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# The role of using big data in predicting customer behaviour: the intermediary role of business intelligence in Jordanian telecommunications companies (a field study)

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**Abstract:** The aim of study is to investigate the role of big data in predicting customer behaviour and the intermediate role of business intelligence in the Jordanian telecom companies. In order to achieve the objectives of this study, the questionnaire was developed to collect data in a random stratified manner on a sample of 168 employees working in the senior and middle management of the heads of departments in the Jordanian telecommunication companies (Zain, Orange and Umniah). The study hypotheses were selected using descriptive and analytical statistical methods using (Amos) programs. The study found that there is an indirect effect of the big data dimensions combined in predicting the behaviour of the customer with the presence of business intelligence as an intermediate variable for the Jordanian telecomcompanies.

**Keywords:** big data; customer behaviour; business intelligence; Jordanian telecommunications.

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**Biographical notes:** Raed. M. Khrisat has eight years of experience areas of marketing, sales support, management, and entrepreneurship. Moreover, his major research interests include big data, technology management, business intelligence, and business analytics, consumer behaviour, which was in 2019. He has obtained his Master degree from Amman Arab University (AAU) in Management Information Systems and BS was also in Management

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## **1 Introduction**

The rapid and continuous emergence of large amounts of data has become the most important in the field of information technology, referred to as big data, which ensures great opportunities for specialised companies to influence a wide range of business processes (Izhar et al., 2013). The widespread use of electronic devices and the generation of widely available digital information have led to a change in the nature of data that is now produced continuously and in large quantities from its various sources, whether structured or unstructured, has led to problems with the possibility of analysis, processing, extraction and use of data better in the decision-making process (UN, 2014). Wamba et al. (2017) noted that the concept of Big Data creates it technically possible to sift, structure, analyse very huge datasets in a timely and cost effective method in order to improve organisation performance.

The need for business intelligence, which simply analyses a huge amount of data from multiple sources and regulates the flow of big data, is important through the use of applications, methodologies and techniques that help the organisation understand its operations and market for timely decision-making (Chen et al., 2012; Obeidat, 2019).

Kumar et al. (2017) noted that the important of big data allows manager to examine their competitive position and strategic marketing planning through analysis the performance of organisations and consumers to improve their decision-making.

Through the use of big data, customer behaviour can be predicted more accurately and in real time using more sophisticated predictive and analytical tools that help expose customer intentions that are the primary responsibility of most marketers (Boykin, 2009), through make better and faster decisions rely on information processed accurately and continuously updated, so as to maintain customers and maximise profitability and competitive advantage.

More precisely, Oussous et al. (2018) explained that the big data involve to clean, procedure, analyse, protected and provide a granular access to massive evolving datasets. Therefore, organisations are more aware that data examination is increasingly becoming a vital factor to be competitive advantage, to determine new vision, and to personalise services. Consequently, the use of appropriate systems and methods to deal with this huge amount of data to predict the behaviour of the customer in the telecommunications sector in Jordan, by providing an effective and more advanced system than traditional methods, provides appropriate and accurate information in time to help telecommunications companies to predict the behaviour of the customer accurately.

By carefully analysing customer behaviour, marketers can make better and faster decisions based on accurate and up-to-date processing information, to maintain existing customers and acquire new customers, to maximise profitability and competitive advantage by delivering one or more value to customers that outperform competitors in the same field.

Johnson et al. (2019) noted that, In light of the tremendous increase in data availability, One major category of big data encompasses digital traces of human behaviours.

Therefore, companies should be more interactive when it comes to customer satisfaction. In this study we will focus on the use of appropriate systems and methods to deal with data produced continuously and in huge quantities, in order to understand what the customer expects and provide products and services Yagate to minimise the reluctance of customers to compete against another company.

## **2 Big data**

The term 'big data' has recently been termed datasets that are so large that they are so complex that they are difficult to manipulate using traditional database management systems (Kubick, 2012). Furthermore, the concept of big data can provide value based on the types of data collected, the larger the amount of volume the higher the chance of insight (Hashem et al., 2015). Today, the big data analytics is used in diverse areas as the data are obtainable in too large amounts to be systematically understood by human mind, big data is a term that describes large volumes of high velocity, therefore, big data analytics is reflected to be an ideal method to help marketing decision-makers get better insights to improve the production success (Saidali et al., 2019).

To store this huge, ever-increasing data size, ranging from tens of terabytes to many petabytes of data in a single dataset to make good use of it (Russom, 2011). Big data refers to large datasets that cannot be captured, stored, managed and analysed by typical software tools (Manyika et al., 2011). These sets of data are not only huge in size, but there is a state of heterogeneity and complexity where they include structured, semi-structured and unstructured data, as well as operating data, transactions, sales, marketing and other data, in addition to big data includes data that come in many forms such as text, images and voice these unstructured data grow faster than their structure and account for 90% of the data volume (Gantz and Reinsel, 2011). There is therefore a need for systems that have the ability to process this data that helps make better decisions (Malkawi et al., 2017; Cuzzocrea et al., 2011) has defined big data as massive amounts of unstructured data produced by high-performance applications. Madden (2012) states that

big data refers to very large, very fast and very difficult data on existing tools and programs to process them.

One of the most important things that make big data so important is that it is a variety of sources such as records and social media, which means that structured data is now linked to unstructured data. They come from audio, video and other devices, so organisations should manage them in terms of where and how to store this data once it is obtained (Elgendy and Elragal, 2014). Furthermore, Satish and Yusof (2017) noted that the Big data concept is getting larger and data continues to explode for assuming appreciated customer experiences from large amounts of structured and unstructured data from different bases in different presentations need the proper structures and tools.

Other difficulties related to big data include image capture, voice recording, research, sharing and analysis (Kubick, 2012). Big data also offers many advantages, leading to recognition and increased enthusiasm for decision-making, also known as evidence-based decision-making (Labrinidis and Jagadish, 2012). It is understood that the more data-driven the organisation makes, the better the organisation will perform (McAfee and Brynjolfsson, 2012). Big data also has the potential to revolutionise management, because one important aspect of big data is to influence when and how decisions are made and who makes them (McAfee and Brynjolfsson, 2012). Thus the use of big data in the organisation leads to data-based decisions to enhance the performance of the organisation. Bello-Orgaz et al. (2016) stated that big data is not only classified by size, but is classified on the 4V's principle, which consists of:

- 1 Volume: Refers to the huge amount of datasets produced by the machine, which is increasing from multiple sources through the development and the increase of smart phones, sensors and other devices connected to the internet, all of which play a major role in this. In 2000, 800,000 petabytes of data were stored and in 2020 the figure is expected to reach 35 zettabytes of data. Additionally, the concept of volume refers to the size of data that is generated from a variety of sources (Gandomi and Haider, 2015).
- 2 Variety: Refers to multiple sources of data include structured data in databases and non-structured data of a non-systematic nature, which make up to 80% of the huge data comes from different devices such as smart devices and sensors and social networking sites where they have a large role In producing big data such as messages, documents, sensor data, search engines, web log files, updates, photos and videos that are posted on social networks such as Facebook, Twitter and SMS. Additionally, variety refers to the structural heterogeneity in a dataset that is that the dataset can be structured, semi-structured and unstructured (Gandomi and Haider, 2015).
- 3 Velocity: Means high speed data production by devices connected to the internet where it reaches the institutions in real time, which is important in taking decisions and actions that enable them to gain more flexibility and competitive advantage against competitors, and with the increase in the frequency of data nowadays the need for an efficient and fast system of real-time analysis of big data is urgently needed. Additionally, velocity refers to how fast the data is made and processed that comes from mobile users, social media, internet users (Gandomi and Haider, 2015).
- 4 Veracity: Refers to objectivity and honesty in the data collected which helps to lay the groundwork for important decisions that enable decision-makers to rely on.

### **3 Business intelligence**

There are many definitions of what business intelligence systems represent, which have addressed different views and opinions by more than one researcher. Negash (2004) defined business intelligence as a system and a set of integrated operational applications that try to understand the position of the company, customers and competitors, the main objective of this The structure is to serve as a base for decision-making. Chaudhuri et al. (2011) also defined the business intelligence system as a set of applications and decision support techniques for organisations to enable CEOs, managers, and analysts to make accurate and fast decisions. Also, the concept of business intelligence refers to the intelligent technologies to implement for small size enterprises to increase their profitability and productivity (D'Arconte, 2018).

According to the definitions, business intelligence systems include the collection of available and relevant internal and external data, and then translate them into useful information that can help users in making decisions. It is therefore clear that awareness of the benefits of business intelligence systems in a complex business environment is increasing day by day, so the need to introduce and implement information systems and identify the introduction of business intelligence tools and systems and enable the use of this discipline in practice, so business intelligence tools must empower business users Of displaying better by analysing massive amounts of complex data. Business users then define visions of these data and come up with decisions through which to solve critical business problems, resulting in a set of tangible and intangible values and actions (Wixom et al., 2013).

Organisations' use of the field of business intelligence, which has become known in recent years, is a new approach to an integrated set of tools and techniques used to collect and analyse data that enables knowledge workers such as executives and analysts to make the right and timely decisions based on data (Gartner, 2009). In addition to gaining a competitive edge by providing new and high quality products and services, BI aims to develop technologies, systems and practices for analysing business data to produce accurate and valuable business-related information to gain new insights into business and markets to ensure continuity. Through the available data from several sources (Al-Obaidi, 2012), and apply the experience gained in order to develop and improve the quality and value of decisions to be made on the basis of information. To assist decision-makers, and to improve the timeliness and quality of input in the decision-making process and thus facilitate the administrative work, and helps business intelligence in decision-strategic and operational-making, which is the company's performance management, improve customer relationships and monitor business activity and to provide support for traditional resolutions (Negash, 2004).

Several researchers have cited the three most common dimensions of business intelligence.

#### *3.1 OLAP*

OLAP is an online analytical processing that provides end-user analytical processing over the internet, enabling end-users to conduct multi-dimensional analysis of business data, thus providing the insight and understanding they need to make better decisions and produce reports based on The data warehouse provides direct analysis of the required data to answer the queries of decision makers (Wang et al., 2006). OLAP organises the

data in the data warehouse in a multidimensional cube format based on the multi-dimensional cognitive model. The cube is then processed to provide as much as possible to answer queries and summarise data in multiple ways. OLAP allows the user to communicate with the data warehouse from any destination via the web. Or graphical user interface (Song et al., 2015).

### 3.2 *Data mining*

The development of ICTs has led to a rapid growth in the amount of digital data and traditional (statistical) analytical methods as it can no longer cope with this huge amount of data. Interest in data mining began during a workshop on the discovery of knowledge in 1989 (Piatetsky-Shapiro, 1991) and since the late 1980s, many researches and studies have emerged in an attempt to solve these problems in finding solutions that combine many disciplines, whether for statistics or artificial intelligence, databases and distinguishing analogue computing. (Chen, 2016) Data mining was then proven to be the best solution for analysing large amounts of data by converting it from incomprehensible and accumulated data into valuable information that could then be used to become knowledge (Obeidat and Otibi, 2015). Data mining is one of the fastest growing fields of computer science, and its popularity has come from the urgent need for tools to analyse and understand big data. This data is produced by a huge increase daily by scanners, computers, digital cameras, etc. (Fayez, 2016).

Data mining is the process of applying analytical methods and tools to detect patterns in large datasets according to different destinations to classify them into useful information that helps facilitate business decision-making and aims to reduce costs and increase revenue. Prospecting is a science that combines information technology with statistical models. Predicting the future and discovering patterns between the data, to provide information related to the variables and behaviour of the customer, which provides clear images of the products sold, prices and competition (Wang, 2005). The relationship between data mining techniques and business intelligence is the ability of these technologies to statistically analyse large datasets and play an important role in business intelligence to find and answer questions (Chen et al., 2007).

In fact, there is a mistake in the term exploration in fact is the extraction of knowledge from a huge amount of data, it may be called appropriate to be the exploration of knowledge, but the term does not reflect the assertion that the exploration of a huge amount of data. For this reason, the term Data Mining was found to be appropriate for this science (Fayez, 2016; Saffar and Obeidat, 2020). The discovery of knowledge from data is data mining, which is the process of analysing data from different perspectives and summarising relationships between them into valuable and useful information that contributes to lower costs and increase profits or both. The process of finding and revealing useful information is through the use of a complex set of tools, some of which include mapping, routine statistics, and artificial intelligence (Han et al., 2011). The lifecycle of data mining from technology is unclear and the reason is that it took experts a long time and effort to develop to reach maturity, because this type of technology combines traditional data processing methods with different algorithms to analyse data from new types to produce knowledge from large amounts of data. In light of this vast amount of data, there are two types of knowledge: the first OLAP and the second data

mining, which are analytical tools based on the data warehouse, but the immediate analytical processing appeared before the data mining, which works on satisfying the desires of the beneficiaries efficiently and quickly by relying on multi-dimensional presentation (Eltabakh, 2010). Prospecting tasks are divided into two main sections (CID, 2016):

- 1 Prediction: The purpose of data mining is to propose forecasts for the general situation or the unknown classification of data. A model is used to predict two basic types. First, classification is used to predict symbolic or discrete value, and the second regression is used to predict values. And market risk.
- 2 Description: A data model that summarises the relationships and the explanatory and documentary role, and to find the relationship between the data uses an analysis to describe the model with strong relational features used to derive important models, and the derivation of finding the differences between a set of characteristics of the same method (Padhy et al., 2012).

### 3.3 *Data warehouse*

W.H. Inmon described the data warehouse as a variety of object-oriented and integrated data to support management decisions. It provides access to data for complex analysis, knowledge discovery and decision-making. There are also many types of applications that support the data warehouse, both OLAP, DDS, and OLTP (Trifonova, 2011). It is also a collection of historical and current data stored in one place that helps the organisation to make management decisions. These data may require processing and analysis and represent them in a specially designed format. Includes huge amounts of data from multiple sources or from different database systems, and the data warehouse is logical information collected from many multiple databases to support activity analysis and decision-making, and the basic concept of the data warehouse is the process of consolidating data from many databases In one database (Abdullah, 2009).

Organisations also seek to build the data warehouse as a focal point by sharing analytical data, providing long-term data storage, reporting on operations systems, and providing full control over response time for queries and reports (Sumaidi et al., 2012). Data warehouse separate daily transactional data that is continuously updated from historical data that is more stable is necessary in the analysis processes so analysts and managers can use historical data in the data warehouse for decision-making purposes. The need for disruption of operational systems (Ammoura et al., 2001) also provides a data warehouse that serves to link data and information to sub-units, which provides reports to senior management to integrate the organisation's data into a single repository that provides a comprehensive view of all operations within a single framework. To make sound decisions based on data that does not lead to conflicts and conflicts of interest in the organisation as a whole and to improve the predictability and development of strategies of the organisation, and also helps the data warehouse to achieve a competitive advantage in becoming an organisation with a greater ability to better understand customers in meeting market needs and requirements customer relationship management (Ammoura et al., 2001).



### 3.4 *Client behaviour*

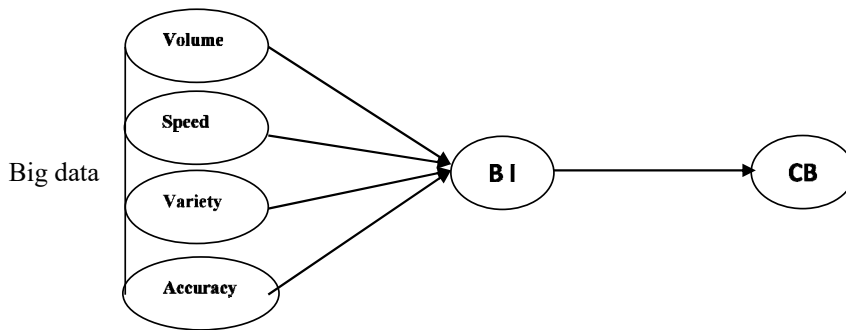
'Customer' is defined as the target person sought by the service provider or the producer of the product receiving the service or settled by the commodity (Al-Aqili et al., 2006). Client behaviour is the pattern used by the customer in conducting research or during purchase. The product or service and also the use which is expected to satisfy his needs and desires (Abdul Hamid, 2002), as we note by definition mention the pattern followed by the customer's behaviour and behaviours during the purchase as well as the use of goods and services and did not mention the motives and factors that led to the conduct of this behaviour, and defined 'Engel' defined customer behaviour as: actions and actions of individuals that pay for the service or product and also includes procedures and decision-making (Sumaida'i and Al'Alaq, 2002); we note by definition that the behaviour of the customer is the acts and apparent actions that drive individuals to obtain a good or service and also the procedures followed by the customer to make a purchasing decision where he did not mention the psychological factors that led to the conduct of these actions. The behaviour of the customer is also defined as the behaviour of the customer in the search for purchase and through the use of goods, services, expertise or ideas that are expected to satisfy his desires and needs according to his purchasing potential (Obeidat, 2012). We note from this definition that the decision-making process of the individual is linked to the distribution and spending of his money from the available resources of money, effort and time on the products acceptable and desired. He also defined the behaviour of the customer as: all acts and actions visible and invisible by individuals in order to obtain a particular good and service from a certain location and place at a specific time (Al-Muezzin, 2008). This definition clarifies that the behaviour of the customer is determined by all direct or indirect acts or actions aimed at obtaining the good or service associated with the time and place.

Under the modern concept of marketing, commercial, service and industrial establishments strive to pay great attention to the study and analysis of the customer's behaviour in order to identify his needs and desires and the different stages through which to make his purchasing decision. Their survival and growth depends on attracting new customers and maintaining the current consumers, which depends on their ability to satisfy their needs and desires. The institutions are concentrating their efforts towards the customer to realise what they have to do to reach the competitive advantage that is the main focus of the consumer (Soleimani, 2017).

## 4 **Research methodology**

### 4.1 *Research model and hypotheses*

There is no statistically significant effect at the level ( $\alpha = 0.05$ ) of the big data in terms of its combined dimensions (size, speed, diversity, accuracy) in predicting the behaviour of the customer through business intelligence as an intermediate variable in the Jordanian telecom companies.

**Figure 1** Research model

#### 4.2 Research design

To answer the questions of the study and test the validity of its hypotheses, descriptive and analytical, some statistical methods were used using the Statistical Package for Social Sciences (SPSS) to conduct various statistical analyses to test the direct and indirect impact of the study model. Also, the study data were collected and analysed based on a field study where respondents answered all items on the five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The researcher designed a questionnaire consisting of the following parts:

- *Part 1:* This section contains the personal information of the respondents, namely: gender, age and years of experience.
- *Part 2:* This part relates to the variables and dimensions of the main study, and was divided into three axes:
  - a The first axis: The independent variable represented by big data, and includes the following dimensions: size, speed, diversity, accuracy, and includes paragraphs (1)–(12).
  - b The second axis: Variable the mediator represented by business intelligence, and includes paragraphs (13)–(21).
  - c The third axis: The dependent variable and the behaviour of the customer, and includes paragraphs (22)–(30).

#### 4.3 Sample and procedure

The study population is represented by all heads of departments in the Jordanian cellular telecom companies, namely: Zain Jordan Telecommunications Company, Jordan Telecom Company (Orange), Umniah Telecom Company, which number 168, 62 in Zain Telecom and 71 individuals. In Jordan Telecom (Orange) and 35 members in Umniah Telecom.

The study was based on a comprehensive survey method in selecting the sample of the study by distributing the questionnaire to all the vocabulary of the study population. The analysis unit consisted of the heads of departments in the Jordanian cellular telecom companies: Zain Jordan Telecom, Jordan Telecom (Orange), and Umniah Telecom,

where they numbered 168. The researcher distributed 168 questionnaires to the respondents of the study sample, and retrieved 154 questionnaires, of which nine questionnaires are not subject to analysis. The returned distributed questionnaires which are statistically accepted totalled 145 questionnaires, in which 93 were male, and more than 73% were less than 35 years old. In terms of experience, the majority of respondents (66.2%) have less than ten years of experience.

**Table 1** Demographic data for respondents

<i>Variable</i>	<i>Category</i>	<i>Repetition</i>	<i>Percentage %</i>
Gender	Male	93	64.1
	Female	52	35.9
	<i>Total</i>	<i>145</i>	<i>100</i>
Age	Less than 25 years	19	13.1
	From 25–less than 35 years	86	59.3
	From 35–less than 45 years	29	20.0
	Above 45	11	7.6
	<i>Total</i>	<i>145</i>	<i>100</i>
Experience	Less than 5 years	48	33.1
	From 5–less than 10 years	48	33.1
	From 10–less than 15 years	30	20.7
	15 and above	19	13.1
	<i>Total</i>	<i>145</i>	<i>100%</i>

## 5 Research results

### 5.1 *Validity and reliability*

The apparent validity of the questionnaire was tested by presenting it to a panel of experienced and competent academic professors in order to give an opinion on it in terms of its validity to collect the data related to the study, its clarity and coherence, or any other observations it deems appropriate with regard to correction, or deletion, The arbitrator sees it. The referees' observations and suggestions have been taken into consideration, and the process of reviewing the questionnaire has been considered by the arbitrators and their observations and suggestions, in addition to making the amendments referred to by them as a test of the apparent truthfulness of the tool. The study instrument is therefore valid for measuring what it was designed for.

The stability of the instrument used to measure the variables involved was then tested using the Cronbach alpha coefficient, where the result of the scale is statistically acceptable if the value of Cronbach alpha is greater than 0.60 [Sekaran and Bougie, (2006), p.311]. From 100%, this indicates higher degrees of stability for the study tool, and looking at the data in the following table has been measured coefficient of internal consistency alpha Kronbach, for the study variables and dimensions and for the study tool as a whole, to see the consistency in the answers; independent and subordinate: the values of the coherence coefficient of internal k. In addition, the alpha value of all paragraphs

was (0.922), and therefore all values are greater than (0.60). This is an indication of consistency between the study instrument paragraphs, the reliability of the study instrument and the possibility of Rely on them for statistical analysis.

## 5.2 Descriptive statistics

As shown in Appendix, the result of the descriptive analysis showed that the overall average of big data in terms of relative importance is high, with an overall average (4.162) and a standard deviation of 0.492. After the accuracy of the big data, it was ranked first with an average of (4.06) and standard deviation (0.579) with high relative importance, while (big data speed) was ranked last with an average of (4.071) and standard deviation (0.613) with relative importance shown high. The general arithmetic mean of the items of customer behaviour in terms of relative importance is high, with an average of (4.173) and a standard deviation (0.503). While the overall arithmetic mean of business intelligence items in terms of relative importance is high, where the arithmetic average (4.033) and standard deviation (0.564).

## 5.3 Hypotheses testing results

To test the validity of the hypothesis of the study related to the direct and indirect impact, the path analysis (path analysis) was used, using the program (Amos) and supported by the SPSS to verify the existence of the direct and indirect impact of the study variables. This hypothesis was designed to determine the intermediate role of business intelligence on the relationship between the dimensions of big data and the prediction of customer behaviour, and the results, as in Table 2 the results of the path analysis test to verify the direct and indirect impact of big data on the prediction of customer behaviour with business intelligence as an intermediate variable

**Table 2** Path analysis test results to verify the direct and indirect impact of big data on predicting customer behaviour with business intelligence as an intermediate variable

<i>Model fit</i>						
<i>Sig</i>	<i>RAMSEA</i>	<i>CFI</i>	<i>GFI</i>	<i>df</i>	<i>Chi<sup>2</sup></i>	<i>Statement</i>
0.000	0.072	0.952	0.977	4	18.760	Predicting customer behaviour

Notes: GFI – Goodness of fit mus proximity.

CFI – Comparative fit index.

RAMSEA – Root mean square error of approximation.

The results of the statistical analysis in Table 2 showed that the value of ( $\text{Chi}^2 = 18.760$ ) which is significant, where the level of significance ( $\text{Sig} = 0.000$ ) is less than 0.05, and the value of any quadrature after dividing by the degree of freedom is (4.690) which is The quality suitability index ( $\text{GFI} = 0.977$ ) is somewhat close to number one, as the closer to the correct one indicates good quality suitability, the comparative alignment index ( $\text{CFI} = 0.952$ ) Which is also somewhat close to the number one, and the square root index to approximate the average error boxes ( $\text{RAMSEA} = 0.072$ ), which is noticeably close to zero, which supports good GE prototype.

Table 3 also showed that the direct effect of volume on business intelligence was (0.152) which is a significant effect. The direct moral impact of accuracy on business

intelligence was 0.139. On the other hand, the direct impact of business intelligence on the prediction of customer behaviour (0.933), a significant impact, which indicates that business intelligence positively affects the prediction of customer behaviour.

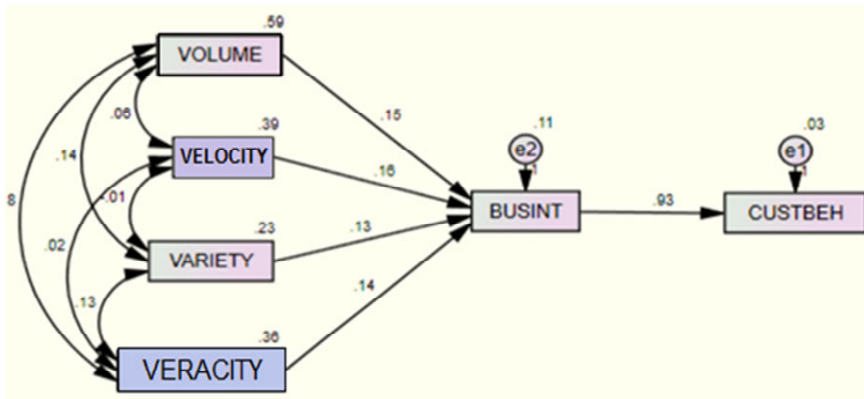
**Table 3** Direct and indirect effect coefficients of the study hypothesis

<i>Estimates</i>					
<i>Sig</i>	<i>The indirect coefficient value</i>	<i>Sig</i>	<i>C.R</i>	<i>Direct impact coefficient values</i>	
0.010	0.142	0.000	3.708	0.152	Volume ← business intelligence
0.010	0.150	0.000	3.558	0.161	Velocity← business intelligence
0.041	0.117	0.060	1.880	0.126	Variety ← business intelligence
0.016	0.129	0.010	2.565	0.139	Veracity ← business intelligence
		0.000	26.979	0.933	Business intelligence ← predicting customer behaviour

The indirect effect of volume on the prediction of customer behaviour was (0.142) which is a significant effect, while the indirect effect of speed on the prediction of customer behaviour was (0.150) which is a significant effect. However, the indirect effect of accuracy on the prediction of customer behaviour was (0.129) which is significant. Because the direct and indirect effect of the dimensions (size, speed, and accuracy) is a moral effect, business intelligence is partly a partial mediation. As for the dimension (diversity), the direct effect was not significant, while the indirect effect was significant. Business intelligence is a full mediation.

This confirms the existence of a positive role for business intelligence as an intermediary variable in the impact of big data on predicting the behaviour of the client when studying the dimensions of big data combined, and therefore can be said to have an indirect impact of the dimensions of the big data combined in predicting the behaviour of the customer with the presence of business intelligence as an intermediate variable in the Jordanian telecommunications companies.

**Figure 2** The hypothesis test results (see online version for colours)



## **6 Discussion and conclusions**

This study aimed to identify the impact of big data in terms of its combined dimensions (size, speed, diversity, accuracy) in predicting the behaviour of the customer through the business intelligence of Jordanian telecommunications companies, where the overall average of big data in terms of relative importance is high, and this indicates the perception The Jordanian telecommunications companies are concerned with the importance of big data in its various fields (size, speed, diversity, accuracy). This is indicated by the study (Al Shawabkeh, 2018), which reached the interest of the University of Jordan on the subject of big data. Arab university libraries have a strong interest in the subject of big data with a focus on the importance of analysis with non-traditional tools. This refers to the companies' realisation of customer loyalty through the persistence (repetition) of the customer in the process of purchasing the services of the provided companies. The overall arithmetic average of business intelligence items in terms of relative importance is high, which indicates that Jordanian telecommunications companies are organising their data by providing a suitable system for storing this data, which he pointed out (Irtaimah et al., 2016), which reached to realise and provide Hikma Pharmaceuticals for intelligent systems that help them in their work.

As for the results of the study hypothesis test, it was found that there is a statistically significant effect of the big data in terms of its combined dimensions (size, speed, diversity, accuracy) in the business intelligence of the Jordanian telecommunication companies. The presence of a strong impact of large data (size, speed, diversity) in the business intelligence in the Jordanian telecommunications companies. Jordanian telecommunications companies and this a study has reached (Olszak et al., 2006), which proved that the concept of BI can contribute to improving the quality of decision-making in any organisation, and better serve customers and some increase in customer loyalty.

Additionally, the big data analytics suggestions multitude of chances to improve business value and productivity. One of the main applications of big data analytics is for business intelligence to improve decision-making capabilities, faster decision-making, understanding of customer needs (Ram et al., 2016). The study also found that there is a statistically significant effect of big data in terms of its combined dimensions (size, speed, diversity, accuracy) in predicting customer behaviour through the business intelligence of Jordanian telecommunications companies.

### *6.1 Managerial implications and future research*

The present study is based on the relevant published works. The study model was developed with the aim of studying the role of using big data in predicting customer behaviour: the intermediary role of business intelligence in Jordanian telecommunications companies. By reviewing the literature, it can be seen that similar studies have not been conducted in Jordan and the telecommunications sector. Consequently, along with the contribution of this study to the current body of knowledge, the results of this study may seem useful to management in developing and implementing different strategic directions.

Derived from our findings, we propose some useful insights for telecommunications companies' providers. In the first place, the role of using big data in predicting customer behaviour is important and essential for any organisation and the role of business Intelligence important influence of survival in global economy. Additionally, to improve

the predicting the behaviour of the customer the business intelligence could give personal functional benefits and enhance the key functionalities of big data dimensions namely: (size, speed, diversity, accuracy). Additionally, the highly involved business intelligence is important from managers' perspective, since these predicting customer behaviour are heavy users of the product or service category in telecommunication sector. The managerial and professional implication is that Telecommunication sector should be able to find decisions to engage business intelligent or to find other ways to increase and predicting customer behaviour as it has significant impact on survival of organisations in the case of telecommunication sectors.

Additionally, there is still a lack of consensus in the scientific literature regarding the big data and business intelligence of the predicting customer behaviour. This is due because academic research on the topic is only emerging, and much of the present discussion has focused on simulations, technical views, and experiments the big data and business intelligence to predicting customer behaviour rather than strategic and managerial implications. Indeed, the research on big data lacks confirmed empirical evidence on the effect of big data analytics (size, speed, diversity, accuracy) on predicting customer behaviour by intermediary role of business intelligence of organisations. Therefore, the originality of this paper seeks to contribute to this gap of knowledge by exploring relations between big data and business intelligence on predicting customer behaviour in the case of telecommunication sectors.

Furthermore, the results will help decision maker and business owners in putting place framework to use big data analytics to understand their business situation better and increase their decision-making and effectiveness. Additionally, the concept of big data and analytics intention different new opportunities to notify the development of sustainable communication application. Moreover, the huge amount of communication data collected by a big data application allows several types of data analytics, comprising past, real-time, predictive, graphical, and audio-visual and image analytics within the telecommunication domain.

Finally, Jordan Telecom companies face increasingly fierce competition, a dynamic environment and continuous daily data, leading to sophisticated strategies, including business intelligence systems, to improve decision-making and make better and faster decisions based on accurate and updated information continuously, enabling them to remain in the digital and dynamic markets Therefore, in order to understand what the customer expects and provide products and services that meet their needs and reduce customer reluctance to another competing company, Jordanian telecom operators should further advance in the use of big data analytics, using business intelligence systems. To reach a mature and deep understanding of the customer and to predict its needs and desires.

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**Appendix****Table A1** The constructs' measure, mean, standard deviation, and level

<i>Q</i>	<i>Measurement</i>	<i>Mean</i>	<i>SD</i>	<i>Level</i>	<i>Cronbach alpha</i>
<i>(Big data)</i>					
1	The company benefits from big data in providing services to its customers through a documented plan for that.	4.248	0.640	High	0.876
2	The company is adopting cloud computing technologies for facing the need to store more processing data.	4.021	0.829	High	
3	The company considerate takes advantage of the analysis of the data collected in an up-to-date manner through experienced specialists (whether from inside or outside the company).	4.207	0.686	High	
<i>(Volume)</i>					
4	The organisational structure of the company over the local network (intranet) supports the flow of data between the different departments.	4.172	0.749	High	0.724
5	The company strengthens its capabilities to quickly distinguish value-added data from big data through appropriate methods of accessing it.	4.124	0.744	High	
6	The company has a rapid analysis of various data (interpretation of images, sound recordings, etc.) depending on programs and means that enable it to do so.	3.917	0.846	High	
<i>(Velocity)</i>					
7	The company is interested in classifying (organising) the data through systems that help to retrieve it and use it in the future.	4.262	0.764	High	0.715
8	The company's groups are enriched with a variety of sources including (databases, smart phone applications, and social media).	4.117	0.821	High	
9	The company is concerned with different prediction models (prediction patterns) to support the activities of generating information sources and developing them according to the actual needs of customers.	3.959	0.897	High	
<i>(Variety)</i>					
10	The company realises the importance of big data management systems.	4.407	0.672	High	0.703
11	The company seeks to obtain accurate data after cleaning (filtering) to be processed later.	4.297	0.708	High	

**Table A1** The constructs' measure, mean, standard deviation, and level (continued)

<i>Q</i>	<i>Measurement</i>	<i>Mean</i>	<i>SD</i>	<i>Level</i>	<i>Cronbach alpha</i>
	<i>(Variety)</i>				<i>0.703</i>
12	The company considerate takes into account the guarantee of data reliability (veracity) before using it in the forecast form, subjecting it to quality inspection before using it.	4.214	0.728	High	
	<i>(Veracity)</i>	<i>4.306</i>	<i>0.579</i>	<i>High</i>	<i>0.763</i>
13	The company has sufficient knowledge in the use of data mining techniques	3.952	0.758	High	
14	The company has an interest in taking benefits of the digital warehouse.	4.062	0.689	High	
15	The company organises its data by providing a suitable system for storing this data.	4.193	0.739	High	
16	The company's departments share data based on a data retrieval system.	4.186	0.736	High	
17	The company has the ability to analyse meaningful data (value added), distinguish its value and make it available to makers and at the right time to benefit in decision-making.	4.090	0.754	High	
18	Modern technologies (OLAP) are used to contribute to data analysis.	3.745	0.848	High	
19	The company seeks to take benefit of the data the experiences of its customers.	4.131	0.775	High	
20	The company uses software to process the unconfirmed (unstructured and semi-structured) data collected.	3.814	0.874	High	
21	The company is keen on managing and updating the data and generating the resulting reports on data processing.	4.124	0.781	High	
	<i>'Business intelligence'</i>	<i>4.033</i>	<i>0.564</i>	<i>High</i>	<i>0.889</i>
22	The purchase decision of customers when purchasing services provided by the company is affected by the small groups (family, friends, colleagues...) to which they belong.	4.262	0.782	High	
23	The customer is affected by the family he belongs to while purchasing services provided by the company.	4.193	0.748	High	
24	I believe that the customer is affected by the customer's social role that he plays when purchasing the services provided by the company.	4.028	0.824	High	
25	The state of urbanisation (urbanisation) affects the customer when purchasing services provided by the company.	4.000	0.866	High	

**Table A1** The constructs' measure, mean, standard deviation, and level (continued)

<i>Q</i>	<i>Measurement</i>	<i>Mean</i>	<i>SD</i>	<i>Level</i>	<i>Cronbach alpha</i>
<i>'Business intelligence'</i>					
26	The client's culture has an impact when he decides to purchase the services provided by the company.	4.200	0.838	High	
27	I think the customers is affected by the social class they belongs to when they purchases the services provided by the company.	4.124	0.881	High	
28	As a result of analysing the big data, an effect of the customer's income on his purchase of the services provided by the company was noted.	4.228	0.734	High	
29	Advance (knowledge) information that the prospective customer has in demanding company services.	4.248	0.672	High	
30	The company realised the customer's loyalty through the consistency of the customer (repetition) in the process of purchasing the services of the provided company.	4.276	0.692	High	
<i>Client behaviour</i>		<i>4.173</i>	<i>0.503</i>	<i>High</i>	<i>0.820</i>

**Figure A1** Study hypothesis test results (see online version for colours)

