The Role of Knowledge-Based Computerized Management Information Systems in the Administrative Decision-Making Process

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ABSTRACT

The research aims to identify the role of Knowledge-Based computerized management information systems in the administrative decision-making process and that can lead to a reduction or limitation of potential problems, especially those related to unintended bias and ambiguous, these problems controls the collection of information for the primary knowledge base, and given that the knowledge based systems, computer information systems constitute a dynamic, constructed and programmed throughout specialized knowledge based systems programming languages. That is, they learn from the experience and knowledge gained. They can be used to build intelligent business decision making systems.

The research found a set of recommendations, including: the need to use knowledge-based computerized information systems in the administrative decision-making process. And the configuration of tires capable of using modern applications of information technology in various administrative levels. As well as benefit from the advantages offered by the knowledge-based with respect to the effort, time and money and to be able to respond to environmental conditions and changes.

Keywords: *Information systems, knowledge-based systems, administrative decisions making.*

1. INTRODUCTION

At the end of the twentieth century humanitarian creativity appeared in the field of information technology and who took transcend until it became one of the necessities of administrative life to accomplish the tasks and functions assigned to it. Organizations sought to computerize its departments to facilitate and accelerate the services offered, the general objective is to make a knowledge base general to facilitate the decision-maker to get the information quickly, in the time required and with minimal effort. The technology has added new recipe to the administration to enable them to perform work better than before, prompting them to exploit those scientific breakthroughs in the field of modern technology desiring to improve and develop their performance, by increasing the speed of completion and accuracy of transactions, and provide customer service in line with their needs and desires, and help by reporting provided to support the decision-making process, thus improving the quality of decisions based on the knowledge(Al Shobaki, 2016, 2017; Al Shobaki & Naser, 2016; Naser & Al Shobaki, 2016; Naser et al., 2016).

Where the information systems are a key factor in the success or failure of an enterprise, and the importance stem from the fact that knowledge is used as a tool to coordinate and support the administrative process and decision-making on one side, and as a communication tool within the facility and with the surrounding environment on the other hand(Al Shobaki et al.,2010; Al Shobaki & Naser, 2016; Naser & Al Shobaki, 2016).

Thus organizations facing operations expansion of the geographical spread and diversification of productive and in facing marketing operations, finance, the need for human resources and other activities, find themselves requires to establish a new framework suitable for these activities that will ensure flow of knowledge from different units and analyze and use it in the performance of the enterprise development in general and in the development of management performance in particular(Al Shobaki & Naser, 2016; Naser & Al Shobaki, 2016).

Administrative activities in the businesses organizations with which the relationship is very close to computerized information systems (Williamson et al. 1975).

Perhaps one of the key elements in the success of these systems is that they have come to rely on very sophisticated technology facilitated access to knowledge and reduced costs obtained clearly. Perhaps the technological revolution, which was described by (Rogers and Grassi, 1988, p. 54) as the greatest phenomenon of influence in the world of economics and business after the industrial revolution, made the technology and information systems two elements of success in a globalizing world and speed of knowledge exchange.

2. RESEARCH PROBLEM

Technological advances accompanied with scientific progress in various areas of life from which humanitarian activities led to the development of innovative scientific methods in the management process. Units and departments working towards application of these methods of modern management information systems in the use of computer applications and to benefit from their positive functions (Fantookh, 2010).

This research aimed to identify the role of computerized information-based knowledge systems in the administrative decision-making processes. Organizations suffer from problems and obstacles due to several factors, most important were the need to invest in information (Abu Naser and AL Shobaki, 2016), the weakness of internal

organizational and management structure (Al-Aidey, 2007), administrative decisions problems have confirmed (Faraj Allah study, 2011) and the lack of managerial competencies (Mashharawi, 2009).

3. RESEARCH QUESTIONS

We are trying through this research to answer the following questions:

- What is the management need of computerized information systems?
- How did the knowledge-based systems evolved.
- What is the difference between traditional computerized information systems and knowledge-based computerized information systems?
- How can the knowledge-based systems contribute to the administrative decision-making process

4. RESEARCH OBJECTIVES

- Identify the most important computerized information systems to help in the decision making process.
- Understand the purpose, components and advantages of knowledge-based systems.
- Understanding the requirements of the success of knowledge-based systems as a decision-maker.

5. RESEARCH IMPORTANCE

The importance of the study of the anticipated for both the academic and scientific fields as well as the usefulness of the following important aspects:

1. Stem the scientific importance of this study through the theoretical background of its relation to knowledge-based computerized information systems and making private management decisions with a lack of research in this area, in addition to the expected contributions of the results that may be useful in improving the role of knowledge-based computerized information systems in making administrative decisions.
2. This research to our knowledge is the first research studying knowledge-based computerized information systems.
3. This research derives its importance from being the first study linking knowledge-based systems and computerized information systems and operations of the administrative decision-making.
4. The growing importance of information technology in the field of decision-making in the business world.

6. COMPUTERIZED INFORMATION SYSTEMS

Technological management development, the spread of information systems in organizations and enterprise applications, large size of institutions and geographic expansion, the emergence of totalitarian concepts and globalization and the complexity of relations lead to an increase in the burdens and responsibilities that organizations must handle(Gad Al-Rab , 2009).

In light of the rapid progress in today's world, knowledge has become one of the important resources of the institution, and for the leaders, planners and decision-makers, so that they cannot get them, because of their availability as a result of the increasing complexity of administrative processes. Thus, they tended to design knowledge-based management information system and its primary mission is to provide knowledge needed to produce useful knowledge to the management in timely, accurate and quantitative manners, and to suit the needs of the decision makers (Thalab, 2011). Knowledge-based systems are the main source of supply to management with appropriate knowledge to help them in managerial in the process of making rational decisions, and contribute in increasing the capacity of management in performing its functions, planning, control and decision-making (Hayek, 2007).

The researchers believe that the emergence of knowledge-based systems, their practice and their application in the administrative area led to overcome many of the complexities of the administrative work dealing in huge quantities of paper and save them posing a waste of precious time in the process. In addition to the large space used and most importantly the difficulty of maintaining such knowledge and keeping it secure (Alibdaanh, 2002).

7. COMPUTERIZED INFORMATION SYSTEMS REQUIREMENTS

Computerized information systems have five major requirements and the organization should be able to expand the five inputs to maximize the usefulness of computerized management information system, those requirements are (Al-Halabi, 2010, Kurdish et al., 2003):

- Human Resources: The presence of individuals is essential to work of any information system, and there are two basic types of information systems necessary for human resources:
  - End users who are using the system directly or using outputs fitted.
  - Specialists in information systems and who develop and occupy the system.
- Material resources: all physical devices and materials used in the operation of the information, which includes computers, peripherals and multimedia.
- Software resources: all types of data including operation instructions, programs and procedures.
- Data resources: Organizations finally realized that data is an important organizational resource that should be managed effectively for benefit all end users in the organization.
- Network resources: communication networks such as Internet, intranet and extranet has become

necessary for the organization to commerce and e-business.

8. THE IMPORTANCE OF INFORMATION MANAGEMENT DEVICES:

8.1 Information as resource

Knowledge represents a resource used in achieving the goals of a project, just like cash, machinery and other resources that the officials working on the proper exploitation and coordination for the benefit of the project. For example, the officials provide good knowledge to consumer on demand for the products of the project will enable them to production scheduling manner that achieves the best possible profit, reduces inventory levels to a minimum.

8.2 Knowledge as an Asset

Knowledge can be viewed as an asset owned by the administration, like buildings, machinery and raw materials that contribute to the production process. This emphasizes the importance of officials to treat knowledge-based systems as an investment, which gives the administrative apparatus a comparative advantage in the face of competitors in the market.

8.3 Knowledge as a Commodity

Knowledge can be considered as goods produced by the administration, whether for internal use such as monitoring and performance evaluation or decision support, or for the purpose of selling it in the markets such as media film production (Gordon & Gordon, 1999).

9. INFORMATION TECHNOLOGY SYSTEMS AT THE END OF THE TWENTIETH CENTURY

Under the physical aspect falls so-called operation of technology and exchange of knowledge. The twentieth century has seen the emergence of many inventions, enormous technological developments especially in the areas of communications, which contributed directly to accelerate the development of knowledge-based systems in business organizations in order to achieve business goals. We can also say that the enormous acceleration in the development of computer since the early sixties of the last century has produced a real revolution in the development and spread of the use of knowledge-based systems in business organizations.

10. ADMINISTRATIVE DECISIONS AND THEIR RELATIONSHIP TO INFORMATION TECHNOLOGY

Administrative decisions can be classified according to different administrative activities: decision planning, implementing the decisions, or censorship decisions, either by level on which the plan should be divided into tactical and strategy decisions. It can be divided as the possibility of restructuring the problem that makes the decision thereon to the structural decisions, semi-structured

decisions and non-structural. The flow of knowledge within the enterprise flows horizontally (between different departments and functions at the same level) and flows vertically (between different organizational levels), in addition to the flow of information from the outside as the arteries that feed the decision-making levels and different types of process.

11. THE IMPORTANCE OF COMPUTERIZED INFORMATION SYSTEMS

Use the information systems of all kinds of technology to run, process, and store and transmit of information in an electronic form, which is known as information technology, which includes computers, means of communication, networking connectivity, fax machines and other equipment. And that is running the data and present it to users information system may be an individual or group of individuals who run their own information system outputs a result of the availability of computers. Perhaps many of the systems are routinely used for the purposes of the outputs of the control of the same administrative system performance or to simplify the operation of user commands.

12. MANAGEMENT INFORMATION SYSTEM:

Today, MIS has matured as both a research area and a teaching topic. MIS is the study of people, technology, and organizations, focusing on computing in the context of organizations. The objective of much of the research and theorizing about Management Information Systems has been about the use of information technologies to improve the efficiency and enhance the effectiveness of businesses and other organizations (Power et al., 2016).

Information is a critical resource in the organization and therefore must be managed with highest degree of efficiency and effectiveness, to provide all possible assistance to the Foundation in all fields and at various levels to achieve its objectives and complete its work successfully. Thus, the institution should prepare information management system and the need for a formal system to provide sound information about the past, present and future, in time for the appropriate authorities to enable them to make the best possible decisions regarding the functions and activities of the institution.

Due to the rapid change in information technology, some institutions are no longer able to keep pace with it, these institutions often resort to contracting with specialized institutions. However, the success of the management information system is not measured by the extent of progress and the complexity of techniques, but it is measured by its contribution and help in achieving the objectives of the institution (Abu Naser, Al Shobaki, 2016).

And therefore we can draw the concept of the information system as follows: group of organized elements (individuals, equipment, software, networks, data) and by which the collection and storage, operation and distribution

of information necessary for decision-making, coordination and oversight within the organization.

13. THE EFFECTIVENESS OF MANAGEMENT INFORMATION SYSTEM

Determining MIS effectiveness is relayed to the following characteristics (Abu Naser & Al Shobaki, 2016):

1. The information has been prepared on the basis of user need and must meet the needs of users to make effective decisions.
2. Provide accurate and relevant information in a timely manner.
3. It should be linked using a computer to facilitate analysis, storage and access operations.
4. To be effective in comparison to the costs.
5. There must be an organizational unit of specialized information management system, and work as a consultant for executives.

14. TYPES OF MANAGEMENT INFORMATION SYSTEMS

o **Data processing systems:** Through this system is information about the different activities of the institution and processed and stored until needed and summarized and displayed in the form of reports collection (Power et al., 2016).
o **Management Information Systems**: Managers have realized that the usefulness of computer-sustainability is not just limited to business accounting, payroll and billing, but also used to store information about the activities of the Foundation on past events and present what is expected to happen in the future and to take administrative decisions.

The main purpose of MIS is to provide the right information to the right people at the right time. The ideas of management information systems were formed to counteract such inefficient development and productive use of the computer. MIS concepts are crucial to efficient computer use in business (Mohammed & HU, 2015).

o **Decision Support Systems**: Defined as information system using computers to give managers easy and quick access to internal and external information they need to perform administrative activities (Kurdish, 2010; Al-Salmi, 2005).
o **The senior management support systems**: It is designed to support senior management in institutions . It includes a PC-specific information the beneficiary, in addition to the possibility of arriving at the information in the mainframe which

15. KNOWLEDGE-BASED SYSTEM DEFINITION

A knowledge-based system is a computer system which produces and employs knowledge from diverse sources, information and data. These systems help in solving problems, particularly difficult ones, by using artificial intelligence thoughts. These systems are frequently used in problem-solving processes and in supporting human learning, decision making and other activities(Abu Naser, 1993; Abu Naser et al., 2010,2011; Akkila & Naser, 2016; Azzab et al., 2000; Buhisi & Naser, 2009).

15.1 Knowledge-Based Versus Information Systems

Table 1 shows a Comparison between Knowledge-Based systems and Information Systems.

Table 1: Comparison between Knowledge-Based systems & Information Systems

| Knowledge-Based versus Information Systems	
Information System	**Knowledge-Based System**
Gives a guaranteed solution and concentrates on efficiency	Adds power to the solution and concentrates on effectiveness without any guarantee of solution
Data and/or information processing approach	Knowledge and/ or decision making approach
Assists in activities related to decision making and routine transactions; supports need for information	Transfer of expertise; Make a decision based on knowledge, explains the decision, and upgrades decision, if required
Examples are TPS, MIS, DSS, etc.	Examples are expert systems, CASE-based systems, etc.
Manipulation method is numeric and algorithmic	Manipulation method is primarily symbolic/connectionist and non-algorithmic
These systems do not make mistakes	These systems learn by mistakes
Need complete information and/or data	Partial and uncertain information, data, or knowledge will do
Works for complex, integrated, and wide areas in a reactive manner	Works for narrow domains in a reactive and proactive manner

15.2 General Structure of a Knowledge-Based Systems
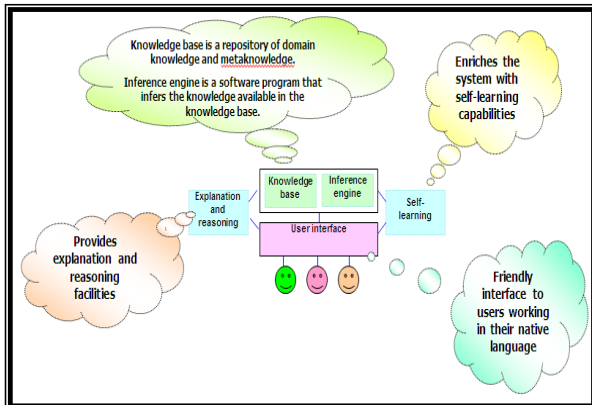
Figure 1: General structure of Knowledge-based Systems
Source: Jones and Bartker Publisher, LLC
(www.jbpub.com), 2010.

A typical Knowledge-based Systems consist of the following elements (as seen in Fig. 1):

- **knowledge base :** It contains the essential information about the problem domain and often represented as facts and rules

- **Inference engine:** It has the mechanism to derive new knowledge from the knowledge base and the information provided by the user which is often based on the use of rules

- **User interface:** used for interaction with end users and for developing and maintaining the knowledge base**.**

15.3 General Concepts And Characteristics Of Knowledge-Based Systems

- **Knowledge acquisition**: transfer of knowledge from top management personnel to computers. Sometimes knowledge can be acquired directly from the environment

- **Knowledge representation:** Suitable for storing and processing knowledge in computers collected from top management**.**

- **Inference:** mechanism that allows the generation of new conclusions from existing knowledge in a computer

- **Explanation:** illustrates to the user how and why a particular decision was made

15.4 Types of Knowledge

The following table shows the different types of knowledge and a brief description of them(Naser & Lmursheidi, 2016; Naser et al., 2010; Naser & Akkila, 2008; Naser & Alawar, 2016; Naser & AlDahdooh, 2016; Naser & Alhabbash, 2016; Naser & Al-Hanjori, 2016; Naser & Al-Nakhal, 2016; Naser & Bastami,2016):

Table 2: Types of knowledge

Knowledge Type	Description
Domain knowledge	Domain knowledge is valid knowledge for a specified domain. Specialists and experts develop their own domain knowledge and use it for problem solving.
Meta knowledge	Meta knowledge can be defined as knowledge about knowledge.
Commonsense knowledge	Common sense knowledge is a general purpose knowledge expected to be present in every normal human being. Common sense ideas tend to relate to events within human experience.
Heuristic knowledge	Heuristic is a specific rule-of-thumb or argument derived from experience.
Explicit knowledge	Explicit knowledge can be easily expressed in words/numbers and shared in the form of data scientific formula product specifications manuals, and universal principles. It is more formal and systematic
Tacit knowledge	Tacit knowledge is the knowledge stored in subconscious mind of experts and not easy to document. It's highly personal and hard to formalize and hence difficult to represent formally in system. Subjective insights, intuitions, emotions, mental models values and actions are examples of tacit knowledge.

15.5 Development of Knowledge-Based System Technology

- KBS is strongly influenced by cognitive science and mathematics which is the way top management make decisions. Its formal foundations as logic and inference.

- Production rules as representation mechanism takes the form " IF … THEN type rules " which is reasonably close to human decision making. It can be easily manipulated by computers. It has an appropriate granularity which means knowledge "chunks" are manageable both for top management and for computers (Naser & El-Najjar, 2016; Naser & Haddad, 2016; Naser & Hamed, 2016).

15.6 Knowledge-Based System Advantages

- Economical: has a lower cost per user
- Availability: it is accessible anytime and almost anywhere
- Response time: It is often faster than top management experts
- Reliability: It can be greater than that of top management experts(no distraction, fatigue, emotional involvement, …)
- Explanation: the reasoning steps that lead to a particular decision
- Intellectual property: It can't walk out of the door.

15.7 Knowledge-Based System languages

There are higher-level languages specifically designed for knowledge representation and decision making like SL5 Object(Naser, 2015). SL5 Object stands for Simpler Level Five Object was designed and developed by Professor Samy S. Abu Naser in 2015 using Delphi Embarcadero XE6.

15.8 Knowledge-Based System Examples:

The financial services industry has been a vigorous user of KBS techniques. Advisory programs have been created to assist bankers in determining whether to make loans to businesses and individuals. Insurance companies have used KBS to assess the risk presented by the customer and to determine a price for the insurance. A typical application in the financial markets is in foreign exchange trading, KBS have used in diagnosing human problems and recommending the appropriate treatment, Machine malfunction diagnosis, Plant diseases diagnosis and prescribing the proper treatment, and deciding the appropriate student major in a university (Naser & Hasanein, 2016; Naser & Hilles, 2016; Naser & Mahdi, 2016; Naser & Shaath, 2016; Naser & Zaiter, 2008, Naser et al., 2008; Naser, 1999; Naser & Al-Bayed, 2016). The following example shows a snap shot of the knowledge based system for deciding the appropriate student major in the faculty of Engineering in Al-Azhar university of Gaza (Naser & Zaqout, 2016). The compete knowledge based system can be found in reference (Naser & Zaqout, 2016).

```
RULE r1
IF start
THEN action OF mstable1 IS top
AND action OF mstable2 IS top
AND start  := FALSE
AND subj4  := ((mstable1.calc1 * 4) + (mstable1.calc2 * 4)
+ (mstable1.electricity * 3) + (mstable1.electronic * 3)) / 14
AND subj2  := (mstable1.icomp + mstable1.prog ) / 2
```

```
RULE r2
IF me = 0
AND mstable1.gpa >= mstable2.me1
AND mstable1.pcredit >= 24
AND subj4 >= mstable2.me2
THEN me := 3
```

```
RULE r3
IF cce = 0
AND mstable1.gpa >= mstable2.cce1
AND mstable1.pcredit >= 24
AND subj4 >= mstable2.cce2
THEN cce := 3
```

```
RULE r4
IF mde = 0
AND mstable1.gpa >= mstable2.mde1
AND mstable1.pcredit >= 24
AND subj4 >= mstable2.mde2
THEN mde:=3
```

```
RULE r5
IF re = 0
AND mstable1.gpa >= mstable2.re1
AND mstable1.pcredit >= 24
AND subj4 >= mstable2.re2
THEN re:=3
RULE r6
IF se = 0
AND mstable1.gpa >= mstable2.se1
AND mstable1.pcredit >= 24
AND subj2 >= mstable2.se2
THEN se := 3
```

```
RULE r7
IF cs = 0
AND mstable1.gpa >= mstable2.cs1
AND mstable1.pcredit >= 24
AND subj2 >= mstable2.cs2
THEN cs := 3
```

```
RULE r8
IF is = 0
AND mstable1.gpa >= mstable2.is1
AND mstable1.pcredit >= 24
AND subj2 >= mstable2.is2
THEN is := 3
```

16. CONCLUSION RECOMMENDATIONS

Researchers propose a set of recommendations that could lead to a reduction or limitation of potential problems, especially those related to unintentional bias and ambiguity, these problems controls the collection of information for the elementary knowledge base. Considering that the knowledge-based information systems are dynamic where it formed, constructed and programmed throughout development phase for training and learning. That is, they learn from the experience and knowledge gained through training and practice, they can distinguish patterns and determine handwritten symbols and word recognition, forecasting and other variables, and other various applications especially in the areas of business and finance. So the various institutions should:

- Use of knowledge-based information systems in the administrative decision-making process.
- Create frameworks capable of using modern applications of information technology in various administrative levels.
- Benefit from the advantages offered by the existing knowledge-based information systems with respect to the effort, time and money and to be able to respond to the conditions and environmental changes

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