

## Impact of Big Data on Decision-Making Process in Business Environments

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**Abstract.** The enormous development of information systems and techniques are called for the need to be used by senior management in business organizations and to help speed decision-making and support the organization's operations in general. The information is an important component supplier and a strategic objective depends upon enterprises in the competitive confrontation with their peers. Relying on the information system that helps the decision maker to take the decision to speed and accuracy required, giving it a competitive advantage. The Decision support systems are considered the most important information that rely on computers to provide appropriate support to improve the quality of decision systems; and this is done by integrating data and models and software in an effective system of decision-making. The use of these systems, especially in support of the semi and non-structural decisions that serve mainly middle management is characterized by integrating the information and research technology operations, which contribute to the decision support at all levels of decision-making. There are a great variety of applications of these systems between the planning of the institution, risk management and Advertising strategy. So, the main objective of this article is to analyze and examine the theoretical roles of Big Data in the decision-making process, and to provide researchers and practitioners with a clear vision of the challenges and opportunities of applying data storage technologies so that new knowledge can be discovered.

### Keywords

Big Data, Decision support system DSS, Hadoop, RFID, XML, and Decision making process

### 1. Introduction

Computer technology during the last decade has numerous changes in the many fields. Looking back the evolution of the computer, in the early ages, the mainframe era was made a big evolution in which only expert accessed the computer. But today, the popular devices as laptops, tablets and Smartphone are owned and accessed by all ages [1]. The third wave of computing (ubiquitous computing) is already upon us, leading to the departure of mainframe and personal computer[2]. The technologies like satellite navigation, sensor network, grid computing, context-aware computing and the ubiquitous computing are supporting the domain for improved monitoring and decision making capabilities[3].

Big Data is an important phase in the development of information and communication systems. They express the concept of simplified and reductive for a huge amount of complex data that are larger than traditional computer software and mechanisms ability to be stored, processed and distributed, which prompted specialists to develop a sophisticated alternative solutions enable the control and flow control. The question here is about the nature of the phenomenon and how to be included in the general path of technological developments that defined the information society since the advent of the digital revolution. In fact, it can be considered an extension of the phenomenon of massive data and over again to the phenomenon of returning the information and

communication society since the beginning of binary encoding of the data that led to the digital revolution and the emergence of the information society.

In every stage of the development of communicative phenomena, it has always been the obvious reaction is to find alternatives and updating curricula and conditioning solutions and devise appropriate ways to control the rapid flow of data. This is what happens the day before the direct perpetrators of designers, manufacturers and users of digital evidence on networks which make the phenomenon of mega-event data circulating widely the latter period. Increasingly, nowadays, companies realize the importance of using Big Data in business environment, because of their confrontation with huge amounts of data that originate in social networks and mobile communications, in addition to the traditional databases. The economic impact of the sheer amount of data produced in a last two years has increased rapidly. It is necessary to aggregate all types of data (structured and unstructured) in order to improve current transactions, to develop new business models to provide a real image of the supply and demand and thereby, generate market advantages[4].

Big Data already penetrated businesses processes and in few years will impact all economic and social sectors, even there are several technical challenges. The influence of Big Data analysis on management and decision making is too valuable to be ignored. A major issue for companies leveraging Big Data is the processing time for data analysis. After gathering and storing data, the massive parallel processing and the usage of analytics in order to better understand the dynamics of business is essential. Big data is first and foremost about data volume, namely large datasets measured in tens of terabytes, or sometimes in hundreds of terabytes or peta bytes. In addition to very large data sets, big data can also be an eclectic mix of structured data (relational data), unstructured data (human language text), semi-structured data (RFID, XML), and streaming data (from machines, sensors, web and mobile applications, and social media) [5].

The term data refers to data sets or data environments related to mobile services. These data are generated from transactions through web/mobile, e-mails, multimedia (Images, videos...), logs, Electronic health records, social networking services and interactions, sensors and web or mobile services etc. The mobile services dimension deserves to be revised to increase the scope of our work [1]. This data storing database raising enormously and become tough for capturing, arranging, storing, managing, sharing, analyzing, and visualizing via classic or traditional database software tools. Big data demands a revolutionary move towards from classical data analysis. However, the definition basically states the most obvious dimension of Big Data: volume, but obviates velocity and variety. The convergence of these three V's comprises the primitive Big Data characterization.

Regarding Big data management, we say that it is concerned with two things – Big data and data management plus how these two work together to reach the goal [1]. This is where data management disciplines, tools, and platforms are applied to the management of big data. Traditional data and new big data can be quite different in terms of content, structure, and intended use, and each category has many variations within it. To accommodate this diversity, there is need of multiple types of data management tools and platforms, as well as diverse user skills and practices [6]. Relative to big data, [1] identified two complementary types of resources:-

- The data itself
- The capability to handle/control and utilize big data.

It is good news from [7,8] where a survey conducted in this paper mention that there are so many options to manage big data. But there is also a bad news, it's hard to know them all and select the best one. An option can be many things, including vendor tool types and tool features, as well as user's techniques and methodologies. Regardless of what project stage you're in with big data management, knowing the available options is foundational to making good decisions about approaches to take and software or hardware products to evaluate. This survey provides a list includes options that have arrived fairly recently (Hadoop, Map Reduce, event processing), have been around for a few years but are just now experiencing broad adoption (in-database analytics, in-memory DBMSs, clouds),or

have been around for years and are firmly established (metadata management, data federation, appliances, columnar DBMSs).

## 2. Phases of Development of Digital Data Processing Systems Till Big Data

The sequence of technological development systems courses digital data which arrived at this point to the phenomenon of big data in all its forms and in all related technologies, including fast data transfer network address (Grid networks) and data cloud (Data in the clouds) and technological standards (interoperability standards) and analysis data (data analytics). Without also return to the historical origins of the invention of printing five centuries ago, or return to the assets prehistory to the invention of writing since 5000 (and both of the major inventions that can be considered in their historical context - versions primitive to the phenomenon of mega) data, reflected for us in three stages mainly on the level of digital data contributed to the payment to the huge data that today's stage:-

- **The first phase:** from paper to digital culture vessels: This is the invention of printing and book manufacturing and distributing a broad revolutionary leader is unprecedented in the dissemination of information. It has produced a massive explosion of data in all fields and in all forms (huge database paper by age) standards. Then came the digital technologies at a later date to include blast paperwork and re-structured first through the invention of the personal computer, and then by connecting computers in local networks operate according to international standards conformity.
- **The second phase:** from the PC and local networks to the Internet: what has implemented the ability of desktop PCs and local networks to follow up on the massive influx of data (especially after the development of the multi) media techniques, it became open to international VPN to share resources and exchange inevitable. It was the establishment of search engines and directories on the virtual networks such as the Internet to help control the amount of data produced and exchanged. As new international standards for the units, indexing and cataloging design (metadata) and more sophisticated search tools (smart) agents. The metadata "Dublin Core," which was designed in 1995, a blatant expression of the concern of many international actors such as OCLC and NCSA of the possibility of losing the ability to control the vast amount of streaming online data model. Metadata or metadata repositories, smart agents is also considered, and fuzzy logic, and techniques of payment data, etc other forms to express the need to improve the possibilities of access and use the enormous amount of data available on the Internet.
- **Third phase:** from the Internet to the classic mega-data: The massive data a new reality that was produced by the ongoing developments in terms of quantity and quality of automated systems for the production and processing of information. In 2013, it arrived daily trading volume of data that have been created to 2.5 trillion bytes, and 90% of it was created during the past two years. Thus, the huge Data is a term used to express the volume of data used resources to respond to the questions was hard to come by in the past. It is also the subject of a broad consensus on the massive data the ability to replace the traditional curriculum shop thanks to three characteristics: size and speed and diversity. There is also a broad consensus on the great potential for massive data to drive innovation and advancement in all fields of economic and cultural activities. To do that, the huge data relied on modern technologies and the application of standards for information and communication technology. And cloud computing, and high-speed data networks and data analysis programs are among the

formidable technological arsenal that support the emergence of huge data in various sectors.

But despite the general agreement both on potential or existing data entries huge, the lack of access to a complete consensus on many major issues and the basic things about this phenomenon continues to be a source of confusion. From these basic issues recall, for example, those relating to the identification approved qualities in a particular classification system as a system of massive data [9]. Also it can be questioned for determining the nature of the difference between mega data on the one hand and traditional data applications on the other hand. Then what are the basic characteristics of large data environments? How can the environments currently deployed to integrate into the structure of massive data? What are the technological, scientific and regulatory challenges that must be addressed in order to accelerate the adoption of large data solutions for efficient and reliable manner? All questions are still in the process of search and sift through the studies and experiments and research programs and uses and feasibility studies, which are all involved in the construction of the theoretical and technical framework for the general development of technology and the creation of differences innovation and creativity and innovation.

### **3. Big Data Definition & Characteristics and Importance**

McKinsey Global Institute 2011 has defined Big data as any set of data that are beyond the capacity of the size of traditional database tools to capture, store, manage and analyze that data. Consisting massive data from both structured information, which constitute a fraction of up to 10% compared with information is make up the rest. The information is organized is manmade, e-mail messages, videos, tweets, Facebook publication, chat messages on Whatsapp, clicks on sites and others. Big data has become the reality we live in, so that the Oxford Dictionary the term was adopted and added to the dictionary with other terms such as innovative Tweet. What is a huge day, it will not be the case tomorrow. What is huge for you is too small for others. Here, the challenge is huge meaning to the definition. Since last year, the limits on the size of data sets appropriate for treatment in a reasonable period of time subject to the EB unit data measurement. Intel research estimates that the volume of data generated by humans since the beginning of history until 2003 amounted to 5 Exabytes, but this figure has doubled 500 times during 2012 to reach 2.7 Zettabyte, and figure was triples on 2015 [10].

Each one of us fired 2.2 million terabytes of data per day, and there are 12 terabytes of tweets a day with 25 terabytes of entry on Facebook and on Twitter a day more than 200 million active users are writing more than 230 million tweets daily records. The volume of data in 2009 was about 1 Zeta byte (trillion gigabytes) in 2011 and rose to 1.8 Zeta bytes. IBM says that we produce 2.5 quintillion bytes of data every day (Alquintelln is the number one followed by 18 to zero). These data stem from everywhere, such as information on climate and comments posted on social networking sites, digital photos, videos, and transactions buying and selling [11].

Big data is the next generation of computing and working to create value through the scanning and data analysis. Over time, the data produced by the user become a rapidly growing for several reasons, including the procurement data in supermarkets and commercial markets, shipping bills, banking, health and social networks. With the development of facial recognition and people techniques, they will be able to find more details and information about anyone, and with the growing number of Internet-connected devices, devices that are not used to connect to the World Wide Web such as cars and refrigerators and washing machines, they all contribute to increasing the volume the data produced (see Fig.1).

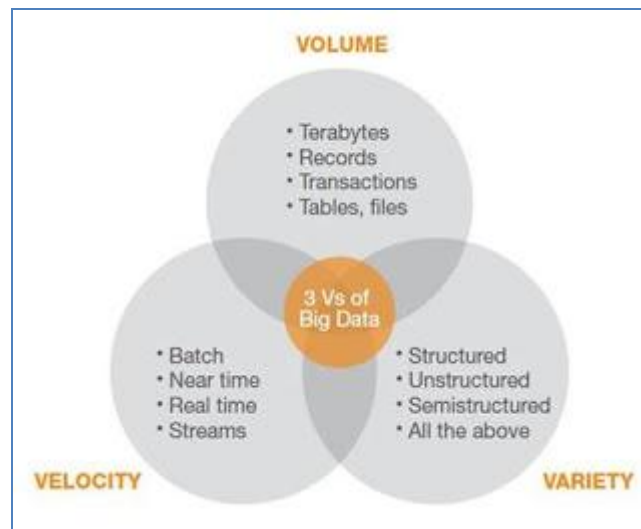


Fig.1 Big Data Types and Characteristics

To make the data be large or massive, it should cope of three key factors:-

**Size:** The number of Terabyte data that we are launching a day of content.

**Diversity:** It is the diversity of this data between structured and unstructured and semi-structured

**Speed:** How fast the frequency of data occurs, for example, the speed of deployment of tweets for scan speed sensors after climate changes vary.

But what are the characteristics of massive data? Through the data size is huge discrimination, diversity, and speed. Through the study of the large volume of data companies can customers better understand, imagine, for example, research in purchases million data deal with Wal-Mart store, this research and analysis in the avalanche of bills purchases and repeat purchases and diversity, will give very useful for management and decision makers information. It highlights the challenges to the management of traditional databases in dealing with diverse data and fast tools, where the traditional databases dealing with text documents and numbers only, while huge data today contain new types of data that cannot be ignored, such as images and audio clips, video, three-dimensional models and data, and other geographic locations [12,13].

With the increasing volume and diversity of data that companies deal with today and found herself in front of two ways, either to ignore this data, or to adapt them to start gradually to understand and take advantage of them. But with the use of traditional tools used previously, you cannot analyze and take advantage of this huge new data. For example, the vast majority of shops and commercial markets that deal with loyalty cards, do not benefit from this data and dealt with in a way to help them understand buyers better to develop a model of loyalty cards. And also all the video recorded by the medical devices during surgical clips, do not use them properly, but they are deleted within weeks. Today **Hadoop** is the best techniques to deal with massive data [14], which is an open source library appropriate to deal with the colossal data and fast, and used large companies **Hadoop** service, for example, there Linked specialized social network functions and work use the service in order to generate more than 100 billion proposal to users Weekly. But what is the use of large data? IBM says that the huge data give you a chance discovery of important insights in the data, Oracle says that the huge data allows companies to understand their customers more deeply. Cisco estimated that, by 2015, the



- **Amazon.com site** handles millions of background processes every day, as well as inquiries from more than half a million third-party vendor. Amazon on the Linux system and relies mainly to be able to deal with this huge amount of data, and Amazon owns three largest Linux databases in the world, with a capacity of 7.8, 18.5 and 24.7 terabytes.
- **Supermarket chain Walmart** deal with more than one million commercial transaction every hour, which is imported into databases estimated to contain more than 2.5 Petabytes (2560 terabytes) of data - the equivalent of 167 double the data contained in all the books in the Library of Congress in the US United.
- **Facebook** handles 50 billion image of its users base. The protection of credit card fraud "FICO Falcon Credit Card System Fraud Detection System" to protect 2.1 billion active accounts in all parts of the world.
- **The Windermere Real Estate Company** using GPS signals from unknown nearly 100 million drivers to help new home buyers to determine their leadership times to and from work during different times of the day.

### 5. The Concept and Importance of Decision Support Systems

Decisions represent the most challenging role of managers when the industry, and given the tremendous development in information systems and technologies used, this is called to be used by senior management in business organizations to help speed decision-making. The decision-support systems of the most important information that rely on computers, which was a harvest of evolution in information technology during the seventies and eighties a natural progression for the way you use your computer. This system simply focuses on providing appropriate support to improve the quality of decisions, as it works to achieve this requirement by integrating data systems the models and software in an effective system of decision-making. Given the nature of the composition is of extreme importance, since its inception in carrying ultra-development information technologies leading to the organization gain a competitive advantage for all competitors who do not use these systems [15,16]

Depending on these important applications in numerous areas of the institutions, and to achieve the effective application of these systems must provide several factors, the most important support of senior management have in addition to the availability of cadres constituents in the various fields of economic analysis, statistics and operations research. Within this context, we should be aware about the following important queries:-

- What are the dimensions and mechanisms of decision support systems?
- What are the areas of applications?
- What are the criteria for effectiveness?
- The most important obstacles and dilemmas facing the application process?

The concept of decision support systems is composed mainly from three basic concepts defined by:-

- **Concept system:** the system is meant in the context of general systems theory as a regular set of parts or sub-systems interconnected and interacting with each other.
- **The concept of support:** is the support that these systems offer to the decision maker or team decision.
- **The concept of the administrative decision:** is the product of the process of differentiation between the proposed alternatives, and the resolution is generally linked to the process of making and decision-making which is a logical product of this process

With regard to the concept of Decision Support System is a built-up information systems on the computers and the systems that facilitate the interaction between the human element and information technology in the production of appropriate information to the

needs of users in the decision support system goal of this interaction is to be providing the necessary support to streamline decision-making process. Only [17] defines Decision Support System DSS linked to the computer to support managers and business professional's information system during the decision-making process has been developed to support the administration and solving unstructured problems to improve the decision-making process [13,14].

Lecker [10], see that the decision support systems are interactive computerized systems will help the decision-maker on the use of data and models to solve the semi-structural and non-structural problems, but somehow these managers and their personal style in solving problems. This is consistent with the definition of (CASE PAKER): who sees it systems is equipping managers with tools to help them in solving the semi-structural and non-structural problems, but somehow these managers and their personal style in solving problems.

There are those who suggest that they represent an extension of the management information systems that provide managers with the tools and data they need to make decisions, while management information systems provide structural and routine information necessary for management decision-making, then the field of support systems managers in problem solving unstructured and non-routine [18].

In addition it is an interactive computer-based systems and models of decisions and database specialist to assist the decision done by the user Director-making system and it is a natural product of the Information Systems reports and transaction processing systems. Decision support and various kinds of advanced systems because of the need for objectivity emerged departments for the presence of techniques and tools to support the complex decisions that are subject to the conditions of risk and uncertainty. As it is, in the words [10] is the effective combination of human intelligence and information technology and software that interact strongly with each other in order to solve complex problems. The importance and benefits of these systems can be summed as follows:-

- Characterized with supporting the rest of the other information systems by integrating systems between technology and operations research as part of the efficiency of the decision-maker.
- Increase the number of alternatives and the possibility of choosing the optimal alternative from a range of alternatives tested by providing a sensitivity analysis faster and faster response and faster response. Where you can provide support successive and interconnected by a series of decisions, it provides support for all stages of the decision-making process.
- Better business understanding, enabling decision-makers to see relationships, which can be used to develop a comprehensive picture of the business.
- Quick response to unexpected situations, easy review of the models and the vision for rapid variables.
- The ability to complete the analysis for a particular purpose, providing a variety of means and methods for the preparation of the technical analysis for specific purposes.
- Improve communications, control, communication channels are documented and improved, more consistent and plans and procedures for calculation stylized.
- Save time and costs, and shorten the office work and reduce overtime and then.
- Better decisions, better teamwork, efficiency and better use of the resources of the data.

Finally, it could be argued that the use of decision support systems carry its inception in cutting-edge information technologies leading to the organization for an important competitive advantage for each of its competitors who do not use these systems and techniques. The decision support systems can be classified into three types according to its application in various environments as follows:-



- **Institutional support systems decisions:** It is a complete systems to be developed in order to allow the decision-maker to retrieve or generate the related problem of a general nature information example, market analysis, production schedules etc ... These systems are designed with a view to continuous use.
- **Generators decision support systems:** These generators are designed to help the decision-maker in the generation of fast applications for decision support systems with limited potential compared with the institutional support systems decisions but characterized by fast development and its ability to generate reports and perform analyzes very quickly, using the fourth generation languages.
- **Decision support systems tools:** These tools are designed to assist in the development of decision support with limited potential compared to the previous two species systems. Examples of such tools are packed electronic scales and offered the possibility of generating graphs and address database is limited and can use these tools independently or through a decision-support systems.

## 6. Decision Support Systems Properties and Advantages

In view point of the areas of application of decision support systems there are several applications for decision support systems in areas that require and semi-structural decisions, in addition to supporting the structural decisions that applications are spread broadly to support the activities and operations of the administration in the first-line systems [18]. Most of these applications have been developed by the information and international consulting IT companies in the field of software and industry more companies are buying these systems are packaged especially in complex applications integrated packed. These systems are used in activities that require speed, accuracy and objectivity in decision-making, where there is a decision support systems used mainly analysis techniques Why? Technique sensitivity analysis more than any other functions use these functions for the analysis of investment and risk management, for example, while based work of other packages on simulation or the use of digital documents and maps as in geographic information. As we may find important applications for systems supporting decisions under different labels lacks support word or word decision as is the case in, for example, geographic information systems, however they are patterns or generations of decision support systems because and the nature of their goals is limited in providing effective support to take a semi and non-structural decisions. Examples of decision support systems to predict and plan for the institution purchase patterns analysis, investment evaluation, and selection promotion. In addition to other patterns geared to accomplish specific functional decisions, such as the development of advertising strategy.

The major properties that decision support system should be met are:-

- Assist decision makers in the implementation of semi-structured tasks.
- Rely on human interaction - by providing automated capabilities to get answers to a series of questions to put forward alternative scenarios in front of the decision maker.
- Provide support for decision support for all levels of management, especially top management systems.
- Decision Support provides support in the field of independent decisions systems or the decisions that require a decision that the entire one taken as a result of consultation and interaction between a group of people.

- Enable decision-maker of information systems to the problems of finding solutions under study and also choose a number of different solutions while retaining its activity, a primary and control over decision-making control.
- Combines decision support systems between data mathematical and statistical models and rules.
- Provide decision support necessary support in various stages of decision-making systems, starting with perception and problem identification to the final selection of the best alternatives stage.
- Must be flexible decision support systems so they can be adjusted to fit in with the surrounding circumstances.

The important advantages that any organization gets it from using DSS are:-

- Possibility of testing a larger number of alternatives.
- Rapid response to unexpected situations.
- Save time and cost.
- The possibility of more than a different policy to resolve the experience.
- Access to objective decisions take into account the perspective of the decision maker.
- Increase the effectiveness of the decision-making process.
- Narrowing the gap between the performance levels of decision makers.

## **7. Current Business Applications using Big Data Tools**

In the current times, there are many big data analytical tools available, such as predictive analytics, descriptive analytics, and survival analysis. Many methods and techniques are designed, such as linear regression, logistic regression, neural networks, and support vector machines. They are applied in many business areas, some of which are discussed as follows [19,22]:-

### **7.1. Social network analysis**

The increasing use of social networks, such as Facebook, Twitter, and Weibo (<http://www.weibo.com/>), has produced and is producing huge volume of data. Twitter posts more than 500 million tweets every day. Weibo is reported to have over 766 million active users per day in 2014. Business firms and other organizations are interested in discovering new business insight to increase business performance. By using advanced analytics, enterprises can analyze big data to learn about relationships underlying social networks that characterize the social behavior of individuals and groups. Using data describing the relationships, we are able to identify social leaders who influence the behavior of others in the network, and on the other hand, to determine which people are most affected by other network participants. We can also use diffusion analysis to identify the individuals most affected by the group leaders and target the marketing to them.

### **7.2. Fraud detection**

Fraud detection is used in many areas including credit card fraud, insurance claim fraud, money laundering and tax evasion. Basically, it is to detect anomalies from data and transactions. Supervised, unsupervised, and social network learning can be used for fraud detection. For example, in banking industry, FICO Card Detection System protects accounts world-wide.

### **7.3. Customer Relationship Management**

The cost of retaining customers is significantly lower than the cost of replacing them, making the ability to identify customers at risk of churning vital. Key

Performance Indicators are used to describe customers, including demographic information and recent call patterns for each individual customer. Predictive models based on these fields use changes in customer call patterns that are consistent with call patterns of customers who have churned in the past to identify people having an increased churn risk. Customers identified as being at risk receive additional customer service or service options in an effort to retain them.

#### **7.4. Marketing**

Customer classification is helpful for designing campaigns and customizing promotion. For example, a telecommunications provider has segmented its customer base by service usage patterns, categorizing the customers into four groups. If demographic data can be used to predict group membership, we can customize offers for individual prospective customers. These can be done by applying logistic regression or neural networks.

### **8. Conclusion**

The decision support systems sophistication from the rest of the other information systems by integrating the information and research technology operations in an interactive framework which contributes to the support of makers various stages of making Alaqrar.oon core feature of these systems is to provide managers with the tools and not the information that will help them in solving semi-structural problems. Due to its importance in supporting and rationalization of administrative decisions; it expanded the areas of use and fields of application, and this is not necessarily led to the development of the evolution of information technology.

The decision support system environment of the most important factors affecting the effectiveness, including the indicators most important top management support as well as financing and the availability of technology, mechanisms and rely on cadres in various fields, especially in operations research and economic analysis, and cadres of computers and communications networks service. The management of this system from the most important of these conditions, which must be scientific and conscious, enjoy bold leadership with vision and strategic planning capacity in line with the requirements of the current age. The most important obstacles and dilemmas facing the application of decision support resistance to change and a weak environment IT infrastructure and poor decision-environment systems.

We should expand the wide application of big data analytics in the business world, as well as an exponentially increasing number of papers in this area. These business applications have dramatically changed our everyday life. Finally, it could be argued that the administrative decision in Arab institutions in general; still based on intuition, experience and trial and error and lacks scientific use of information technology based on modern technologies such as the big data and Internet of things must insert a quantitative dimension and the use of modern techniques and try to apply decision support systems to be making more quality and effectiveness. This necessarily contributes to the achievement of the objectives of the organization and growth in light of competition and rapid changes.

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