MARAM SALEH MIRALAM,
MA., PhD Candidate, Lecturer, Faculty of Business and Administrative
University of Business and Technology, Jeddah (Kingdome of Saudi Arabia)
https://orcid.org/ 0000-0002-1176-8336

MUNA DAKIL ALSURAIHI,
Professor, Lecturer, Faculty of Information Science
King Abdul Aziz University, Jeddah (Kingdome of Saudi Arabia)
https://orcid.org/ 0000-0003-0225-1383

ANALYTICAL STUDY ON THE ROLE OF KNOWLEDGE MANAGEMENT IN BIG DATA INVESTMENT

This century has witnessed the greatest development of information technology. Accordingly, the factor of the developments in the field of knowledge has become more influential in life. Therefore, institutions must obtain the most important elements of success, catch up with the latest changes, and maintain their ability to compete and persist in the market in the age of information technology. The massive accumulation of data and information and the emergence of the so-called big data (BD), have led to an urgent need to manage knowledge and the ability to invest in it. On this basis, arose the need to conduct this research that deals with the role of knowledge management (KM) in decision-making for institutions. This research aims at shedding light on the role of KM in BD investment in the Ministry of education in Saudi Arabia. To achieve this goal, the descriptive analytical method was used, which depends on the evaluation of many works and research papers, during the period from 2014 to 2022. After evaluating many studies, the study concluded that it is necessary first, to publish more Arabic future studies concerned with the role of KM, its technologies and types. Second, to find appropriate solutions and stand against the challenges faced by the Ministry, and finally to find a model that shows the role of KM in BD investment in the Ministry of Education to make the process of taking the right decisions easier and at the right time, and achieve sustainable development.

***Keywords:** knowledge management, knowledge management processes, knowledge sharing, knowledge investment, big data, big data management, big data analysis*
JEL: *D83, C55*

У нинішньому столітті спостерігається найбільший розвиток інформаційних технологій. Відповідно, фактор розвитку у сфері знань став більш впливовим у житті. Тому інституції повинні забезпечувати найважливіші елементи успіху, своєчасно запроваджувати інновації, зберігати свою здатність конкурувати та залишатися на ринку в епоху інформаційних технологій. Величезне накопичення даних та інформації та поява так званих великих даних (BD, скорочення від англ. Big Data) призвели до гострої потреби в управлінні знаннями (KM, скорочення від англ. Knowledge Management) та можливості інвестувати в них. На цій основі виникла потреба у проведенні цього дослідження, яке стосується ролі управління знаннями у прийнятті інвестиційних рішень. Це дослідження має на меті пролити світло на роль управління знаннями в інвестуванні у великі бази даних Міністерства освіти Саудівської Аравії. Для досягнення цієї мети було використано описовий аналітичний метод, який полягає в оцінці багатьох досліджень

та наукових статей протягом 2014-2022 років. Після проведеного аналізу, автори прийшли до висновку про необхідність збільшення публікацій саме арабською мовою щодо майбутніх досліджень, пов'язаних з роллю управління знаннями та менеджменту разом із його технологіями та типами. По-друге, необхідно знайти відповідні рішення та протистояти викликам, з якими стикається міністерство, і, нарешті, працювати над пошуком моделі, яка показує роль управління знаннями в інвестуванні у великі дані Міністерства освіти, щоб полегшити прийняття правильних рішень у потрібний час і досягти стійкого розвитку.

Ключові слова: управління знаннями, процеси управління знаннями, обмін знаннями, інвестиції в знання, великі дані, управління великими даними, аналіз великих даних.
JEL: D83, C55

Introduction:

In fact, knowledge has become the main resource and the supporting engine for all sectors that aspire to reach competitiveness. Accordingly, the interest in knowledge has increased because it is a source of organizations' wealth, survival, continuity, and excellence considering these changes. As a result, studies focused on how to invest this knowledge by exploring it, preserving, managing, and making optimal use of it. However, this could not be achieved by traditional methods as it represents a challenge in how to manage this huge amount. This, in its turn, led to the emergence of the concept of BD to solve these problems and help information centers to provide modern methods and tools that allow for managing these huge amounts of data – storing, processing, analyzing, using them in a timely and productive manner, assisting leaders in making administrative decisions based on accurate information and building strategic plans based on the analysis of this data and its optimal investment, which contributes to improving the quality of the services provided by these centers and saving their costs while increasing productivity. There were many previous studies that dealt with the role of KM for the success of organizations in general and KM support in decision-making. A series of recent studies has traced the history of knowledge and the emergence of KM and the extent to which it is used in any institution. From the researchers' point of view, all studies dealt with the role of KM such as sharing knowledge and how to transfer and distribute it in institutions of all kinds. The current researchers find that the research gap here lies in the fact that there

has not been any study so far that showed the extent of the role of KM in BD investment in the governmental or private sectors. This makes understanding the role of KM in BD and investment creating a model that facilitates the investment process difficult and scattered among large-scale studies. Hence the need for this study has arisen, as it collects the studies most relevant to the role of KM and its processes in decision-making in institutions, and praises the studies that carry the largest amount of information showing the process of sharing knowledge, ways to benefit from KM, and its high ability in decision-making.

For this reason, this study is a starting point for many studies that are concerned with clarifying the role of KM and its operations in investing in government institutions in order to support strategic decisions and raise efficiency, competitiveness, and productivity. This study answers a question that researchers have been wondering about recently: **What is the role of knowledge management in big data investment?**

This study consists of several sections, starting with an introductory section on the concept of KM and its operations, followed by sections on the concept of BD and its characteristics and on BD management and analysis, finally on the concept of knowledge investment and its fields. Added to that, there is the "Previous Studies" section which focuses on the analysis of previous studies that include information in different fields, the role of KM in different types of sectors, the concept of BD and how to benefit from, analyze, and manage it. This is followed by the section "Discussion of the results" that conducts an analysis of these studies to highlight the latest findings in terms of

describing the importance of the role of KM in the BD investment in the government sector. The last section of this paper includes the conclusion, recommendations, and the future directions for research.

Knowledge Management Definition (KM):

KM is the process of extracting and investing the capital of the organization in order to reach innovative, efficient, and effective decisions for the organization to gain competitive advantages and customer commitment and loyalty (Al-Rashidi et al., 2020).

Knowledge Management Processes:

KM is based on a set of processes aiming at achieving its objectives, controlling them, and making the necessary improvements to them. There is a diversity and multiplicity in the researchers' visions to identify fixed processes for KM or practices emanating from them, their activities, and ways to address them. And despite the large number of reviews of the concepts of these processes, there is no agreement between scholars and researchers in the field of KM on the number or arrangement of KM processes. The use of information technologies in the KM process is inevitable because the conveniences brought have revolutionized the storage, sharing, and rapid production of knowledge in organizations. However, technology alone is not sufficient for KM practices in organizations although it is essential for effective knowledge management. KM in any organization can also serve different organizational purposes (Kazak, 2021). Therefore, the authors conducted the literature review and scrutinized published research and previous studies related to BD investment which enabled them to focus their attention on the models that dealt with BD investment processes, and not to repeat the explanation of the concepts and implications of these processes. Considering this, the current study adopts the identification of three KM processes: knowledge storage, knowledge sharing, and knowledge application, as they are believed to be the most comprehensive, especially as they are the common elements between many researchers. These processes are reviewed as follows:

A- Knowledge Organization or Storage:

Some call this process the preservation of knowledge or the stage of organizing knowledge, and Abdul Rahman explained that the processes of storing knowledge mean those processes that include retention, search, sustainability, access, retrieval, and location (Abdul & Tariq, 2017). The process of storing knowledge refers to the preservation of knowledge. This is what the current researchers seeks, as KM must find a model that invests BD in any organization.

B- Knowledge Sharing:

Sometimes this stage is called knowledge distribution, knowledge transfer, knowledge exchange, knowledge dissemination or knowledge sharing. The process of spreading knowledge means the processes of distribution, sharing, flow, and transfer. It includes many modalities such as project teams, intranet, and knowledge agents. When moving and transferring knowledge, consideration must be given to converting tacit knowledge to explicit knowledge, as well as considering the circulation of knowledge and transferring it to the workers who need it in a timely manner so that they can carry out their essential tasks. Distribution and sharing of knowledge have become easier using modern technologies such as the Internet and advanced communication networks (Abdul & Tariq, 2017).

C- Knowledge Application:

The application of knowledge is the purpose of knowledge management. This means that investing knowledge, obtaining it, storing it, and participating in it are not enough, and the important factor is to transfer this knowledge to the implementation phase, as the knowledge that is not reflected in implementation is just a cost. The gap between knowledge and implementation of this knowledge is one of the most important evaluation criteria in this field. Institutions, in order to implement what they know, must define a model. KM models are what guide departments on how to invest knowledge and transfer it into implementation. Ode and Ayavoo stressed that the application of knowledge mainly aims at integrating the knowledge obtained from internal and external sources to

achieve the organizational goals of the organization (Ode &Ayavoo, 2020).

Knowledge Investment Definition:

Knowledge investment can be defined as mentioned by Thabit (2019) as the employment of knowledge in a way that is expected to generate income for the investor (Thabit, 2019). Therefore, from the researchers` point of view, investing in knowledge is one of the most important functions that should be taken care of by developing intermediary institutions between knowledge-generating agencies, production activities and services such as technological institutions, engineering laboratories, patent support, intellectual property protection, and other procedures. Moreover, from the authors' point of view, knowledge in our modern life is no longer just a simple means of information exchange devoid of complexity, driven by the desire of the parties to gain access to knowledge and easily accessible in the economic and commercial exchange.

The Definition of Big Data:

Investopedia defines Big Data as "a growth in the volume of structured and unstructured data, the speed of its creation and aggregation, and the coverage of how many data points" (Investopedia, 2017). BD comes from multiple sources, and it is received in different formats. De Mauro, et. al (2015, 103) considered that "BD represents information that is characterized by its large quantity, speed, and diversity that requires specific technology and analytical methods to be converted into value". Similarly, Al Bar and Al Marhabi (2018) defines it as "different categories with unique properties such as size, speed, diversity, variance, and validity that cannot be efficiently addressed using current and traditional technology to take advantage of them".

Big Data Characteristics:

The characteristics of BD were known in 2001, before the term was developed, so three characteristics were named (Vs3), which are volume, velocity, and variety, which are the most common characteristics, and many scientists and researchers in this field agreed on them. As mentioned in (Latabi, 2019), these characteristics are (Fig.1):

1. Volume

It is the number of terabytes of data that we release daily from the content. And that what is a huge amount of data varies from one institution to another and from one sector to another.

2. Velocity

It depends mainly on the speed of data collection, the reliability of data transmission, the efficiency of data storage, and the speed of exploration in knowledge discovery. The importance of the speed of data processing is that decisions based on it must be made as quickly as possible.

3. Variety:

This data varies between structured, unstructured, and semi-structured data. Combining different data sources allows researchers to have a deeper understanding of any phenomenon.
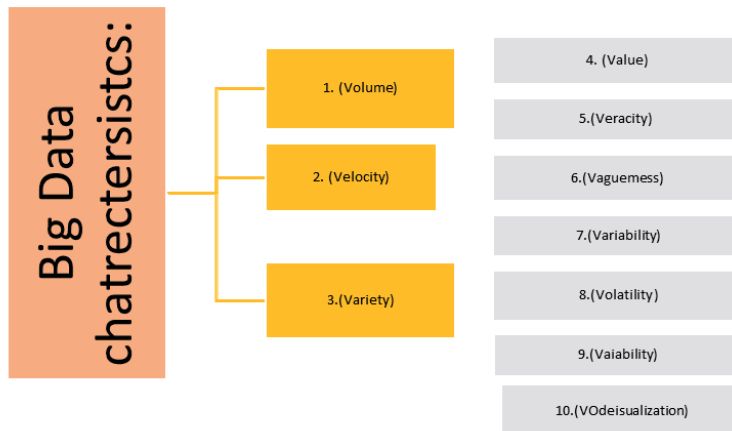

Fig. 1. Big data features Vs3 and other Vs10 features, added later
Source: Author`s compilation (2022)

According to Fig. 1, the researchers agreed on the number of main characteristics of BD (Vs3). However, many researchers disagreed on the number of other added properties of Vs10. The authors believe that the reason for this difference is the complexities and challenges faced by any organization and people when dealing with this data, because it is huge not only in terms of size, but also in terms of flow speed and diversity.

Definition of Big Data Management:

BD management is defined as "an organized and direct process of controlling data from its collection, entry, processing, output, and storage" (Mersal & Koko, 2018).

Definition of Big Data Analytics:

Big data analytics (BDA) is defined as referring to advanced analytical techniques, considering large and diverse types of data sets to examine and extract knowledge from BD, which constitutes a sub-process of gaining insights from the BD process (Vassikis et al., 2018). Advanced technologies, including (BDA) include data management, open-source programming such as Hadoop, statistical (analysis such as sentiment analysis and time series, and visualization tools that help to structure and link data to reveal hidden patterns.

Literature Review

This section includes a collection of previous and recent literature, both Arab and foreign in the topic of the current study, that shed light on the role of KM in BD investment in the government sector. The studies were reviewed from the least to the most recent to identify the research developments in the studies according to their chronological order. These studies cover the period from 2014 to 2022.

The Study (Gang-Hoon et al., 2014) compared the application of BD technologies by governments and the private business sector in terms of objectives, tasks, decision-making processes, actors in decision-making, and the organizational structure and strategies. The study sample comprised several government projects in the United States of America, Australia, South Korea, Singapore, and the United Kingdom. Among

the results of this study, we can mention that governments face more difficult challenges than the private sector such as the integration of BD from multiple sources in exorbitant forms and costs. They have multiple channels for data collection, and this requires dealing with sophisticated and expensive tools, and from the reality of the reviewed government projects, most of the reviewed government projects cannot be classified as BD applications, and it seems that most government data project in these countries share stored and structured databases. They do not use real-time, moving, irregular or semi-systematic data, and most governments that pursue or plan BD projects need to take a step-by-step approach to setting the right goals and expectations and developing realistic Hadoop. Hence arose the importance of this paper, which is very close to this current research, as the Ministry of Education has huge data that must be invested by BD managing and analyzing tools. However, the difference between the two researches is that in our research we will clarify the role of KM in BD investment in the ministry. The study showed that it is necessary to manage and integrate BD in governments from top to bottom, establish BD watchtowers to integrate accumulated data sets, regular or irregular, with administrative repositories, and create an advanced analytics agency that is concerned with developing strategies for how to manage BD and qualify skilled employees.

The study (Izhar & Shoid, 2016) proposed a framework for assessing the level of awareness of BD and the success factors towards the impact of KM in organizations. This will allow industry experts and entrepreneurs to assess the level of BD in their organizations by looking at the level of understanding, usefulness, and effectiveness of BD. The contribution of this paper represents a first step in understanding the relationship between BD and knowledge management. The study detailed that the impact of BD analytics is present in every area of the organization. Despite research in knowledge management, there is still debate these days about the role of BD in KM for

effective decision making versus computing, data warehousing, and data mining. There is still no consensus on how best to integrate BD and KM into organizations to improve business analytics and timely decision making. Fig.2 illustrates the proposed framework initially on three main variables based on awareness of BD and success factors.

The originality of this framework lies in the creation of a BD integration "roadmap" that contains references to concepts and characteristics from three different relevant variables to assess the level of understanding and awareness of BD. This roadmap would enable the tight integration of BD and knowledge management. It would also enable organizations to have a comprehensive view of the connectivity of BD inside and outside organizations, and enable them to collect interrelated information for analysis purposes that would improve the implications of KM in organizations. The expected outcome of the framework is to collect measurement data and produce more effective results to assess the level of awareness and understanding of BD towards the implications of knowledge management. This is where the importance of this study comes from, as both focus on a few previous researches clarify the role of KM in investing huge data in government sectors. The study recommended several suggestions including suggesting future approaches to address any gaps in the current research to integrate BD and knowledge management, which significantly enhances their ability to participate and influence organizations and societies, as well as developing effective approaches to updating the organization's

knowledge to support the creation and delivery of knowledge in the age of BD.

The study (Ali, 2017) aimed at determining the impact of KM on improving total quality at the Egyptian Tax Authority, with an attempt to reach a proposed model for KM whose application leads to improving the overall quality in the Egyptian Tax Authority which explains the need for this study. This research reached a set of results, the most important of which are the existence of an important and statistically significant effect of KM on improving the overall quality in the Egyptian Tax Authority. This study supports our current research by providing a practical model that shows the role of KM in BD investment in the Ministry of Education as well, as shown in Fig.3:

The most important recommendations of the study were the establishment and creation of an appropriate infrastructure for KM in terms of organizational, cultural, technical and human resources, as well as the implementation of the proposed model, which has been proven by field tests to have a clear contribution to the use of KM to improve the quality of the department.

The study (Al-Mutlaq, 2017) aimed at identifying the degree of importance of the proposed mechanisms for knowledge investment (KI) and the degree of their importance in building competitive advantage in emerging universities in the Kingdom of Saudi Arabia, which justifies the need for it. The study used the descriptive approach represented by relationships studies and the questionnaire was the tool for collecting information. The study sample
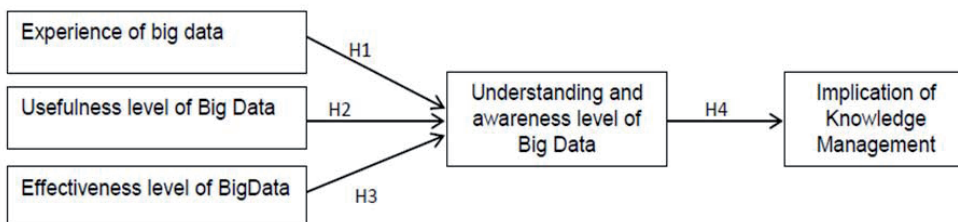

Fig. 2. Theoretical framework: awareness of big data towards the implications of knowledge management
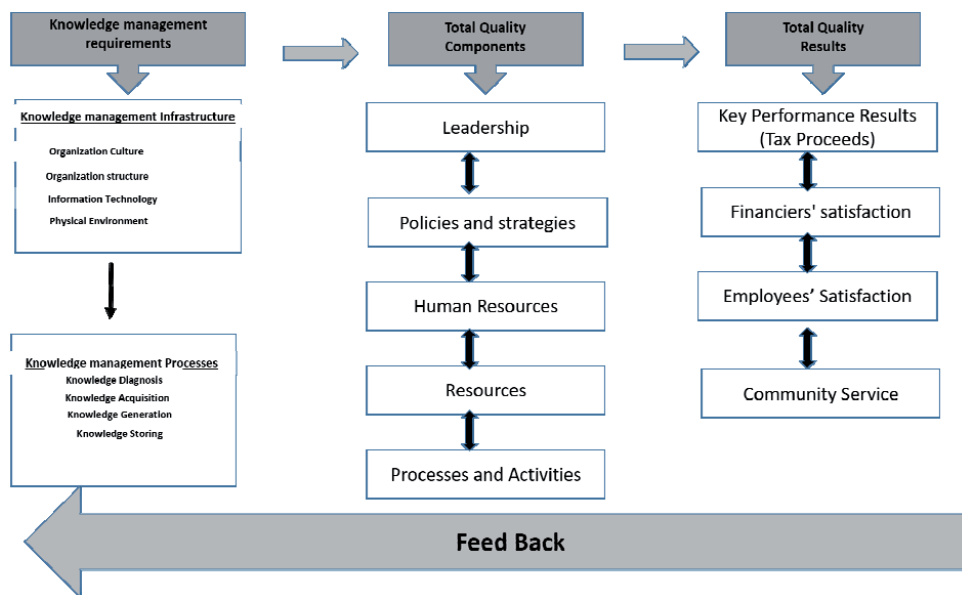*Source: (Izhar, 2016)*

Fig. 3. The role of KM in improving the overall quality of the Egyptian Tax Authority
Source: (Ali, 2017)

consisted of heads of academic departments in emerging universities in Jazan, Hail, and Al-Jawf. The most prominent results of the study were that the study sample members agreed with a high degree on the importance of (KI) mechanisms in the fields of education and training in emerging universities, and the study sample members agreed with a very high degree on the importance of knowledge investment mechanisms in the fields of scientific research, consultancy, and scientific production in emerging universities, as well as the approval of the study members with a high degree on the importance of knowledge investment mechanisms In building a competitive advantage in emerging universities in the fields of education, training, scientific research, consulting, and scientific production. This study is consistent with our research in investing big data through KM and its processes, because there is a relationship between knowledge investments and building a permanent competitive advantage in the information era. The results of the study also showed the existence of a direct (positive) relationship between the degree of importance of the proposed mechanisms for knowledge investment and the degree

of their importance in building competitive advantage in the fields of education, training, scientific research, consulting, and scientific production in emerging universities. The study concluded several recommendations, the most important of which is that universities should start implementing mechanisms for knowledge investment in humanitarian disciplines in all fields, starting with education, scientific research, training, and scientific production, given the accumulation of experiences in them.

The study (Pauleen, & Wang, 2017) aimed at proving that the field of KM must respond to the important changes brought by BD / analytics to activate the production of data and organizational information. Hence the need for this study emerged. This is in line with our current research in that without knowledge management, there is no BD and no analytics. The study was based on the premise that knowledge is fundamental to any discussion about BD for simple reasons, the most important of which are that it is human knowledge that has developed the capabilities of BD and analytics. Human knowledge and experience are solely responsible for the decisions about where

to collect data and the algorithms to analyze it. Therefore, it is impossible to negate the influence of knowledge when discussing the effects of BD/analytics. In the results, a (BD/ Analytics-KM Model) has been proposed. This model demonstrates the centralization of knowledge as a guiding principle in the use of BD/analytics in organizations, and is one of the early models that put knowledge as a priority consideration in successful organizational use of BD/analytics.

Fig.4 showed that the model still retains all the useful and fruitful steps that we have learned from knowledge creation/ management. The model also holds all intangible factors such as leadership, change factor, trust, politics, and reinforcement learning as critical factors for the success of any technology application. The result is sustainable performance as success alone is not enough. Success needs to be evaluated, recharged, and prepared to deal with all business obstacles that prevent it from being achieved. Finally, the study recommended that academics and practitioners in KM should be able to control the application of BD/analytics. It called for more research into how KM can be used conceptually and operationally and how to integrate

BD/analytics to enhance organizational knowledge for better decision making and organizational value creation.

The study (Fredriksson, 2018) indicated that the decision-making process in organizations is facing a change due to the increasing amount of data that offers new possibilities in information management and decision-making, or the so-called "BD." Despite the interest in BD, little is known so far about the results of the practical use of BD in organizations, which necessitates encouraging a broader discussion of its implications. Hence the need for this study arose as it provides examples of how BD is used in practice in the public sector, conceptualized with a case from a local government context, and how practitioners view BD and the changes in information and KM that follow. This study intersects with the current study in that it discussed BD in the theoretical light of organizational knowledge creation and decision-making in organizations. The results indicated that creating new information and knowledge from BD and using it as support for decision-making in organizations would enhance quality and increase trustworthiness in decision making.
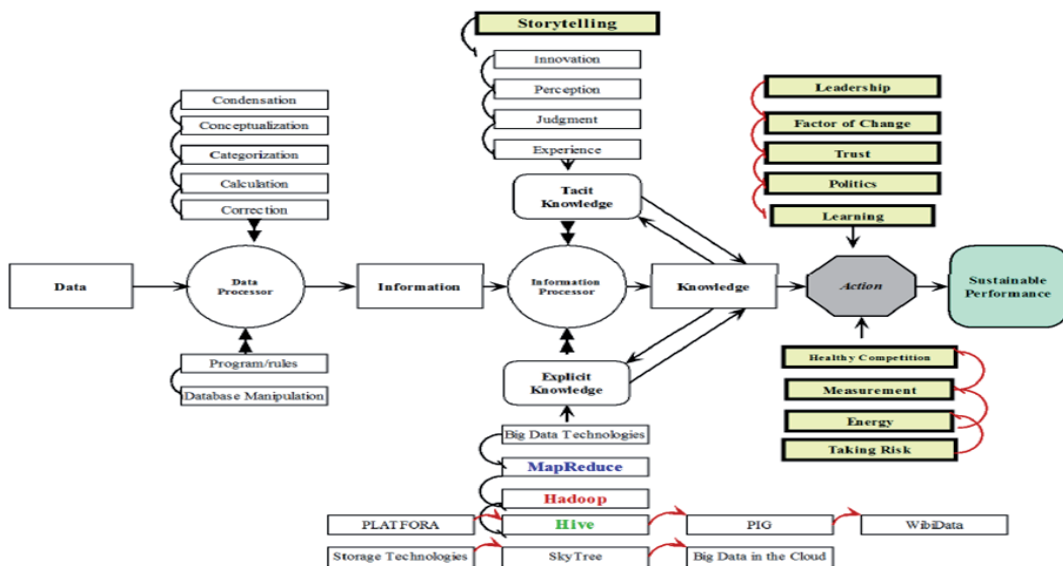

Fig. 4. The big data/analytics model - knowledge management
Source: (Pauleen, & Wang, 2017)

The study (Ekambaram, 2018) sought to explore the role of BD and KM in improving projects and implementing projects. It aimed at showing the interaction between KM and BD in the same context and the challenges and opportunities associated with that, and how this interaction can improve projects so that projects can be implemented efficiently and effectively. Therefore, the importance of this study and its relation with the current study arose, as there is a strong similarity between the two studies in clarifying the role of KM in BD investment, which is not denied by the owner of knowledge or any institution, especially the government sector. The study showed not only that data can be linked but also that it is possible to see patterns and trends, which helps create opportunities for extracting new knowledge. This helps to improve the planning and implementation of projects in the future. The study concluded that dealing effectively with the implicit elements of knowledge and ensuring the correct interpretation of the knowledge provided by BD analytics can be a challenge.

The study (Hosseinioun, 2018) was a systematic literature review aimed at identifying the problems of knowledge sharing in the BD society in the form of a huge amount of data and highlighting the characteristics of the knowledge network that can improve the flow of knowledge between members of society. To achieve these objectives, this study followed the method of SLR (Kitchenham, 2009). As a result, three research questions were selected in the first stage, and then all relevant articles were collected that help answer search questions for the collected keywords. Therefore, the importance of this study and its similarity to the current study lies in the theoretical basis for identifying the role of KM for BD investment in the government sector. The analysis of the results revealed the difficulty of sharing knowledge through community members' interaction and cooperation. Added to that, there is a gap in research on BD and user roles to participate through the BD community. Moreover, the knowledge network as a communication infrastructure can effectively acquire, represent, and

exchange huge amount of knowledge, but current knowledge network models focus on discovering knowledge through BD and there is a lack of an effective knowledge network model for distributing knowledge among the members of society by considering their influence on knowledge.

The study (Alhashimiya, 2019) mentioned the need to identify the reality of database management in government institutions, the sources of obtaining this data, methods for its comprehension and factors influencing its management. Hence the need for this study arose. The study relied on the qualitative descriptive approach, and used the semi-structured interview tool to collect data. The study community included government institutions in the Sultanate of Oman. It reached a set of results, the most important of which are the disparity of government institutions (the study sample) in their management of BD. It was also found that the electronic census project of 2020 adopted by the National Center for Statistics and Information was one of the most prominent BD initiatives. As well, the results indicated a set of sources on which government institutions rely on as a major source of BD, the most important of which are official administrative records, field and electronic surveys, geographic information systems, projects, and electronic systems. The study also showed that dealing with BD is carried out according to several mechanisms, the most important of which are storing data in several ways, the programs and applications used for processing and analyzing, data output after analysis, and BD preservation and updating. This study agrees with the current study in that there are some challenges for good management of BD and that KM should play a role the investment in the government sector. And it showed the presence of factors supporting the management of BD in government institutions including administrative factors, technical factors that related to the nature of the data. However, the unwillingness of some institutions to share data, the lack of human resources, and the large volume of data and multiple sources are all problems that hinder

the benefits of BD. The results of the study indicated that the study sample invested data in the areas of strategic planning and decision-making, understanding the needs of individuals, improving services, and forecasting future needs. The study concluded with a number of recommendations, the most important of which are finding a national plan to take advantage of BD at the level of the public and private sectors in a way that ensures the creation of unified systems and methods for analyzing and processing data, benefiting from it in decision-making and facilitating access to it, and spreading awareness and culture of the importance of BD for decision makers and for all the society members through organizing more seminars and conferences.

The study (Wang & Wang, 2020) aimed at describing the synergistic relationship between BD and knowledge management. As well it sought to analyze the challenges facing small and medium-sized companies around BD technology and then come up with a proposed model that shows the relationship between KM and BD. The importance of the study lies in the scientific addition to the literature of KM and BD through the study of the basic dimensions of the strategic use of BD and information technology solutions for small and medium companies and the production of new knowledge. Hence the need for this study arose, as it agrees with the current study in that it is necessary for any institution

to invest in BD to ensure its success using KM in addition to working on a proposed model that shows the role of KM in BD investment. However, this study differs from the current study in that current researchers work on a large government institution. To achieve the objectives of the study, the content analysis method was used, in which it relied on the analysis of eight models of small and medium companies that analyzed BD and used it in knowledge management. The study yielded several findings, the most important of which was that BD analysis provides valuable insights for small and medium enterprises. Moreover, the study came up with a proposed model that shows the relationship between KM and BD. The study recommended that small and medium enterprises take advantage of BD in their KM using the model proposed in the study, as shown in Fig.5 below:

The study (Karaboğa & Karaboğa, 2022) aimed at organizing the literature on big data and KM from a bibliometric perspective and creating a general framework for the past, present, and future of the field. This study examined 622 papers obtained from the Clarivate Analytics Web of Science database (WoS) between 2013 and 2020.

This paper is consistent with our study in the lack of foreign scientific research on KM and BD, but the difference between this study and the current study is that in terms of current paper, it confirms the existence of a deficit also in terms of Arabic scientific
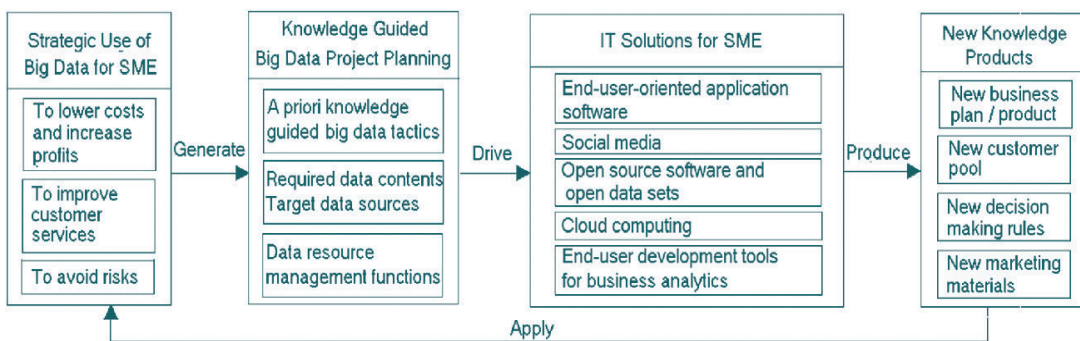

Fig. 5. BD KM Model for Small and Medium Enterprises
Source: (Wang & Wang, 2020)

research until 2022. The results showed that the annual growth rate of the relevant field reached 42.9% indicating an increase in popularity among researchers. China and the United States are home to the most productive authors and institutions in the field. Table 1 shows foreign literary production in KM and BD compared to Arab literary production. The Kingdom of Saudi Arabia appears as the only example of the Arab countries, and this was confirmed by the current study, but there is progress over time.

Also, the Country Collaboration Network, the Institutional Authorship Network, the Common Words Network, and the Common Citation Network are introduced to present the intellectual structure of the field. This study is useful for understanding the industry leading trends in terms of the most influential authors, institutions and countries, most productive journals, and scholarly journals, most popular keywords, collaboration networks, and co-citation networks. This study is the first bibliometric examination attempt to understand the flow at the intersection of BD and KM over time.

Methodology

The current millennium in which organizations and institutions operate is characterized by challenges, competitiveness, and permanent changes, especially with the birth of many technical innovations that contributed to the emergence of the data revolution in its various forms, various sources, rapid circulation, and the need for integration, and thus preparing huge data. Hence, it became difficult to analyze and deal with it using traditional tools, which also resulted in the fact that it is not possible for these organizations to manage their tangible resources only to achieve excellence in their services and achieve their goals. It is necessary to adopt this data as assets and drivers of business in organizations and improve their investment. Government agencies play an important role in the development of the society, so they need to be taken care of and work to improve their performance by using knowledge management, which has a number of benefits and allows to achieve the goals set, face and adapt to continuous and rapid environmental changes.

Given the importance of the Ministry of Education in Saudi Arabia as an important tributary of intellectual, social, political, and economic growth and considering the development renaissance that the Kingdom is witnessing, the most prominent challenge the Ministry of Education is facing at present is the information revolution and dealing

Table 1

Paper frequencies for countries

#	Country	Articles	SCP	MCP	Total Citations	Average Articles Citations
1	China	140	89	51	1.592	11.37
2	USA	126	95	31	1.748	13.87
3	Italy	42	22	20	747	17.79
4	UK	37	22	15	692	18.70
5	German	23	17	6	287	12.48
6	India	22	19	3	256	11.64
7	Spain	21	13	8	291	13.86
8	Australia	17	11	6	234	13.77
9	France	13	8	5	150	11.54
10	Canada	12	6	6	199	16.58
11	Korea	9	6	3	62	6.89
12	Saudi Arabia	9	4	5	40	4.44
SCP: single country Publication\ MCP: Multiple-country Publications						

Source:(Karaboğa & Karaboğa, 2022)

with the huge amount of data and successive changes. This made it necessary for the KM to adopt the BD investment in the ministry.

From this perspective, the idea of this study arose, in which current researchers will clarify the role of KM as an effective tool and contribution to BD investments in the organization. The problem of the study can be formulated in the following question: **What is the role of KM in BD investment?**

This research relied on the use and application of the descriptive analytical approach by collecting previous studies, which cover the period from 2014 to 2022 in order to raise the efficiency of the decision-making process and achieve competitiveness among institutions. The researchers of this study arranged the studies according to the year of their publication, so the beginning was with the least recent studies followed by the most recent ones.

Findings and Discussion

The previous studies that were reviewed dealt with the major topic assuming that there is a close relationship between KM and BR, its management and analysis. While some studies discussed different aspects, they all agreed to clarify the role of CM in investing in BD in organizations. Most of the studies were similar in their use of the descriptive analytical method in the theoretical aspect. By presenting the previous studies, the researchers reached a set of results, presented below.

In most of the studies reviewed, BD together were recent, and in the intellectual production published in a foreign language, which indicates the weakness of Arab intellectual production related to the subject (Alhashimiya et al., 2019; Ekambaram et al., 2018; Hosseinioun, 2018; Wang & Wang, 2020).

The study (Karaboğa & Karaboğa, 2022) was unique in that it was the first bibliometric examination attempt to understand the flow at the intersection of and KM over time. This study is useful for understanding the leading trends in the field in terms of the most influential authors, institutions and countries, most productive journals, and scholarly journals. As shown in Table 2 the leading journals in this field are "IEEE Access", "Journal of Knowledge Management", "Expert Systems with Applications", "Management Decision", and "Journal of Business Research" respectively. The first publications of these magazines showed that they entered the field in 2015, 2016 and 2017. Although they entered the field later than some other journals, their dominance indicates that they will be the dominant journals in the field in the coming years due to the high volume of publications and citations they receive.

On the other hand, study (Izhar & Shoid, 2016) was unique, as the paper was a first step in understanding the relationship between BD and knowledge management.

As for study (Ali, 2017), it showed the level of great interest in the subject of KM in organizations and the impact of using this concept on improving the performance of the organization, either production or service. Despite great interest in the topic, local field research has begun to develop, but to a limited extent.

Table 2

The 5 most productive magazines

#	Source	Total Articles	First Publication Year	Total Citations
1	IEEE Access	22	2016	129
2	Journal of Knowledge Management	21	2016	404
3	Expert Systems with Applications	10	2015	245
4	Management Decision	10	2017	121
5	Journal of Business Research	9	2018	215

Source: (Karaboğa & Karaboğa, 2022)

Studies Pauleen & Wang, 2017; Izhar & Shoid, 2016; Ekambaram et al., 2018; Hosseinioun, 2018; Wang & Wang, 2020 indicated that BD analytics is a rapidly developing field that is already showing promising early successes. In addition, there are significant synergies with KM as both aim at improving decision-making, fostering innovation, and nurturing competitive advantage and economic success through knowledge acquisition and application. Both operate in a world of increasing information flow. Most of the previous studies agreed that most of the organizations examined have the intention and capabilities to adopt and invest in BD technologies, but they are still in the early stages and do not have full readiness to manage BD. Besides, studies have unanimously agreed on the possibility of BD investment in studying the behaviour of individuals, supporting, and taking decision-making, predicting indicators of economic and social development, and achieving sustainable development goals, which may affect changing the way institutions compete, and provide them with a new strategy and vision to improve their services and products. Studies have found that poor security that ensures data confidentiality and privacy concerns, lack of information and communication technology infrastructure, inability to manage data and quality problems, and lack of skills and competencies to deal with BD, are among the most important challenges facing organizations when investing in BD.

Studies (Al-Mutlaq, 2017) and (Alhashimiya, 2019) indicated a set of factors that, if available in the institution, would contribute to the success of the institution investing in BD, such as providing material and technical capabilities, higher administrations support to take advantage of BD, and the ease of exchange between various institutions. The studies also clarified the importance of knowledge investment mechanisms in building a competitive advantage in emerging universities in the fields of education, training, scientific research, consulting, and scientific production. And that there are some challenges faced by the management of BD in government institutions, (Fig.6), as revealed by the results of the previous study.

Study (Al-Mutlaq, 2017) also showed, as Fig.7 illustrates, the areas of BD investment in government institutions in the Sultanate of Oman. The study results chapter concluded by identifying the areas of BD investment by government institutions, the sample of the study, represented in strategic planning and appropriate decision-making.

Fig. 6. The challenges of managing big data in government institutions in Oman
Source: (Alhashimiya, 2019)
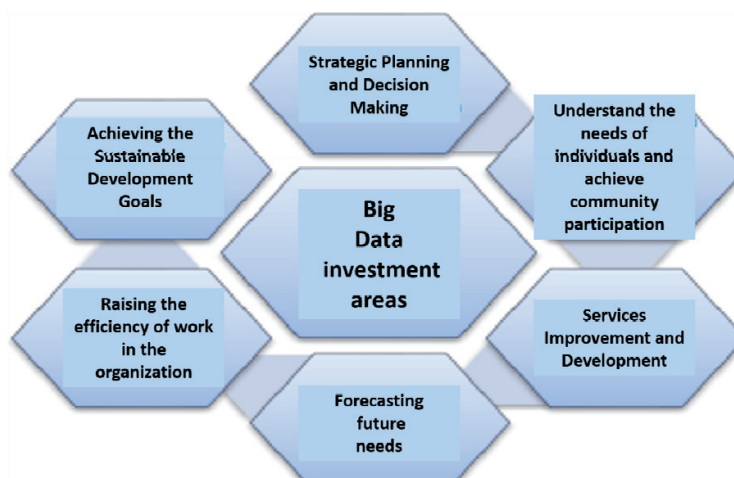
Fig. 7. Areas of BD investment in government institutions in the Sultanate of Oman
Source: (Alhashimiya, 2019)

This chapter also stressed understanding the requirements of individuals and their involvement in a number of community issues, taking their opinions and observations into the services provided by institutions, and raising the efficiency of their work, in addition to knowing the economic and social changes in society, predicting future needs, and achieving sustainable development goals. This study is very important for the current study because it requires knowing the areas of BD investment in the government sector, which is the Ministry of Education.

Conclusion

One of the latest administrative concepts is knowledge management, which represents the sum of the processes that help institutions obtain, create, select, organize, use, distribute, and transfer important information and experiences owned by institutions. In fact, from the researchers` point of view, the growing interest in KM by various institutions and adopting and applying KM leads to the achievement of many benefits and advantages such as making decisions, solving administrative problems, increasing efficiency and effectiveness, improving the quality of outputs, increasing productivity, improving creativity, and most importantly keeping pace with the rapid changes. Among the most important institutions that are interested in adopting knowledge management, which in turn is

also a source of knowledge and investment, the authors emphasize educational institutions that seek to modernize and develop their work and achieve compatibility between their outputs and the requirements of the work environment in line with the aspirations of development because they always seek to improve the educational process, raise the quality of education organizations and achieve their goals with better returns and lower costs.

This will only be achieved by taking care of BD, its management and analysis, and its developments and transformations in the volume of information and the volume of data and its storage. Therefore, decision-makers should invest in BD in the Ministry of Education considering the data of globalization and the explosion of knowledge and technology.

Finally, the most important recommendation of the researchers in this paper is to publish more Arabic research related to BD investments through KM in any organization in the future to help KM find solutions to face the challenges any organization faces as a result. use of BD

In addition, the current researchers recommend working more on finding a model that demonstrates the role of KM in BD investment in the Ministry of Education in order to make the right decisions at the right time and achieve sustainable development, so that the success of KM is achieved in how to manage BD and the ability to invest it.

References

1. Abdul Rahman, Tariq Attia (2017). KM as an entrance to enhance organizational innovation in the central government agencies in the Kingdom of Saudi Arabia: a field study, Institute of Public Administration in Riyadh.

2. Al-Bar, Adnan Mustafa; and Al-Marhabi, Khaled Ali (2018), Big Data and its application areas: https://www.awforum.org/index.php/en/component/k2/item/190%D8 %A7%D8%A7 %D8%A7%D8%A7%D8%A7%D8%A7%D8%A7%D8%A7%D8%A7%D8%A7%D8%A7%D8%A7 %D8%A7%D8%Of 85%D8%A9-Don't perfectly D8%AC%D8%A7%DD%A7%D8%AA-D8%AA%D8%B7%D8%A8%D9% 8A%DirectoryDirectory7%D8%A7Listed on 22/2/2022

3. Alhashimiya, Kawthar bint Muhammad bin Abdullah, Al-Awfi, Ali bin Saif, and Al-Harassi, Nabhan bin Harith. (2019). Big data management and investment areas in government institutions in the Sultanate of Oman (unpublished master's thesis). Sultan Qaboos University, Muscat. Retrieved from http://search.mandumah.com.sdl.idm.oclc.org/Record/1054799

4. Ali, Mahmoud Ahmed Ibrahim (2017). A proposed model for the role of KMin improving overall quality in the Egyptian Tax Authority. The Scientific Journal of Commercial and Environmental Studies: Suez Canal University - Faculty of Commerce in Ismailia, Volume 8, Volume 2, 718 - 750. Retrieved from http://search.mandumah.com/Record/889667

5. Al-Mutlaq, Turki bin Ali Hammoud. (2017). Knowledge investment and its relationship to building the competitive advantage of emerging universities in the Kingdom of Saudi Arabia. Journal of Educational and Psychological Sciences: University of Bahrain - Scientific Publishing Center, Volume 18, Volume 3, 261-299. Retrieved from http://search.mandumah.com.sdl.idm.oclc.org/Record/879483

6. Al-Rashidi, Nayef Fayed, Raja Nayef (2020). The role of KMin achieving quality education in institutions in the State of Kuwait. The Arab Journal of Literature and Human Studies: The Arab Foundation for Education, Science and Arts, vol. 15, 355 - 382. Retrieved from http://search.mandumah.com/Record/1083390

7. David J. Pauleen, & William Y.C. Wang. (2017). Does big data mean big knowledge? KM perspectives on big data and analytics. Journal of Knowledge Management, 21(1), 1–6. https://doiorg.sdl.idm.oclc.org/10.1108/JKM-08-2016-0339

8. De Mauro, A., Greco, M. and Grimaldi, M. (2015). What is big data? A consensual definition and a review of key research topics. AIP Proceedings of the International Conference on Integrated Information, 1644 (n/a), 97-104. doi: 10.1063/1.4907823

9. Ekambaram, A., Sørensen, A. Ø., Bull-Berg, H., &Olsson, N. O. (2018). The role of big data and KMin improving projects and project-based organizations. Procedia Computer Science, 138, 851–858. DOI: https://doi.org/10.1016/j.procs.2018.10.111

10. Fredriksson, C. (2018). Big data creating new knowledge as support in decision-making: practical examples of big data use and consequences of using big data as decision support. Journal of Decision Systems, 27(1), 1–18.

11. Gang-Hoon Kim, Silvana Trimi, Ji-Hyong Chung (2014) Big Data Applications in the Government Sector: A Comparative Analysis among Leading Countries. Communications of the ACM, March 2014, Vol. 57 No.3, Pages 78-85

12. Hosseinioun, S. (2018). KNOWLEDGE GRID MODEL IN FACILITATING KNOWLEDGE SHARING AMONG BIG DATA COMMUNITY.

13. Investopedia. LLC. (2017) Big Data. Retrieved 11 19, 2017, from Investopedia http://www.investopedia.com/terms/b/big-data.

14. Izhar, Tengku Adil, & Shoid, Mohd Shamsul. (2016). A Research Framework on Big Data awareness and Success Factors toward the Implication of Knowledge Management: Critical Review and Theoretical Extension. International Journal of Academic Research in Business and Social Sciences, 4, 325.

15. Karaboğa, T., Sehitoğlu, Y. and Karaboğa, H.A. (2022). The evolution of big data in knowledge management: A bibliometric analysis. Bilgi Dünyası, 23(1), 49-79. doi:10.15612/BD.2022.645.

16. Kazak, E. (2021). A conceptual analysis of the role of KM in knowledge leadership. Journal of Theoretical Educational Science, 14(3), 352-372. Retrieved from https://www.proquest.com/scholarly-journals/conceptual-analysis-role-knowledge-management/docview/2580848150/se-2?accountid=142908

17. Latabi, Maryam. (2019, January 2). Big data and the information industry. ASJP. Retrieved October 19, 2021, from https://www.asjp.cerist.dz/en/article/72975

18. Mersal, Mohieldin Koko Bakhit (2018). The Role and Importance of University Libraries in Managing Big Data: A Case Study of the Central Library of the University of Khartoum.The twenty-fourth annual conference of the Association of Specialized Libraries, Arabian Gulf Branch. Muscat: Sultan Qaboos University) 6-8 March (2018, p. 22).

19. Ode, Egena & Ayavoo, Rajenthyran. (2019). The mediating role of knowledge application in the relationship between KM practices and firm innovation. Journal of Innovation & Knowledge. 5. 10.1016/j.jik.2019.08.002.

20. Thabet, Manahil. (2019, October 8). Knowledge investment. From Albayan. Retrieved November 10, 2021, from https://www.albayan.ae/opinions/articles/2019-10-08-1.3668220

21. Vassikis, Konstantinos & Petrakis, Emmanuel & Kopanakis, Ioannis. (2018). Big Data Analytics: Applications, Prospects and Challenges. 10.1007/978-3-319-67925-9_1.

22. Wang, Shouhong & Wang, hai. (2020) Big data for small and medium-sized enterprises (SME): a KM model. Journal of Knowledge Management. 24 (4) 881-897.

ANALYTICAL STUDY ON THE ROLE OF KNOWLEDGE MANAGEMENT IN BIG DATA INVESTMENT

Maram Saleh Miralam, University of Business and Technology, Jeddah (Kingdome of Saudi Arabia).

E-mail: marammiralam@gmail.com

Muna Dakil Alsuraihi, King Abdul Aziz University, Jeddah (Kingdome of Saudi Arabia).

E-mail: marammiralam@gmail.com

This century has witnessed the greatest development of information technology. Accordingly, the factor of the developments in the field of knowledge has become more influential in life. Therefore, institutions must obtain the most important elements of success, catch up with the latest changes, and maintain their ability to compete and persist in the market in the age of information technology. The massive accumulation of data and information and the emergence of the so-called big data (BD), have led to an urgent need to manage knowledge and the ability to invest in it. On this basis, arose the need to conduct this research that deals with the role of knowledge management (KM) in decision-making for institutions. This research aims at shedding light on the role of KM in BD investment in the Ministry of education in Saudi Arabia. To achieve this goal, the descriptive analytical method was used, which depends on the evaluation of many works and research papers, during the period from 2014 to 2022. After evaluating many studies, the study concluded that it is necessary first, to publish more Arabic future studies concerned with the role of KM, its technologies and types. Second, to find appropriate solutions and stand against the challenges faced by the Ministry, and finally to find a model that shows the role of KM in BD investment in the Ministry of Education to make the process of taking the right decisions easier and at the right time, and achieve sustainable development.

Одержано 15.12.2022.