

The reality of big data and its importance in decision-making at the Ministry of Education: Case study 2020

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Abstract:

The study mainly aimed to investigate the reality of big data and its importance in decision-making at the Ministry of Education. Therefore, a number of questions were raised to explore the challenges facing the officials in analyzing big data, and investigate the level of its benefit in addition to the extent to which the employees are aware of the significant role of big data analysis. The researcher used the descriptive analytical approach to present the theoretical part based on the literature review, and analyzing the data collected from the field study using SPSS.

The questionnaire and the checklist were distributed after being implemented on the study sample consisting of the heads of the departments and the employees of the administration of digital transformation in the Ministry of Education, who are (83) managers and employees.

The results of the study revealed that the decisions based on the results of big data analysis improved the performance of the Ministry of education and enhanced the level of benefiting from them in decision making. It was also concluded that the employees are aware enough of the importance of big data analysis although they find some difficulties in dealing with the amount of data despite its availability in the Ministry. The study finally recommended that it is important to increase the skills of the individuals, bring specialists and experts of data analysis. It was also recommended to expand the use of big data analysis and make more efforts to keep up with the modern technological advances.

Key words: *Big data, decision-making, big data analysis.*

Introduction

Big data constitute a critical stage in the development of Information and Communication techniques and systems. They refer to a huge amount of big and complicated data, which size exceeds the ability of the traditional computerized programs and mechanisms to store, treat and distribute them. This led the specialists to look for more developed alternatives to control such type of data (Ibtisam, 2018).

Analyzing these big data is not enough. Instead, this analysis must be efficient in order to affect the decisions and consequently put these data in the core of decision-making instead of depending on intuition (Bedier, 2014).

Big data analysis is a real challenge for the Ministry of Education as well as many organizations. This is because decision-makers face many challenges as the quick human, financial and economic changes and the lack of knowledge of the modern information in addition to other challenges that

requires the rapid start of plans preparation and keeping up with development in addition to overcoming these challenges.

Based on the above, the current study aims to investigate the reality of big data and its importance in decision-making in the Ministry of Education and the nature, importance and features of big data. It also aims to explore the challenges facing the Ministry of Education in big data analysis and the level of awareness of the officials of the Ministry of Education of the importance of big data. To achieve the study objectives, the researcher attempts to answer the following main question: What is the reality and the importance of big data in decision-making?

Literature Review

Rashwan (2018) aimed to the scientific formalization through investigating the role of big data analysis in minimizing making financial and administrative decisions in the Palestinian universities. The study used the descriptive analytical approach using the questionnaire as the tool of the study. The results of the study confirmed that collecting, storing and treating big data helps to get accurate information based on which administrative decisions can be made in the Palestinian universities. The study recommended to draw a comprehensive strategic plan to manage and analyze big data in addition to make use of them in supporting decision-making in the Palestinian universities.

In addition, Al-Aklabi (2018) aimed to explore the importance of big data in supporting decision-making and Itqan system through the users' inference and the guide of Itqan system in an attempt to draw conclusions that contribute to the system development. This may enhance the ability to the efficient big data analysis to help decision-makers in King Saud University. The study also used the descriptive analytical approach. It finally concluded that the benefit King Saud University gains from the services of Itqan system is still limited in comparison with the system capacities. The study recommended to conduct further studies on the updates in big data analysis.

However, Ragouseo (2018) aimed to identify the benefits and risks of big data techniques and the impact of investing on these data on the processes and strategies of the company. The descriptive analytical approach was used based on the questionnaire as the tool of the study. The study concluded that adopting big data techniques in various companies in the industrial sector is not different from adopting bug data techniques.

On the other hand, Manaseer& Alawneh& Asoudi (2018) aimed to raise the awareness of the importance of big data and how they may be a critical problem in addition to how they may affect the improvement if the academic offices. It also aimed to study the possibility of using HADOOP technique in management of the academic offices, which may help in efficiently storing, managing and analyzing big data in a cheaper way. It also may make the analysis faster. The study finally revealed that big data and big data analysis is a dangerous challenge these days and is a critical part in decision-making and strategic planning.

Besides, Deniz et al. (2018) explained the opportunities and challenges associated with big data in the field of auditing as the study explored (301) research papers discussing the analytical procedures in the audit process. The study induced a proposal for the external audit as the auditors should analyze the percentages of the audited lists and audit the text, regression, decision tree, expert systems, probability models and statistics. The study recommended to use the extensive analyses in the external audit.

Thus, Oussous et al. (2017) made an investigative audit for the improvement of modern technology for big data aiming at the right choice of the different big data techniques in accordance to the company needs. It also aimed to explain HADOOP big data technique and compare some of the

improved main units including data storage, treatment, interactive query and the challenges of the big data systems. Also, the descriptive analytical approach was used. The study concluded that providing technological instruments for big data analysis may offer a comprehensive view for the use, treatment and storage of big data. The study recommended to conduct further studies in the fields of information systems and their instruments in order to establish infrastructure for the second-generation big data.

Hence, Harper & Oltmann (2018) attempted to explore the extent to which big data is implemented in the companies, the level of its impact and to make use of big data analysis in predicting future needs. It also aimed to investigate the pros and cons of big data including individuals' privacy data in addition to the best ways to overcome them. The results of the study confirmed that it is important to look for innovative new methods of data analysis instead of collecting and storing them in order to offer purposeful conclusions and recommendations for the library users.

Theoretical Framework

The term (big data) is a new term that appeared as a new trend to describe the massive flow of data produced manually in addition to their recording and storage since the huge companies try to collect and analyze the data related to their activities. However, big data analysis is considered to be the largest challenge for these data. Regarding digital data, digital data treatment comes across three stages starting with paper-based culture to the digital containers. Then, these data are transformed from the computer and local networks to the internet and finally they are transformed from the classical internet to big data (Handah, 2014). However, big data analysis aims at achieving the most valuable benefit of the electronic experience of the client, predicting future events and supporting the strategic decision using big data (Ghassan et al., 2009). Big data also have a significant role in strategic decision-making within the company as data collection helps to accurately describe and analyze the problem to draw accurate conclusions

(Ibrahim, 2013). On the other hand, companies use data analysis system to improve the involved processes and the current and new services in addition to benefit from the data and providing the suitable offers for the clients in the appropriate time (Hijazi, 2006). This is because the real value of the data is derived from decision making then assessing the decisions consequences and make the appropriate amendments (Suham, 2013). Thus, big data analysis may face some challenges such as the difficulty of data collection or the unavailability of data, carelessness of some individuals in the institution in regard to some data as they believe that these data are not important in addition to the high costs of data collection (Dayyat, 2010). Technological advancement has also contributed to the increase of the impact of data on decision-making. However, neglecting the maintenance of data to be used in decision-making may lead to the failure of these decisions as decision-making may be affected with many factors. These factors may be external such as the international and regional system and the international public opinion in addition to the international advertisement, or they may be internal including the humanitarian, behavioral and environmental factors (Ibrahim, 2013).

Based on the above, we can say that prospecting databases aims to recover the hidden data. Moreover, prospection and analysis provide the institutions with the ability to discover and focus on the important data. In light of the increasing prevalence, it is important to find techniques and programs for deducing knowledge from data and making use of this knowledge in finding solutions for the problems and decision-making. This is also considered to be among the steps of knowledge deduction from databases (Maleek, 2017).

Methodology of the study

Population and sample of the study

The population of the study consists of the employees in the management of digital transformation in the Ministry of Education in Riyadh, who are (320) employees. A sample of 983) managers and employees was randomly chosen, and the study was conducted in the first semester of the year (2019-2020).

Instrument of the study

The researcher designed a questionnaire consisting of six parts, each of which includes many questions. A checklist, which consists of four parts each one of which includes many questions related to the study, was also designed. The responses of the population of the study on the questionnaire items were identified in accordance to Likert fifth scale (Strongly agree, agree, sometimes, disagree, strongly disagree).

Face validity was investigated as the questionnaire was shown to some of the faculty members to make sure the correlation between big data and decision-making in the Ministry of Education, the accuracy and clarity of the items, and its linguistic accuracy in addition to suggest any deletion or amendment to improve them. In addition, internal consistency validity was investigated through implementing the questionnaire on an external sample consisting of (10) employees with the same characteristics of the population of the study. Correlation coefficients were also calculated between each item and the total grade of the questionnaire in addition to Pearson correlation coefficient between each item and the total grade of the questionnaire (look at table 1&2).

Table (1). Correlation coefficients between each item and the total grade of the questionnaire

	No.	Correlation coefficient	No.	Correlation coefficient	No.	Correlation coefficient	No.	Correlation coefficient	No.	Correlation coefficient
Item 1	1	**0.77	2	**0.59	3	**0.64	4	**0.86	5	**0.65
Item 2	1	**0.70	2	**0.68	3	**0.81	4	**0.85	5	**0.87
Item 3	1	**0.73	2	**0.71	3	**0.76	4	**0.80	5	**0.81
Item 4	1	**0.76	2	**0.61	3	**0.56	4	**0.87	5	**0.91
Item 5	1	**0.86	2	**0.69	3	**0.80	4	**0.55	5	**0.82

**** Correlation coefficient is statistically significant at level of significance (0.01)**

Table (2). Pearson Correlation coefficients between each item and the total grade of the questionnaire

Item	Correlation coefficient
Item 1	**0.94
Item 2	**0.94
Item 3	**0.93
Item 4	**0.90
Item 5	**0.91

**** Correlation coefficient is statistically significant at level of significance (0.01)**

Reliability of the study was also investigated through calculating the correlation of internal consistency correlation for the items in the second using Cronbach's Alpha correlation as shown in table (3).

Table (3). Cronbach's Alpha correlation for the items of the second part of the questionnaire

Item	Number of items	Cronbach's Alpha correlation
Item 1	5	0.91
Item 2	5	0.87
Item 3	5	0.90
Item 4	5	0.94
Item 5	5	0.88
Total	25	0.95

Analysis and discussion

First: Sample description according to demographic variables

Frequencies and percentages of the population of the study were calculated in accordance to the objectives of the study. The results related to the managers revealed that the majority of the sample of the study are between 25 and 34 years old. 36.4% of the sample were between 25 and 35 years old while 36.4 were more than 35 and less than 45. This means that the managers, who are the corner stone of the are youth. The table also shows that 63.6% of the sample have the adequate experience required for the work, which can be based upon in the questionnaire. In regard to the excellent outstanding knowledge of the computer, 36.4% of the sample possess intermediate to advanced knowledge of the computer.

Table (4). Distribution of the population of the study according to the study objectives (the managers)

Variables		Frequency	Percentage %
Gender	Male	9	81.8
	Female	2	18.2
Age	Less than 25	0	0
	25-34	5	45.5
	35-44	4	36.4
	45-54	2	18.2
	More than 55	0	0
Certificate	Less than secondary	0	0
	Secondary	2	18.2
	Bachelor	5	45.5
	MPA	3	27.3
	PhD	1	9.1
Years of experience	Less than 10 years	0	0
	10-20 years	7	63.6
	21-30 years	3	27.3
	More than 31 years	1	9.1
Knowledge in computer	Not a user	0	0
	Beginner	3	27.3
	Intermediate	4	36.4

	Advance	4	36.4
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However, the results related to the employees revealed that the majority of the sample is between 35 and 44 years old as 44.4% are between 25 and 35 years old. This confirms that the questionnaire targets the youth as they are the main goal of the study. It was also revealed that these youth have a high educational level as 63.9% of the sample have a bachelor degree. This indicates that the study targets those who have high education certificates.

Table (4). Distribution of the population of the study according to the study objectives (the employees)

Variables		Frequency	Percentage %
Gender	Male	51	70.8
	Female	21	29.2
Age	Less than 25	0	0
	25-34	32	44.4
	35-44	39	54.2
	45-54	1	1.4
	More than 55	0	0
Certificate	Less than secondary	0	0
	Secondary	10	13.9
	Bachelor	46	63.9
	MPA	11	15.3
	PhD	2	2.8
	Less than 10 years	3	4.2
	10-20 years	2	2.8

Years of experience	21-30 years	51	70.8
	More than 31 years	19	26.4
	Not a user	0	0
Knowledge in computer	Beginner	0	0
	Intermediate	0	0
	Advance	18	27

Second: Investigation of the results

To measure and investigate the items of the questionnaire, the researcher calculated the arithmetic averages and the standard deviations of each item of the questionnaire in the part of big data analysis in decision-making.

1st: The role of data analysis in decision-making from the point of view of the managers

A: The First part: Human resources

Having calculated the arithmetic averages and the standard deviations of the items in the first part, it was concluded that there is a clear imbalance in the relationship between the human resources and their ability to analyze big data. The standard deviations for the items of the questionnaire were between (0.45) and (0.96) as about (81%) of the sample admitted that no incentives are offered for the specialists. On the other hand, about (89%) of the sample admitted that the ministry makes use of specialists of data analysts due to the lack of analysts within the ministry. Moreover, lack of employees contributes to finding a gap between data analysis and human resources department with admission of about (81%) of the sample.

B: The Second part: Material and financial resources

Having calculated the arithmetic averages and the standard deviations of the items in the second part, it was concluded that there is a clear imbalance in the material and financial resources department in dealing with the devices of big data analysis from the point if view of the sample. The standard deviations for the items of the questionnaire were between (0.33) and (0.65) as the

lack of the continuous amendment and maintenance of the computers used for big data analysis is a main reason for the imbalance according to (81%) of the sample. Also, (94%) of the sample sees that there is lack in the financing of the requirements of the issues related to data analysis. However, (81%) of the sample thinks that the ministry provided high-quality computers for data analysis, which leaves good impression about the material and financial resources department.

C: The Third part: Programming and data resources

Having calculated the arithmetic averages and the standard deviations of the items in the third part, it was concluded that programming and data resources department has an effective role in dealing with and protecting data. The standard deviation of the items of the questionnaire were between (0.38) and (0.73) as (100%) of the sample see that programming and data resources department could keep the security and privacy of data of the ministry. In addition, the availability of highly accurate data contributed to satisfaction of (8%) of the sample of the study whereas (81%) of the sample think that the ministry doesn't possess the programs that may help in data analysis.

D: The Fourth part: Decision-making

The arithmetic averages and the standard deviations of the items in the fourth part showed a big agreement among the sample of the study on the importance of big data analysis in decision-making. The standard deviations of the items of the questionnaire were about (0.39) and (0.82) as (100%) of the study sample agree on the role of big data analysis in decision-making in the Ministry of Education, and also support promoting the culture of big data analysis. They also confirmed that they base their decisions on data analysis, which strongly indicates the role of data analysis in decision-making.

2nd: The role of data analysis in decision-making from the point of view of the employees

A: the first part: Investigating the importance of big data analysis

Having calculated the arithmetic averages and the standard deviations of the items in the first part, it was found that there is great understanding of the nature of big data analysis, its functions and the ways of using it among the employees. The standard deviations of the items of the questionnaire were between (0.34) and (0.80) as (87%) of the sample are aware that big data analysis provides valuable information helping in decision-making. Thus, about (61%) of the sample are aware that big data analysis helps in predicting all of the future issues, which strongly indicates that data analysis is valuable in the ministry of education, especially among the employees.

B: the second part: identifying the level of benefit of using big data analysis in decision-making

Having calculated the arithmetic averages and standard deviations of the items in the second part, we notice that the sample is aware of the level of benefit of using big data analysis in decision-making. The standard deviations of the items of the questionnaire were between (0.20) and (0.85) as about (83%) of the sample, whose responses where either agree or strongly agree, sated that the decisions based on big data analysis enhances the performance of the ministry of education. hence, (87%) of the sample declared that the outcomes of data analysis lead to correct decisions, which negatively affected the ministry. This is a strong indication that it is important to make use of data analysis in decision-making.

C: The third part: identifying the obstacle facing the ministry of education in big data analysis

Having calculated the arithmetic averages and standard deviations of the items in the third part, it was revealed that the employees are aware of the obstacle facing the ministry of education in big data analysis as the standard deviations of the items of the questionnaire were between (0.19) and (0.77). however, there is difficulty in dealing with such an amount of data although they are available in the ministry according to (80%) of the sample. Besides, (33%) of the sample believe that the ministry does not constantly provide specialists in data analysis which may lead to the ignorance of the employees of the importance of data analysis and its relation to decision-making.

D: The fourth part: the extent to which the officials in the ministry of education are aware of the importance of big data analysis

Having calculated the arithmetic averages and standard deviations of the items in the fourth part, it was clear that the employees are not highly satisfied with the awareness of the officials in the ministry of education of the importance of big data analysis. The standard deviation of the items of the questionnaire were between (0.29) and (0.63) as about (48%) of the sample think that communication between the different parties interested in data and data analysis if not continuous, which affects the performance of the employees in the ministry. Also, (42%) of the sample see that focusing on establishing a private sector for data analysis is not as required.

E: The fifth part: Raising the awareness of the significant role of big data analysis in decision-making and improving the employees' skills in this field

Having calculated the arithmetic averages and standard deviations of the items in the fourth part, it was clear that it is important to raise the awareness of the significant role of big data analysis in decision-making. The standard deviation of the items of the questionnaire were between (0.29) and (0.89) as about (29%) of the sample think that the employees in the ministry of education are highly aware of the importance of data analysis. On the other hand, (48%) of the sample believe

that ministry of education is keen to consolidate the culture of data analysis and raise the awareness of its employees and staff.

Results and recommendations

The study addressed the importance of big data in general and big data in particular, particularly in decision-making within the ministry of education. The definition, characteristics and features of big data were presented. Moreover, the importance, definition, use and benefit of big data analysis were explained. In addition, the study investigated the importance of making use of the systems of the ministry of education including (Fares) and (Noor) systems in drawing conclusions and information that can be used in decision-making.

The results of the study concluded that decisions based on big data analysis enhanced the performance of the ministry of education in regard to making use of it in decision-making. It was also concluded that the employees are aware enough of the importance of big data analysis, and there exists difficulty in dealing with the amount of data although they are available in the ministry.

The study finally recommended to increase the individuals' skills, bring experts in data analysis, expand the use of big data analysis and make more efforts to keep up with the modern technological advances.

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