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THE ROLE OF BIG DATA IN BUSINESS AND DECISION MAKING

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Annotation: Big data has been increasingly considered by experts and company owners due to its direct impact on the development of businesses and companies, so that big data management increases the efficiency of important business decisions. With the increasing use of the Internet and the advancement of information storage technology, there is a vast amount of information that can be used and properly examined. This amount of information is called big data and can be used to make important decisions for the development of a company. All the while, many start-ups and even large corporations are unsure how to use big data. In addition to looking at big data and its role in decision making, this article examines how to properly extract information to support decision making.

Keywords: big data management, business intelligence

Introduction.

Today, the volume, variety, and speed of primary data obtained from individual consumers are unprecedented, and this has led to a so-called big data revolution. The big data revolution will potentially lead to a full understanding of consumer behavior and the formulation of market strategies. Although big data is considered a new form of capital in today's market, many companies do not enjoy its benefits and must allocate appropriate physical, human, and organizational resources and capital to obtain this new form of capital. With the growth of the Internet in the last decade, it has led to the production of large amounts of data in any type of business. The development and application of technology to effectively use large amounts of information available on the Internet to make decisions is

associated with big data. The emergence of new technologies has left us with the daily production of huge amounts of data. Big data has created a competitive environment for companies, so the importance of big data is not hidden from universities, companies, and governments. This data is complementary to activities such as complex problem-solving techniques. Data plays a key role in them. Big data infrastructure projects are used to make the process easier. Issues such as business intelligence, marketing intelligence, healthcare, security, and customer well-being are also tied to big data characteristics, which is why big data is interesting to researchers, businesspeople, and politicians. On the other hand, a large part of the big data related to click-through and relocation data through mobile devices requires high speed, which can be used for short-term forecasting with high accuracy [1-14] That's why big companies like Google and Facebook, which are skilled at analyzing huge amounts of data, are looking to build new businesses and explore big data.

Manyika et. al. (2011) believe that extracting the best possible results for big data management is related to factors such as data policies, specific techniques and technology, organizational change and skills, data access, and infrastructure [7]. Russom (2013) studies show some of the basic problems with big data management, including: a group of people who are not skilled enough in business and IT or fantasy; an inadequate data management infrastructure; and relationships to raw data types from different sources, such as semi-structured or unstructured data [15]. Big data is used incrementally with different structures in different parts of the organization. This data is based on customs including structured data, complex data, semi-structured data, blogs, unstructured data, and media data. Socials are data production machines (sensors, RFID). Therefore, despite the high volume of data (with a wide variety of data types), companies must be able to manage this data with good speed and accuracy and be able to respond quickly to such challenges.

Big data has the potential to increase economic efficiency, improve access to social services, access to relevant information and create new communication platforms. For example, on different maps for drivers, by giving color information about traffic on the road, it is possible to suggest the best possible route that helps in time and fuel consumption. Big data can play an effective role in making organizational processes more efficient by improving performance, facilitating innovation, adapting and optimizing resources. BMW, for example, quickly combines and analyzes data from prototype tests, workshop reports, and many other sources to quickly identify major model problems and vulnerabilities and to identify them before launching new models. It removes the model.

Big data management and technologies that have the ability to analyze and reduce the processing time of some types of data from several months to a few days. By timely obtaining patterns and anomalies in products and reviewing the

data related to the maintenance of a company, it allows it to perform the necessary repairs at the right time. Similarly, according to an IBM report in 2013, big data analytics allowed our company, Dannon, to have a more accurate forecast of customer demand, which ultimately led to higher consumer satisfaction, less waste, and profitability. It got higher. Researchers can also use big data in their research for human welfare. For example, massive amounts of data and information about patients have aided them in identifying drug interactions as well as designing and implementing optimal drug treatment methods.

Definition of terms used in research.

Big data refers to a set of data that is larger than a typical database and can be created, stored, managed, and analyzed by existing tools but requires the creation of new technologies for managing big data [7]. According to research by Fisher, DeLine, Czerwinski & Drucker (2012) [5], big data often means that data volumes cannot be managed, processed, and analyzed in simple ways, and that technologies, much more powerful techniques, and people are needed, with new skills for managing large data sets.

Business intelligence is defined as "a set of methods, processes, architectures, and technologies that turn raw data into meaningful and useful information in order to have strategic, tactical, and operational insights and make effective decisions".

2. Theoretical foundations and research background.

Big data operations are related to different sectors and for specific purposes, such as: governments and businesses analyze the opinions of individuals by tracking the contents of various social networks; government agencies oversee health research and various networks to assess and treat epidemics; business marketing evaluates people's actions through social media in order to understand potential customers. In order to achieve satisfactory big data management results for each sector, some issues need to be considered [13]. Big data management studies are usually clear from two perspectives: one is to focus on technological and technical issues in order to maintain the big data infrastructure, and the other is to achieve business goals. In this research, management of big data is not limited to information technology-based management, but also involves human resource involvement as well as organizational processes for big data management. According to Turban, Aronson, and Liang (2005), information engineering and knowledge management will help increase the capacity of competitive intelligence and organizational decision-making [16]. Therefore, big data management is essential to achieve business goals and deliver the desired results from large volumes of data. A case study of the banking industry by Bedeley & Iyer (2014) [4] shows that in this sector, where a large amount of data is continuously generated and processed, it leads to the high competitiveness of the sector and a significant increase in data in customer databases. Mobile banking and e-banking

are other issues that will increase the volume of data for this sector, and it requires data collection, storage, processing, and analysis strategies so that big data management must provide the best The results are supported by a high level of technology.

Data management is the most important part. It is the basis of business intelligence solutions, and usually time is the most important part. Many companies today offer their own solutions. However, their applications do not guarantee that all the necessary information will be available in the decision-making process. Instead of focusing on the information needed to create a good solution, many application providers focus on the technological aspects. Such behavior does not meet the real needs of the business, and in this case, there will be no alignment between the business and the technology domains. Had. Studies by Brynjolfsson & McAfee (2012) show that organizations need to consider five areas for big data management [11]:

1. Leadership: refers not only to more data, but also to the ability to extract results.
2. Talent Management: Highly skilled professionals who manage large volumes of data and organize large data sets that may or may not be structured are referred to as talent managers.
3. Technology: as an important component of the big data strategy Although existing technology has been significantly improved for big data management, it needs to be considered and integrated for many new IT sectors.
4. Decision-making indicates the need to maximize functional interaction between the people who manage the data and the people who use it. Also, people who are directly involved with business problems should be in contact with people who are dealing with effective methods to achieve the best results.
5. Organizational culture: A data-driven organization should abandon purely traditional methods.

According to Borkar, Carey, and Li (2012), the definition of "big data" has changed over time from megabytes to exabytes [13]. Big data has transformed business intelligence and marketing intelligence, which have traditionally relied on market research to understand consumer behavior and product design. Many big data applications work with operational or transactional data that provides new information about operations, supply chains, distribution channel performance, and customer or consumer behavior. Big data in particular has the potential to create value by providing transparency with immediate performance feedback, fast test results, more accurate segmentation, more objective decision making (algorithms instead of humans), and new products [7]. Big data and business analytics create new capabilities by combining data and information versus knowledge and intelligence, and provide an opportunity for the interplay between big data and business analytics and the areas of knowledge management, intellectual capital,

and related disciplines. Knowledge management benefits from paying more attention to pre-knowledge input. It also has a wide range of development tools and techniques for identifying, developing, and enhancing intangible assets. In addition to information technology and systems approaches, knowledge management focuses on issues related to the actual operation of the person, the person with the system, and the success of the system. Big data is defined as a constraint on the analysis and storage capacity of standard data processing tools such as database management systems and is expressed by the three characteristics of volume, speed, and variety. Volume actually refers to the limitation of data processing due to the large size of the data. Speed indicates that the speed of the input data is also very important, because the data is generated and stored at a high speed. Diversity indicates that data comes from different heterogeneous sources (social networks, sensors, transactional data, etc.).

Big data goes beyond the capabilities of technology to store, manage, and process data efficiently. Data can also be analyzed in terms of various dimensions such as volume, speed, and large variability. Big data research mainly faces three types of challenges: data storage, management, and processing. According to Gartner, IDC, IBM, and SAS, there are five dimensions of data called "5vs" that have created new challenges for data analysis and management (fig. 1).

1. Data volume: is determined based on the measurement of data storage units on different media.
2. Data variety: Refers to many digital data formats including photos, email and text.
3. Data velocity: According to Gartner, refers to the speed of data production and data processing speed to meet demand.
4. Data variability: Data flow can be very unstable over a periodic period.
5. Data complexity: Data are from multiple sources and communication between data, compatibility, clearing and conversion of data across the system is challenging and difficult.

management.

Data is collected, tested, stored, and processed by information systems as the main part of an information system in order to provide acceptable results to users. According to Lauden, information systems include people, technology, and organizations (with an emphasis on the need for organizational processes) (Laudon, 2007). From this perspective, these dimensions should be considered for centralized big data management in the organization. To improve competitive advantage and decision-making, organizations consider information a fundamental object. In the information age, these smart assets are increasingly needed for business survival. According to O'Brien and Marakas, three key roles in the information systems business include [12]:

1. Support processes and operations.
2. Decision support by organizational agents.
3. Supporting strategies to gain a competitive advantage (O'Brien and Marakas , 2013) [12].

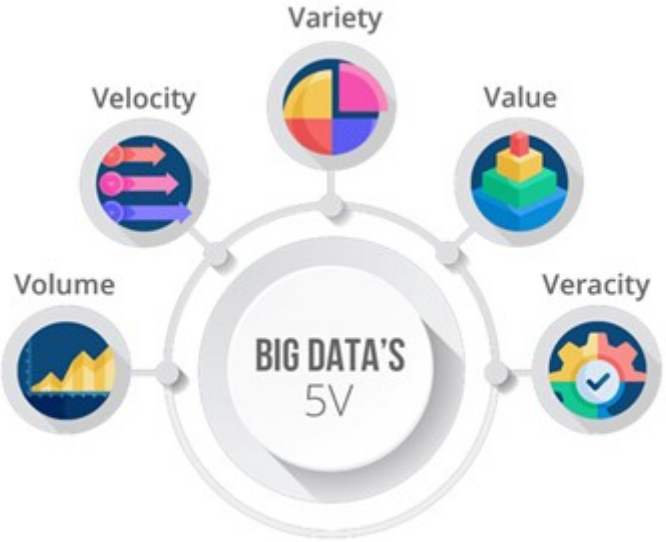

Figure 1 – Big Data Dimensions (Daniel, 2014)

Investigating the dimensions of people, process, technology in big data

To improve decision making, information systems need to consider some basic needs, such as the type of support provided for the data, the amount and form of information provided, the format of the information, and the method of processing the information. The need for accurate, fast, and concise information means that information is a costly and, at the same time, necessary asset for the organization. Therefore, big data is considered an important tool in this scenario, which can be considered as a basic input for decision-making and gaining a competitive advantage. In fact, big data analysis, as a new branch of knowledge, equates terabytes of low-value data to several bits of valuable data. Understand the need for big data management with specific methods and technologies and people with different profiles involved in different organizational processes and in business or technology areas.

Dimensions of individuals: People involved in big data management now have positions with different titles. Common job titles in this field are considered to be information architects, data analysts, and business intelligence managers or data warehouse managers. On the other hand, NIST (2014) has defined specific roles and actors for big data management, which include data providers, data consumers, big data application providers, big data framework providers, and system orchestrators (fig. 2) [6]. Groups that are capable of managing big data in an organization, such as the data warehouse group, central IT teams, as well as business units, must have the appropriate skills and training programs to use big data well. Obtain better results. According to Brynjolfsson & McAfee (2012), people involved in problems must interact with people who deal with big data technologies to get better results from large amounts of data [11].

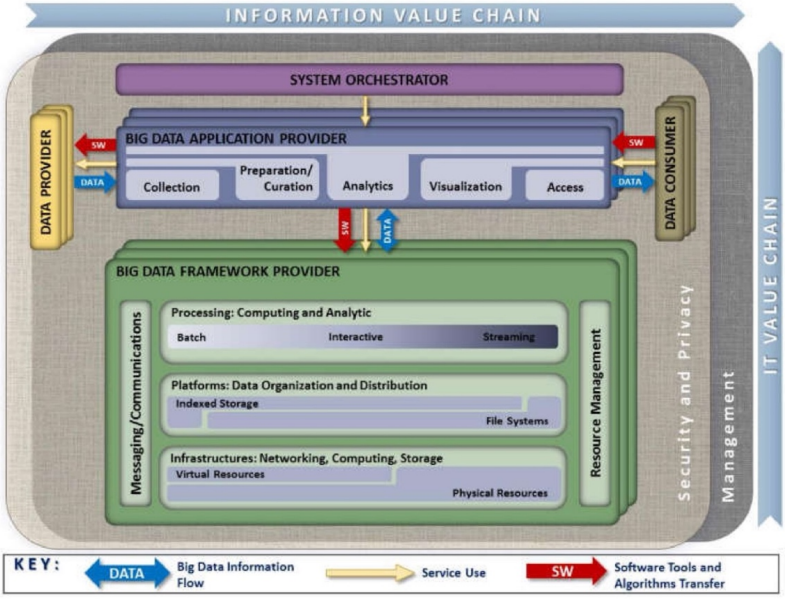

Figure 2 – Actors and roles related to big data management (NIST, 2014)

Process dimension:

Fisher et al. (2012) believes that there are challenges related to big data and one of them is related to the analysis of large volumes of data that have different structures [5]. In connection with this challenge, the pipeline is presented with a set of five steps by Fisher et al [5]. These results demonstrate the data management process's ability to provide the best results from the analysis. In fact,

this pipeline represents the practical state of data analysis from a large volume of data and has been created as a cascading model of software development, which is shown in the figure below (fig. 3).

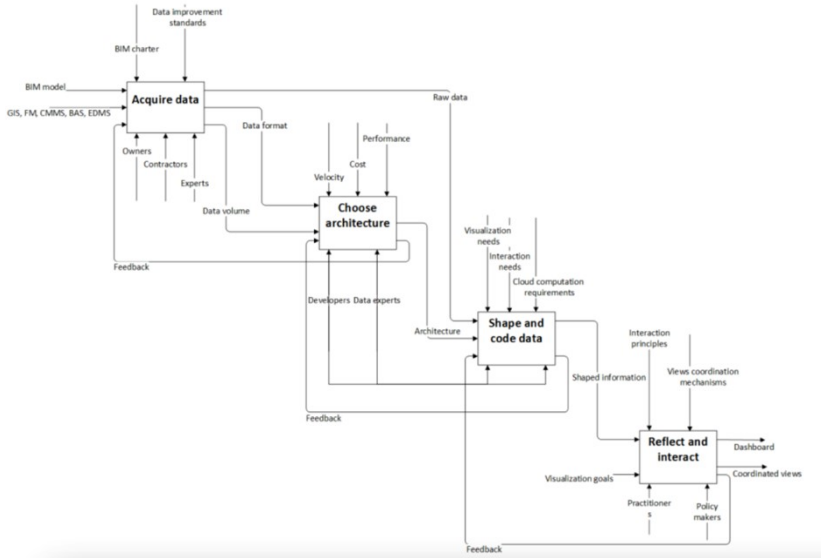

Figure 3 – Big Data Pipeline (Fisher et al., 2012)

Data retrieval refers to where the data is extracted and refers to how the data source is discovered, and its related subset formats are to achieve results. There is also an opportunity to improve data storage standards, simplify search and format data at this stage. The choice of architecture takes into account such things as cost and performance. Sometimes, analyzing large volumes of data requires abstraction, which is fundamentally different from applications designed for traditional environments. Especially when faced with a cloud computing environment, it will incur non-linear costs in access, storage, and changes that occur in the environment. Data visualization to architecture is a compatible way to compute and distribute data and ensure consistency when uploading data to the platform of choice. In the code/debug step, a special language such as R, Python, or PIG (data manipulation language) related to Hadoop technology is used. The reflection phase in response to the debugging phase refers to the visualization and interpretation of the results. This pipeline is useful for corporate and business environments to provide answers to business leaders who still use techniques such as data mining, machine learning, and visualization. It is also used to provide

answers to scientific research, which has precise mechanisms for analyzing data to test theories and hypotheses.

Technology dimension: The "big data environment" encompasses a variety of techniques and technologies for collecting, storing, processing, and analyzing data. Some of these technologies and techniques were created specifically for the big data age, while others were developed for big data. Many techniques and technologies have been developed to manage big data and to create the analytical potential that must be derived from big data.

Manyika et al. (2011) consider some of the big data analysis techniques that include sciences such as statistics and theories of computer science to include the following [7]:

1. Data mining is the method used to extract patterns from large volumes of data by combining statistical methods with machine learning.
2. A genetic algorithm is a technique for solving nonlinear and optimization problems.
3. Machine learning: a method that uses the principles of artificial intelligence and the development of algorithms to distinguish complex patterns from large volumes of data to provide intelligent decisions.
4. Neural Networks: A method that considers the assumptions of biological neural networks according to computational models in pattern recognition, from the vast amount of data used for pattern recognition and optimization.

There are also a number of other technologies and techniques related to the big data environment [7]:

1. Hadoop: an open source framework for processing large amounts of data in distributed systems using tools from Google such as Map Radius and Google File System (GFS).
2. Map Radius: The software framework introduced by Google for processing large volumes of data, which is part of the implementation of Hadoop technology, In fact, the Map Radius architecture is one of the main components of Hadoop.
3. Business intelligence : refers to a type of application based on software developed to display and analyze data.
4. Cloud computing : is a type of computing with a high level of computing resources that is sometimes configured as distributed systems to provide services through digital networks. In fact, it is a computational model that facilitates resource management by users by virtualizing resources and allocating these resources to users.

Business intelligence and big data.

Business intelligence helps decision makers with data, information, or knowledge on issues related to their needs and supports extensive decision-making

at the organization level. Business intelligence systems were created primarily to improve the quality of decisions and provide timely solutions to a variety of problems, ranging from highly structured to highly unstructured (Lucian et al., 2016) [18]. They are also involved in the strategic plan of the organization that deals with the effectiveness of management. Business intelligence is defined as "the set of methods, processes, architectures, and technologies that transform raw data into meaningful and useful information in order to have strategic, tactical, and operational insights and make effective decisions." Effective business intelligence systems allow decision makers access to quality information, enabling them to determine where their company has been, where it is now, and where it should be in the future. Despite the many benefits that an effective and efficient business intelligence system can bring, numerous studies have shown that the use of this system is low, especially among small institutions and companies with limited resources. Market intelligence is the daily information related to a company's markets that is specifically collected and analyzed in order to make accurate decisions in determining market opportunities, market penetration strategies, and market development indicators. In marketing, the main technologies of business intelligence include reporting, online analytical processing, analysis (past and forecast), data mining, and text mining.

Businesses typically integrate data from multiple sources into data warehousing, create data models to help integrate and define metadata (e.g., how an "active customer" is defined using various variables), and analyze and present data results. By reporting and transferring personal data (e.g., customer information during a transaction) on any platform or device required by users [2].

According to Wang, Y., & Liu Z (2009), a business intelligence system should have the following basic features [17]:

1. Data management includes data mining, data cleaning, data integration, as well as efficient storage and storage of large amounts of data.

2. Data analysis includes information query, report creation, and data visualization functions. In fact, data analysis involves data interpretation and decision-making.

3. Knowledge exploration: extracting useful information (knowledge) from the rapidly growing volume of digital data in a database.

According to Datameer , the most important goals of large companies in implementing big data are to increase revenue, reduce costs, and increase productivity. In order to extract knowledge, first the data must be stored locally, and then appropriate analytical methods are used to obtain value from the data. There are basically two methods of structured query language (SQL) and map radius for implementing data analysis.

There are many advantages in the business sector to exploiting big data, including increasing operational efficiency, being on a strategic path, developing

better customer service, identifying and developing new products and services, identifying new customers and markets, and so on [3].

Researchers use a variety of methods to collect data, such as surveys, interviews, focus groups, observations, and archives. Different data collection methods are different from research methods. Experiments, for example, are widely used marketing research methods, but researchers rely on research, observations, and interviews to gather experimental data. Surveys and recorded events are the most common methods for obtaining information for business intelligence [10].

The survey is defined as "the collection of information in an organized and methodical manner about the characteristics of the interests of part or all of the population using well-defined concepts, methods, and procedures and the collection of this information into a useful summary form." Companies collect data from surveys for a variety of purposes, including customer perceptions, preferences, and behaviors. For example, Apple sends surveys to customers who have just purchased an iPhone to get feedback on their purchases and experiences. Event logs are created by information systems that record transaction records and user behavior. Wal-Mart, for example, started by analyzing social media data to get customer feedback on a particular company or product. Event data and survey data vary in size, quality, repeatability, objectives, content, and processing techniques. These two methods of data collection in different areas of business are complementary. Navigation can be useful when we want to collect data on phenomena that cannot be directly observed. Log events are useful when we want to get instant results from real user behavior. These two methods can be combined when we want to examine the relationship between user purpose and user behavior, and big data management must consider both methods together.

1. Size: Because the survey is costly, the sample size for navigation is relatively small and typically ranges from 100 to a few thousand. Log data, on the other hand, may contain millions or billions of records.

2. Quality: Registration data, especially data collected from external platforms, may have noise generated by incomplete data, incorrect information, and irrelevant data. Data cleaning is usually an essential step in analyzing report data. Survey data is collected using a well-designed questionnaire and its quality can be controlled by monitoring the data collection process. There is a systematic method for quality control in survey data, but there is no standard method for quality control in event log data.

3. Repetition: Event log data can be collected in real time while the survey can only be done over a period of time, such as a few weeks or a few months.

4. Content: Survey data includes behavioral intentions, comments, explanations, and notes, while event log data shows the actual behavior of users in the past.

5. Processing Techniques: In order to analyze survey data, statistical methods may be used to test the hypothesis, for example, using regression, analysis of variance, or chi-square test.

6. Data mining techniques, such as behavioral analysis and subject analysis, are commonly used when processing event log data.

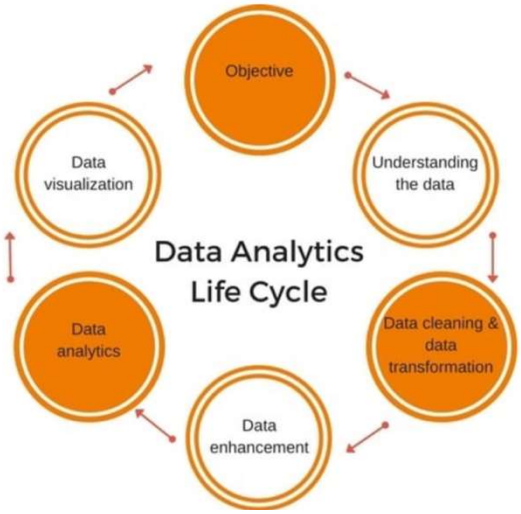

Figure 4 – Data Analysis Cycle (Storey, 2017)

Data analysis cycle:

The cross-industry standard process for data mining (CRISP-DM) methodology, as an industry standard process for data mining, consists of various components. The data analysis cycle in this methodology begins with understanding the business, which includes understanding what questions need to be addressed and what criteria are appropriate for evaluation. In the next step, understanding the data requires identifying the appropriate data sources and tools needed. Data preparation is then performed, which includes data acquisition, data cleaning and conversion, and data quality verification. In model planning, methods, techniques, and workflow are identified. Key variables are selected and the correlations between them are identified. In the evaluation step, the results are evaluated against the criteria and a relationship is established between them. In the final step, the deployment of analytics methods is integrated into management dashboards and operating systems [19]. The data analysis cycle presented in Figure

4 begins with the business strategy and continues with questions of data acquisition, solution generation, evaluation, and monitoring.

Also, The Chief Data Officer (CDO), as the data management manager, must pursue governance and innovation goals and be able to provide perspectives and strategies for data management solutions. Leadership, communication, and data management skills, expertise in business and its values, project management, big data analytics, familiarity with technologies and solutions related to big data and systems thinking are in the field of senior data management and as much Focusing on tools and technical skills is important for big data management and paying attention to managerial capabilities to extract value from big data is also very [19].

Research methodology.

The overall purpose of this study is to investigate the role of big data management in business intelligence, which can be used to provide effective factors in big data management to make better decisions and achieve intelligence in the business environment. Therefore, this research is applied in terms of purpose, and the research method is a descriptive review in terms of data collection.

Research findings.

From different perspectives, various factors for big data management have been proposed as the basis of business intelligence. Data analysis in terms of data such as data volume for storage on media, content and data type (image, email, text), data quality (according to data noise), data production and processing speed, data complexity (data from different sources) and data processing techniques that will have a significant impact on big data management. Organizations can gradually expand their analytical capacity by employing key employees in processes that support efficiency and analytical intelligence, as talent management places great importance on macro-management and decision-making as one of the areas. They are important in big data management, and in fact, for big data management, organizations need professionals familiar with leadership skills to pursue governance and innovation goals. These people will often play an important role as senior data managers in the implementation of management strategies, and there is a need for functional interaction between key players in big data management to make better decisions. On the other hand, attention to the development of analytical skills in organizations, in addition to information technology infrastructure, depends on the culture of the government and the organization. The evolution of big data and new technologies related to the processing and analysis of large databases has led to a dramatic change in the management of companies. Big data technology is important not only for obtaining large volumes of data, but also for analyzing large volumes of data and thus gaining access to the information and knowledge gained from it. Companies that use big data technology and business computing intelligence will have more

complex information about customer preferences and demand than other competitors, and, as a result, they will be able to more accurately predict customer demand. Paying attention to all these factors will cause companies to be more successful in achieving their goals in order to implement a strategy based on big data. In general, considering these factors by companies will reduce the time spent analyzing different types of data. Timely detection of patterns in products will facilitate innovation and efficiency of organizational processes and optimize resource allocation for better performance. In order to better summarize, the summary of studies conducted in relation to the factors affecting big data management from the perspective of various researchers is presented in the following table 1.

Table 1 – Factors affecting big data management

Row	Factors	Researchers
1	Leadership	McAfee, A., Brynjolfsson (2012), Storey (2017)
2	talent management	McAfee, A., Brynjolfsson (2012), Storey (2017)
3	Organization technology	Laudon (2007),McAfee, A., Brynjolfsson (2012), Manyika et al.(2011)
4	Decision making	McAfee, A., Brynjolfsson (2012),
5	Culture	McAfee, A., Brynjolfsson (2012), Storey (2017)
6	Data volume	Daniel J. Power (2014), S. Fan et al.(2015) ,Storey (2017)
7	Data variety	Daniel J. Power (2014), Storey (2017)
8	Data velocity	
9	Data variability	
10	Data complexity	
11	People of the organization	Laudon (2007), Russom, P. (2013), NIST(2014)
12	Organizational processes	Laudon (2007), Fisher, D., DeLine, R., Czerwinski, M., & Drucker, S. (2012)
13	Data management infrastructure	Russom, P. (2013) ,Manyika et al.(2011)
14	Data quality	S. Fan et al.(2015), Lucian L. Visinescu, Mary C. Jones & Anna Sidorova (2016)

Row	Factors	Researchers
15	Data content	S. Fan et al.(2015)
16	Data processing techniques	S. Fan et al.(2015), O'BRIEN, J. A., & Marakas, G. M. (2013).

Conclusion.

Many organizations face big data management challenges, and this is a challenging fact for computer science and information technology. Big data affects the public and private sectors, science and economics, and areas such as education and healthcare. Organizations need market analysis to stay abreast of market changes, and to that end, they need to be able to update business processes using new technologies called business intelligence. In today's big data age, companies are increasingly looking for the best way to make the most of their data to make better decisions. Although business intelligence has the potential to improve decision-making, empirical research on the success of business intelligence suggests that the quality of decision-making using this intelligence has been largely neglected. Therefore, examining the role of big data management in business intelligence can provide more favorable conditions for effective business decisions in this new scenario.

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