors increased the algorithm will prpose thats the distrbution is changed, and the current model decsions are inappropriate. Two classifiers have been chosen for this experiment which are naïve Bayes (NB) and adaptive Hoffding tree classifier (AH). These models have been tested by running their codes, the code has been imported from

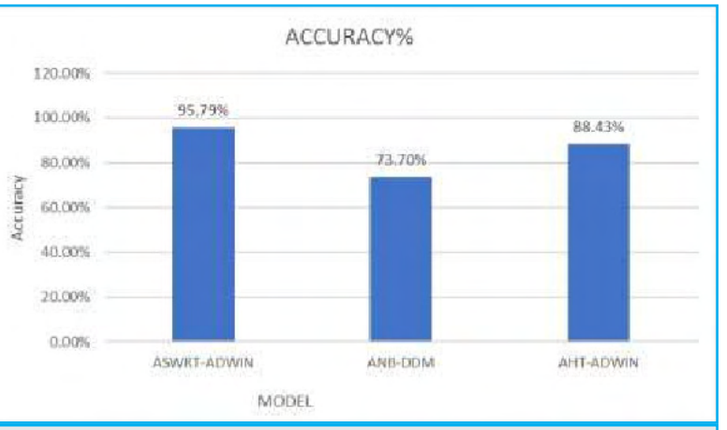


Figure 10. The accuracy of different adaptive model for classification

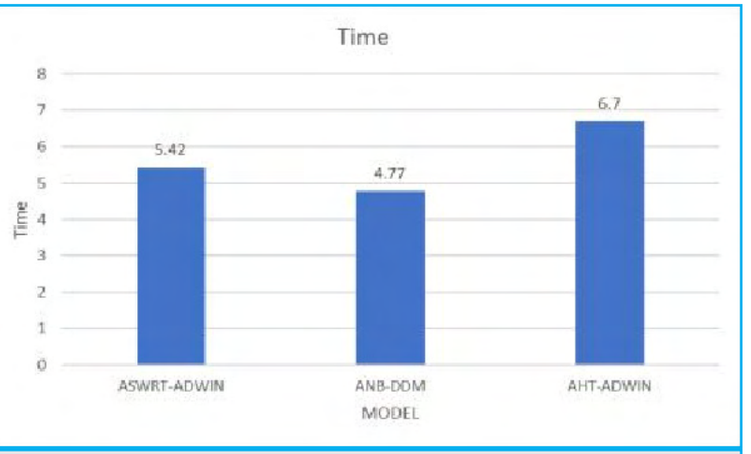


Figure 11. The run time of different adaptive model for classification

Waikato websites [2]. As shown in table 2, ASWRT and AHT classifier give more accurate results compared to the naïve Bayes in both cases. While AHT and ASWRT show a proximity result with preference to ASWRT, the result depending on the running the three-models using MOA using default values for all parameters. Figure 10 shows the accuracy of the three models, ASWRT shows the highest accuracy among others. While in case of time as shown by figure 11, ASWRT recorded acceptable time.

CONCLUSION AND FUTURE WORK

This research has concentrated on developing a novel model in the field of data stream mining which is ASWRT. This aim has been achieved by applying two contributions; the first one is the process of developing algorithm for the adaptive sliding window. This algorithm has a several cases depending on type of data streams as discussed in algorithm 2. The output of this algorithm is ordered sequence of buckets inside the window. The second contribution was to apply drift detection process using ADWIN change detectors. The detector will cooperate with the estimator in case of drifting and the classifier also have been modified in case of drift by eliminate the affected leaves in the tree which may reduce the accuracy of the classification. The evaluation of the results was depending on two factors which are accuracy and time. The testing methodologies was depending on the adjustment of some parameter related to the classifier to see the impact of this adjustment on the time and accuracy. In near future some extra functions can be increased like multi-labelling and detecting outlier to make a complete model and the developer should care of time because the time increase by increasing the number of computations. Also, same model can tested in case of increasing the data throughputs and analysing the results.

REFERENCES

[1] Aggarwal, C. C. A framework for diagnosing changes in evolving data streams. Paper presented at the Proceedings of the 2003 ACM SIGMOD international conference on Management of data

[2] Bifet, A. & Kirkby, R.: Data stream mining a practical approach.

[3] Gama, J., Sebastião, R., & Rodrigues, P. P. Issues in evaluation of stream learning algorithms. Paper presented at the Proceedings of the 15th ACM SIGKDD international conference on Knowledge discovery and data mining.

[4] Giannella, C., Han, J., Pei, J., Yan, X., & Yu, P. S.: Mining frequent patterns in data streams at multiple time granularities. Next generation data mining, 212, 191-212.

[5] Gustafsson, F., & Gustafsson, F.; Adaptive filtering and change detection (Vol. 1): Wiley New York.

[6] Heinz, C.: Density estimation over data streams.

[7] Jiang, N., & Gruenwald, L.; Research issues in data stream association rule mining. ACM Sigmod Record, 35(1), 14-19.

[8] Kifer, D., Ben-David, S., & Gehrke, J.; Detecting change in data streams. Paper presented at the Proceedings of the Thirtieth international conference on Very large data bases-Volume 30.

[9] Lakshmi, K. P., & Reddy, C.; A survey on different trends in data streams. Paper presented at the Networking and Information Technology (ICNIT), 2010 International Conference on

[10] Last, M. Online classification of nonstationary data streams. Intelligent data analysis, 6(2), 129-147.

[11] Mala, A., & Dhanaseelan, F. R.; Data stream mining algorithms: a review of issues and existing approaches. International Journal on Computer Science and Engineering, 3(7), 2726-2732.

[12] Mossel, E., Olsman, N., & Tamuz, O.; Efficient bayesian learning in social networks with gaussian estimators. Paper presented at the Communication, Control, and Computing (Allerton), 2016 54th Annual Allerton Conference on.

[13] Stanley, K. O.; Learning concept drift with a committee of decision trees. Informe técnico: UT-AI-TR-03-302, Department of Computer Sciences, University of Texas at Austin, USA.

Biosci. Biotech. Res. Comm. Special Issue Vol 12 No (1) February 2019

The Role of ICT in our Daily Life Applications:
Obstacles and Challenges

BBRC
Bioscience Biotechnology
Research Communications

A Holy Quran Ontology Construction with Semi-Automatic Population

Eman Elkhammash and Wahiba Ben Abdessalem

Department of Computer Science, Faculty of Computer and Information Technology, University of Taif, Taif, Saudi Arabia

ABSTRACT

Ontology population is an instantiation of the ontology classes and subclasses. Ontology population is the main step in ontology construction. However, the manual population is a time-consuming task. Accordingly, automatic or semi-automatic methods to populate an ontology are required. This paper suggests an approach for the creation of an ontology and its population. The studied ontology is related to named entities in the holy Quran. The major contribution of this approach is to harness the benefits of learning methods, conjoined with statistical models to extract contexts (words surrounding a named entity) from Quran and Hadith and retain the weighty contexts for the recognition of supplementary named entities to populate the ontology.

KEY WORDS: ONTOLOGY; HOLY QURAN; NAMED ENTITY; MACHINE LEARNING

INTRODUCTION

The Holy Quran is a document having its proper and unique style. It is a base knowledge discussing practically all life fields. Ontology is a type of knowledge representation and it became a major device for numerous applications that are interested in the semantic content. A holy Quran ontology will offer a powerful representation of its knowledge. An ontology with named entities of the holy Quran will be useful for implementing many applications (information retrieval, information extraction). The population of this ontology is also a huge task.

This paper aims to create an ontology related to named entities in the Holy Quran (names of god, angels, prophets...) from the holy Quran and prophetic traditions (Hadith). Hadith is considered as a very important source of Islamic knowledge. In our work, we preferred to use Sahih Al-Bukhari [4] and Sahih Muslim [5] collections to

ARTICLE INFORMATION:

**Corresponding Author: Eman.kms@tu.edu.sa, wahiba.bak@gmail.com*
Received 12th Nov, 2018
Accepted after revision 29th Dec, 2018
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007 CODEN: USA BBRCBA
Thomson Reuters ISI ESC / Clarivate Analytics USA and Crossref Indexed Journal
NAAS Journal Score 2018: 4.31 SJIF 2017: 4.196
© A Society of Science and Nature Publication, Bhopal India 2018. All rights reserved.
Online Contents Available at: http//www.bbrc.in/
DOI: 10.21786/bbrc/12.1/26

extract instances of the concepts described by the ontology.

This work proposes, also, a new approach, which is Natural Language Processing (NLP)-independent process for a semi-automatic population of a Quran ontology from texts (Quran and Hadith). This approach applies learning techniques and statistical models to acquire and classify ontology instances.

The article is organized into five sections as follows. Section 2 summarizes related work. Section 3 presents the proposed approach related to holy Quran ontology construction and population. Section 4 describes the implementation experiments. Finally, section 5 concludes the work.

RELATED WORK

Several studies have been undertaken on the topic of Quran ontology. In this section, we introduce some researches that describe Quranic ontology.Quran corpus ontology that describes around 300 concepts in Quran and 350 relations between them. It is available at (http://corpus.quran.com/ontology). Quran corpus focuses only on concepts mentioned in Quran and provides features such as Arabic grammar, syntax, and morphology for each word in the Holy Quran [2].

Another work in [1] developed an OWL ontological model for Quranic concepts described in the Quran. SPARQL queries are then used to retrieve the knowledge from the Ontology where single queries can extract similar concepts of the holy Quran which are spread out over different chapters and verses.There are numerous researches that developed a particular chapter in Quran or focused on particular subjects such as [3] that described domain ontology of living creatures and introduced semantic search of the living creatures mentioned in the Holy Quran including animals and birds. Also [9] proposed an ontology for "Salat (prayers)" based on translated texts of the Quran.

All the above mentioned works either focused on particular subjects in Quran or built ontology based on several concepts existing in Quran, but did not use approaches or methods to ensure that the conceptualisation is comprehensive.

The ontology developed in this paper augments concepts from Quran and Hadith. Moreover, we provide in this paper a new approach to further extend the developed ontology using learning methods.

PROPOSED APPROACH

A large number of methods exist for ontological engineering, describing the steps for the construction of an ontology. The building of the Holy Quran ontology was directed by the University of Stanford [6]. It comprises the following steps:

- Step1: Definition of the ontology domain and scope.
- Step2: Exploration of the possibility to reuse existing ontologies.
- Step 3: Identification of the ontology terms.
- Step 4: Definition of the ontology hierarchy of classes.
- Step 5: Definition of the classes' attributes.
- Step 6: Definition of the attributes' values.
- Step 7: Population of the ontology.

The steps we follow to develop the proposed holy Quran ontology baptized: NEQ-Ontology are as follows.

Step 1: Definition of the ontology domain and scope: this step allows determining the ontology domain by answering (A) a set of basic questions (Q), such as:

Q: What is the domain that the ontology will cover?
A: Named entities in the Holy Quran and Hadith.
Q: For what we will use the ontology?
A: For many applications dealing with the holy Quran, such as information retrieval, information extraction, text mining...
Q: What types of questions will the ontology answers to?
A: The names of God, angels, devil, hell, paradise...
Q: Who will use and maintain the ontology?
A: Researchers interested in the study of the holy Quran and Hadith

Step 2: Exploration the possibility to reuse existing ontologies: the ontology "corpus. Quran" [7] is showing a classification of 300 concepts that appear in the Quran. This ontology is used to retrieve semantically relevant verses. However, this ontology does not hold all the class' instances. For example, the god names are missing, only the name "Allah" exists. Also, some angels 'names are indicated in the authentic texts: Sahih ElBukhari and Sahih Muslim (i.e. Israfeel, Monkir, Nakeer) do not exist in this ontology.

We will reuse some of the concepts that appear in this ontology [7], rather than develop a new one from scratch. However, we will make a new taxonomy and populate this ontology based on the Holy Quran and Hadith of Sahih ElBukhari and Sahih Muslim.

Step 3: Identification of the ontology terms: a complete list of the terms (in a non-structured form) related to the ontology domain is defined. For example God, angels, prophet, religion, language, Holy Book, food, disease, animal, body organ, mosque, vegetable, tree, Planets, events, month, day, location, mountain, color, etc.

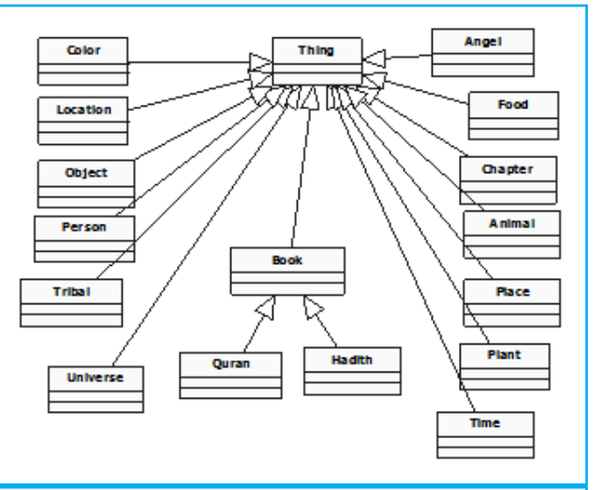


Figure 1. Shows an UML class diagram designing QNE-Ontology.

Step 4: Definition of the ontology hierarchy of classes: in this step, based on the terms defined in the previous step, classes are defined in a hierarchical taxonomy.

Step 5: Definition of the classes' attributes: The properties are attached to classes or subclasses taking into account the inheritance between classes and subclasses.

Step 6: Definition of the attributes' values: The value types of the attributes are assigned to attributes. In addition, the multiplicity (the number of values for attributes) is determined, and the relations between classes.

Step 7: Population of the ontology: in order to create the classes' instances of the ontology, we used a semi-automatic method. The process for the semi-automatic ontology population is proposed in the following algorithm:

1. *Instances← Examples*
2. *List-Occ ← Find-occ (Instances, Quran, Sahih El Bukhari, Sahih Muslim)*
3. *Cont ← Find-Context (Instances, Quran, Sahih El Bukhari, Sahih Muslim)*
4. *RankC ← Rank-Context (Cont, Quran, Sahih El Bukhari, Sahih Muslim, Instances)*
5. *Instances ← Find-Exp (Cont, Quran, Sahih El Bukhari, Sahih Muslim)*
6. *Instances-Validation (instances)*
7. *Return to step 2.*

Our approach for populating the Holy Quran ontology with named entities performs as follows: (1) we introduce for each concept a small set of confident and well-known instances as examples of named entities (i.e. *Jebreel, Mikaeel*). Then, (2) we search all occurrences of those instances on the Holy Quran and Hadiths. For these occurrences, (3) we identify words surrounding them. We call context of a named entities, the set of *n* words that precede and follow the named entity. (4) We calculate the ranking of contexts to assure the quality of these contexts. The aim of this step is to identify the most pertinent contexts that appear in the texts. The ranking function is computed as follows:

$$wi = cfi * icfi * \sum efi * \sum iefi$$

Where, (*cfi*) is the context frequency, (*icfi*) is the inverse context frequency, (*efi*) is the example frequency, and (*iefi*) the example inverse frequency. These frequencies are computed based on the formula: Term Frequency-Inverse Document Frequency (*tf-idf*) [8]. (5) Search segments matching the retained contexts. These segments are considered as newly named entity instances. (6) The found named entity instances are validated by an expert in Islamic knowledge and the initial set of instances is updated and extended by larger examples: the validated instances. (7) Perform a new iteration. In each iteration, the system learns, generates news contexts, and therefore new instances.

IMPLEMENTATION

The Holy Quran ontology (NEQ-Ontology) is implemented using the ontology editor Protégé 2000 [9]. The ontology consists of 15 super classes (Figure 2):

Individuals are used to represent the objects (instances) of the classes. For instance, *Al_Quran, Bible, Torah* are represented as individuals in the Class *Book*.

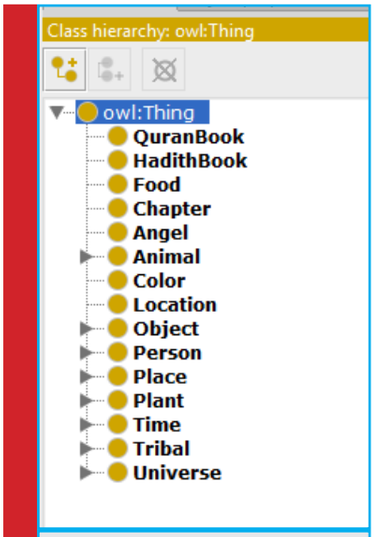


Figure 2. Example The NEQ-Ontology (root)

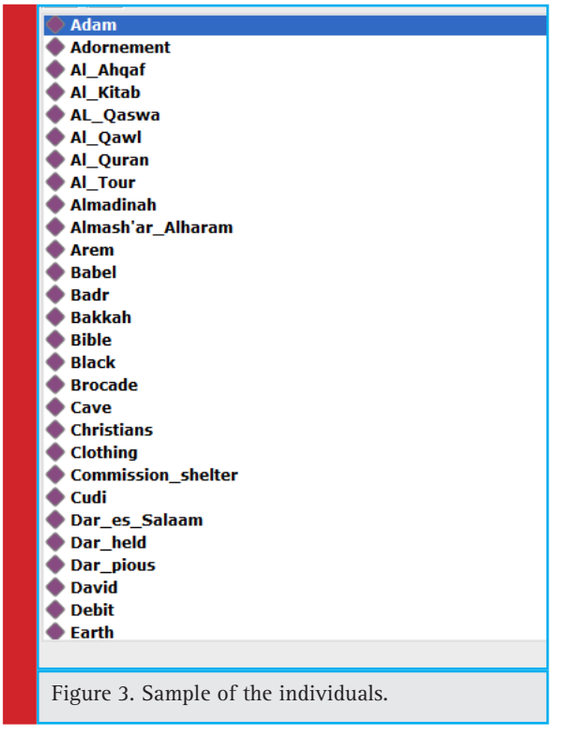


Figure 3. Sample of the individuals.

Mohammed, Musa, Essa are individuals in the subclass *Prophet* under *Person* class. Al-Qaswa is an individual of *Cow* subclass under *Animal* class. Figure 3 shows some individuals of NEQ ontology.

Properties are binary relations on individuals. Figure 4 shows sample of object properties of NEQ ontology.

For instance, in the context of the story mentioned in the holy Quran that describes the Almighty order to Bani Israel to slaughter a cow. We have *Miraculous Cow*, which is an individual in the COW subclass under the Animal class, and it is linked to *Yellow* individual via the object property *has Color* to describe the color of the *Miraculous Cow*. The individual *Musa* under *Prophet* class is linked to the individual *Bani Israel* of *Tribal* class via the property *SenderTo*. Moreover, the individual

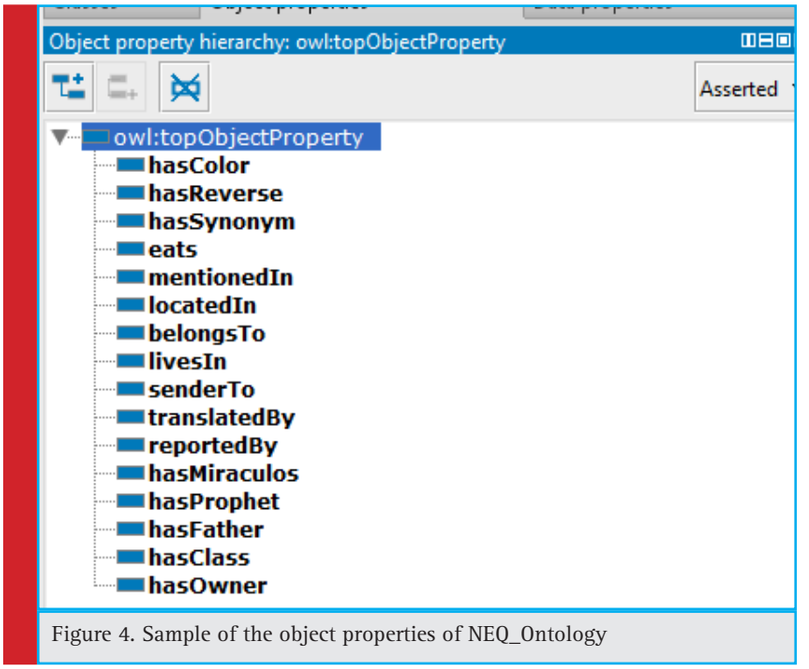


Figure 4. Sample of the object properties of NEQ_Ontology

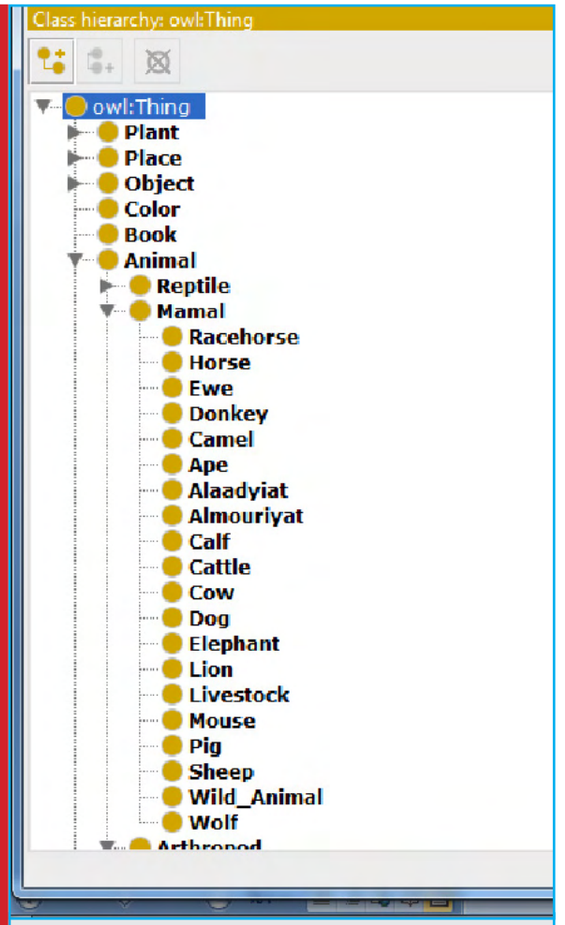


Figure 5. Sample of class hierarchy of *Animal*

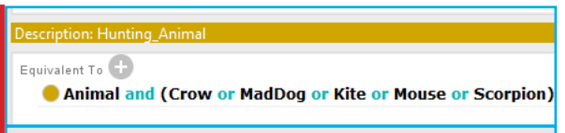


Figure 6. Class equivallent to specify *Hunting Animal*

Musa is linked to the individual *Miraculous Cow* via the property *has Mircaulous*.

A class can extend another class, for instance, *Animal* class in Figure 5 can be divided into a number of subclasses such as, *Reptile, Mammal, Arthpod*... subclasses and *Mammal* class can further be extended into a number of subclasses such as *Horse, Ewe, etc.*

```
>  >  Owl:Class
rdf:about="http://www.semanticweb.org/ontologies/2017/2/NEQ#Hu
nting_Animal<"
>       owl:equivalentClass<
>          owl:Class<
>             owl:intersectionOf rdf:parseType="Collection<"
>                rdf:Description
rdf:about="http://www.semanticweb.org/ontologies/2017/2/ NEQ
#Animal</"
>                   owl:Class<
>                      owl:unionOf rdf:parseType="Collection<"
>                         rdf:Description
rdf:about="http://www.semanticweb.org/ontologies/2017/2/ NEQ
#Crow</"
>                         rdf:Description
rdf:about="http://www.semanticweb.org/ontologies/2017/2/ NEQ
#Kite</"
>                         rdf:Description
rdf:about="http://www.semanticweb.org/ontologies/2017/2/ NEQ
#MadDog</"
>                         rdf:Description
rdf:about="http://www.semanticweb.org/ontologies/2017/2/ NEQ
#Mouse</"
>                         rdf:Description
rdf:about="http://www.semanticweb.org/ontologies/2017/2/ NEQ
#Scorpion</"
/>                      owl:unionOf<
/>                   owl:Class<
/>                owl:intersectionOf<
/>             owl:Class<
/>          owl:equivalentClass<
>          rdfs:subClassOf
rdf:resource="http://www.semanticweb.org/ontologies/2017/2/NEQ#
Animal</"
/>    owl:Class<
```

Figure 7. OWL for Class equivallent of Figure 4

According to Sahih Muslim *Hunting animal* are five which is *Crow* or Mad Dog or *Kite* or *Mouse* or *Scorpion*. We use class equivalent, which is a built-in property that links a class description to another class description to define Hunting animal as shown in Figure 6.

The OWL formalism of corresponds to the definition of *HuntingAnimal* can be shown in Figure 7.

Protégé offers a number of visualization tools that facilitate visualization of the ontology structure. Figure 8 depicts a view of *Camel* class, which is a subclass of *Animal* and has an individual call *Al_Qaswa*.

We used OntoGraf tool to visualize the ontology. OntoGraf is a visualization tool in Protégé which provides many features to visualize the structure of the whole ontology or part of it. It also supports various layouts to organize the structure of the ontology and view different relationships. For instance, the tooltip in Figure 9 showed extensive details about the properties of individual *Al_Qaswa* such as the source that mentioned *Al-Qaswa*, *Al_Qaswa* meaning,...etc.

Figure 8. Visulazation of *AlQaswa* instance

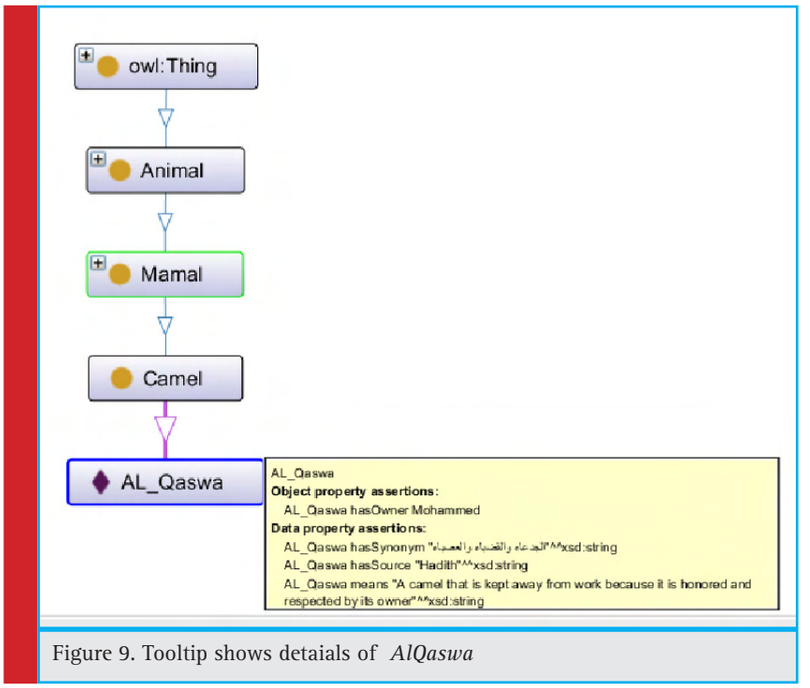


Figure 9. Tooltip shows detaials of *AlQaswa*

CONCLUSION

This paper aimed to construct an ontology (NEQ-ontology) related to named entities in the holy Quran. The referred named entities are not exhaustive in the holy Quran. For this reason, we have used prophetic traditions (Hadith) to populate the ontology and extract additional named entities. Hadith is considered as a very important source of Islamic knowledge. In our work, we have used the Sahih Al-Bukhari and Sahih Muslim collections.

In future work, we want to investigate methods to (semi)-automatically find not only instances of classes, but also new classes of the ontology.This work can be extended to other Hadiths (al-Tirmidhi, Ibn Maja...) and Fiqh (Temporal interpretation of Sharia rules (Islamic law). In addition, implementation of complete application covering the entire proposed ontology needs to be accomplished.

ACKNOWLEDGMENT

This work was supported by Taif University. The college of Computer science and Information Technologies.

REFERENCES

[1] A. B. M. S. Sadi *et al.* Applying ontological modeling on quranic "nature" domain," *2016 7th International Conference on Information and Communication Systems (ICICS)*, Irbid, 2016, pp. 151-155. doi: 10.1109/ IACS.2016.7476102

[2] K. Dukes & E. Atwell, E. LAMP: A Multimodal Web Platform for Collaborative Linguistic Analysis., in Nicoletta Calzolari; Khalid Choukri; Thierry Declerck; Mehmet Ugur Dogan; Bente Maegaard; Joseph Mariani; Jan Odijk & Stelios Piperidis, ed., 'LREC' , European Language Resources Association (ELRA),2012 , pp. 3268-3275 .

[3] H. Khan, S. Saqlain, M. Shoaib, and M. Sher, "Ontology Based Semantic Search in Holy Quran," International Journal of Future Computer and Communication vol. 2, no. 6, pp. 570-575, 2013.

[4] M. Bin Ismail Abu Abdullah Bukhari Aljafee. "Sahih Bukhari". Dar tuq alnnaja. Edition: I, 1422.

[5] M. Ibn Al-Hajjaj. "Sahih Muslim". http://al-hakawati.net/arabic/Civilizations/80.pdf. Viewed marc. 2017.

[6] N. F. Noy, and Mcguinness D.L. " Ontology development 101: A guide to creating your first ontology". University of Stanford, Stanford. 2001.

[7] Corpus quran. http://corpus.quran.com/ontology.jsp. Viewed march 2017.

[8] G. Salton, A. Wong, and C. Yang. "A Vector Space Model for Information Retrieval", Journal of the American Society for Information Science, vol. 8, no. 11, pp. 613-620, 1975.

[9] Protege. http://protege.stanford.edu/Viewed march 2017.

[10] S. Saad, N. Salim and S. Zainuddin, "An early stage of knowledge acquisition based on Quranic text," *2011 International Conference on Semantic Technology and Information Retrieval,* Putrajaya, 2011, pp. 130-136.doi:10.1109/ STAIR.2011.5995777