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Conceptual Model for Successful Implementation of Big Data in Organizations

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ABSTRACT

The term 'big data' has gained huge popularity in recent years among IT professionals and academicians. Big data describes the massive amount of data that can be processed and analyzed using technology to gain business values that will help organizations to achieve competitive advantages. The current paper aims to develop a holistic model that includes the factors that would affect the success or failure of the implementation of big data in organizations. Furthermore, this research examines the opportunities that organizations would attain from implementing big data, as well as the challenges that could hinder this implementation. The proposed model provides IT managers and decision makers the important factors that they need to consider when deciding to implement big data in order to ensure that it achieves the competitive advantage.

KEYWORDS: Big Data, opportunities, challenges, implementation

INTRODUCTION

The interest of big data has increased because of the significant amount of data generated every day. Data is getting bigger because it is continuing to be generated from more devices and more sources such as personal computers, mobile phones, government records, healthcare records, social media, street sensors, climate sensors, airport terminals, hypermarkets' points of sales, etc. These sources generate a massive amount of data and it will continue to generate more and more data as time passes since people are getting more dependent on technology. As anticipated by Cisco Visual Networking Index (VNI) report (2015), mobile data traffic is expected to grow to 24.3 Exabytes per month by 2019 because of increased usage on smartphones. This is nearly a tenfold increase over 2014. A study by Intel also showed that data has increased enormously in the last decade. It showed that humankind has generated five Exabytes until 2003. From 2003 to 2013, data has increased to reach 2.7 Zettabytes (i.e. 500x more data). Data will continue to increase to three times bigger than that by 2015. In the same context, Das et al. (2013) pointed to the rapid growth of global data. He mentioned that it took from the dawn of time to 2003 to create five Exabytes of information whereas now the same volume of data is created in just two days. This will continue to reach eight Zettabytes by 2015 (i.e. that is the equivalent of 18 million Libraries of Congress). Although data is increasing enormously, a very small fraction of this data has been exploited; the rest is not tapped yet. According to IBM and Intel, 90% of data is unstructured and is not used.

Data can be classified into structured and unstructured data. Structured data refers to data that can be organized and stored in relational databases so it can be easily used and searched efficiently. Unstructured data refers to data, which does not have a pre-defined data model, or it is not organized in a pre-defined manner such as videos, photos, images, emails, text documents and blogs. Searching and analyzing of unstructured data is more difficult than for structured data. Das et al. (2013) also argued that unstructured data would account for 90% of data in the next decade where analyzing this massive amount of data would expose new improvements in business that were impossible to determine previously. Indeed, the interest of big data has increased because it is supposed to have a significant impact on the organizations and this would be achieved by analyzing the unstructured data. According to a survey conducted by IDG Enterprise (2014) amongst more than 750 IT decision-makers in 2013, the interest in big data continues to rise, as nearly half of the respondents (50%) are implementing or planning to implement big data projects within their organizations.

BIG DATA DEFINITION

Although the term has gained huge popularity in recent years, it is still poorly defined and there is huge ambiguity regarding its exact meaning (Hartmann et al. 2014). Manyika et al., (2011) defined big data as “large pools of data that can be captured, communicated, aggregated, stored, and analyzed”. They added that big data refers to datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze. Another definition which was widely cited and used was proposed by Gartner which defines big data as “high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making” (Gartner, 2012). The definition refers to the 3Vs (volume, velocity and variety) which are the three-dimensional characteristics of big data. These are described below:

- Volume: refers to the size of data which is huge and needs an intensive processing
- Velocity: refers to the speed at which data is created, processed and analyzed.
- Variety (range of data types and sources): not all data in a form that is ready for processing. Data can be in many different formats such text, photo, audio, video, web content, GPS data, sensor data, documents, SMS, blogs etc..

While the term ‘Big Data’ may seem to reference the volume of data, others (Schroeck et al., 2012) refer to it as technology (which includes sophisticated analytical tools) that an organization can use to analyze a massive amounts of data. In the same context, Woo et al. (2011) characterized big data as the new generation of technologies and architectures which are designed to economically extract value from very large volumes of a wide variety of data, by enabling high velocity capture, discovery and/or analysis. Chen et al. (2012) view big data as subset of Business Intelligence (BI). He stated that BI could be seen as an “umbrella” that includes applications and tools that enable access and analysis of big data and information in order to improve business performance, competitive advantages and to create business value. Since Big data is a new technology (or it requires new advanced analytical tools), it involves uncertainty. This uncertainty is the output from the unknown opportunities as well as challenges / risks. In the following section, this paper investigates these opportunities and challenges.

OBJECTIVES OF THE RESEARCH

Although the term ‘big data’ has gained huge popularity in recent years, there is a lack of academic literature on the topic in general where most of the published work is technical paper or White papers produced by consulting companies or from IT vendors (Max et al., 2014), e.g., Oracle 2013, DMS 2013 and IBS 2012, TechAmerica Foundation, 2012. However, some academic research aimed to define big data and its characteristics, and develop techniques and tools for analyzing big data. At the same time and from business perspective, there is a lack of research that has shed the light on big data successful implementation. A gap which this research aims to fill.

Due to the emergency nature of the topic and the increasing use of the concept (i.e. big data) by professionals in business and IT communities, the current paper will focus on big data implementation. This research aims to propose indicators model that includes the factors that will affect big data implementation by synthesizing concepts identified from the literature review. In order to identify those factors, it is important to study why organizations are implementing big data. This will be done by identifying the benefits and opportunities that organizations could achieve. Moreover, identifying the implementation challenges would be the main driver to reveal these factors since identifying and tackling the challenges would lead to successful implementation. The identified factors and their relationships will be models to represent an initial model of indicators.

Although the use of critical success factors models might be relevant to the current research. However, this paper is going to use a different method and the reason for that is the nature of the topic. There would be some factors that are exclusive to big data projects such as the data and its characteristics of the 3Vs. In order to identify those factors, an intensive literature review will be carried to investigate big data challenges. Identifying the challenges and tackling them in the right way would contribute towards a successful implementation.

The following section respectively presents a literature review on big data including its opportunities and challenges. This followed by another section, which proposes a model for successful implementation of big data. Last section concludes the paper by highlighting the research contributions and providing suggestions for future research work.

LITERATURE REVIEW

The current paper classifies the relevant literature into two categories, opportunities and challenges of big data in order to define the critical factors that would affect the success of the implementation of big data in organizations, and consequently, could drive business value.

Big data opportunities

Organizations have a massive amount of data. This data lies either inside the organizations in the data centers or outside the organization. In the past, most of these types of information were unavailable or unutilized. For example, inside the organization, there might be rarely used datasets, email archives, speared sheets, e-services records and call centers' recordings. Furthermore, other sources of data exist outside the organization such as social media logs, government records and

competitor's documents that might not be utilized. Organizations that can analyze this big data would create new value for businesses (Laney et al., 2012). The CEBR (2012) has anticipated that the benefits of big data innovation opportunities would contribute £24 billion to the UK economy between 2012 and 2017. Big data offers opportunities such as identifying hidden patterns, better decision making, improving business processes and developing new business models.

Analyzing big data would make new improvements that were difficult or impossible to be determined previously. Manyika et al. (2011) pointed that big data analytics would help discovering valuable insights that otherwise remain hidden. These insights would help organizations in innovating new business models, products and services. Besides getting valuable insights that would help gaining competitive advantage, Das et al. (2013) added some other opportunities such as making time-sensitive decisions faster than ever before and easily monitor the emerging trends within the market. This will allow organizations to jump into new business opportunities. It is commonly agreed that big data would improve decision making because the availability of valuable insights. Moreover, the sophisticated analysis of data would help stakeholder to take decisions in a timely manner since the relevant data is easily accessible (Manyika et al., 2011). Laney et al. (2012) has also shown the case of Wal-Mart, in which they used big data to increase their revenue by using clickstream data from its 45 million monthly online shoppers. This has increased the number of online shoppers 10% to 15%, and it gave around billion dollars in incremental sales. In addition, Laney et al. (2012) showed the case how big data could improve business processes. They cited an interesting example for that. One of McDonald's bakeries replaced the manual checking of buns with high-speed image analytics that can check thousands of buns per minutes for color, size and even sesame seed distribution. This could be used to adjust the oven accordingly to create uniform buns and to reduce wastage.

Implementing big data would help in creating new innovative business models (Manyika et al., 2011). In today's challenging business environment, top executives are challenged to make their organizations resilient and agile to the business environments changes. O'Driscoll, (2014) argues that organizations in the data-driven era are in need to improve the current business models by applying more automation or adopt new innovative and creative ones in order to maximize the value. He argues that the usage of big data will allow the business leaders to make decisions that are more informed on how to create, deliver and capture more value in the short and long terms. In the same context, Vimarlund et al. (2014) argues that the introduction of innovative IT solutions into the market such as big data, smart homes and ambient assisted, would require developing new business models. Callari (2014) has made the case that new technologies such as big data, Internet of Things (IoT), smart devices and high-speed connections would help creating new business models.

Researchers have shown how big data would change the current business models. For example, Chen et al. (2014) discussed how online recruitment would benefit by leveraging big data analytics. The authors argue that, the traditional online recruitment has the benefits of wide coverage, low cost recruitment, and recruiting without time and space constraints. However, with big data analytics, employers can find the right person by collecting and analyzing the huge data created by the users from different communities. Hence, big data analytics would help in finding the ideal employees and guarantee the high success of online recruitment. Moreover, Rijmenam

(2014) argues that big data will revolutionize education by changing the way students learn and teachers teach. He has pointed to the changes that big data analytics would introduce as follows:

- Improve student results: during the student life, every student generates a unique data trail (this includes answers to assignments and exams, how long they take to answer a question, which sources they use, which questions they skipped, how much research was done, what the relation is to other questions answered, which tips work best for which student, etc.). These data and more could be analyzed to deliver an optimal learning environment to the student as well as gaining a better understanding in the individual behavior of the students.
- Create mass-customized programs: big data analytics would help to create a customized program for each individual student. This is done by giving the students the ability to customize their own personalized program, attending these classes, which they have an interest in, studying on their own and getting the guidance from the professors.
- Reduce dropouts and increase results: monitoring students and analyzing their behavior then providing instant feedback or coaching if required, would help in reducing the dropouts. Analyzing student data can be used to change a program if it predicts bad results on a particular program or even runs scenario analysis on a program before it is started.

In the same context, Hougan (2014) has made the case that there are big amounts of students' data stored in the Learning Management Systems such as: specific modules, questions or assignments where students excelled and where they had difficulty, length of time it took to read certain articles and answer-related questions, videos watched and areas where students paused, replayed or stopped watching. This data could be used to tailor eLearning experiences to meet students' specific needs. Furthermore, the analytics would help in changing the overall course or module design to improve the learning experience.

In Healthcare, Burg (2014) argued that big data would help in creating a transparent healthcare system that provides accessible and affordable care for patients. Allouche (2014) also discussed several advantages of using big data in healthcare such as reducing cost where the healthcare industry can identify and reduce unnecessary spending by providing doctors more information about their patients to help eliminate unnecessary procedures. Big data also provides physicians with patient's health data, which can be used to make personalized recommendations for lifestyle changes or treatments or send alerts to prevent serious and costly potential diseases. Moreover, Groves et al. (2013) discussed the innovations that have been introduced by big data in the healthcare sector. They referred to the healthcare applications that have been developed to help patients. For example, Ginger.io mobile application is used to track the patients who have diabetes. The application collects data from the patient smart phone such as phone logs, GPS locations, and surveys that the application sends. The collected data is analyzed, and the insights are sent to the patients to warn them in case of any physical unwell is imminent.

In transportation sector, big data can reduce traffic jams, energy waste that contributes to the global warming and save individuals time and money. Distributed sensors on handheld devices, on cars, and on roads can provide real-time traffic information that is analyzed and shared with many

parties such as police, transportation authorities and drivers. This information can allow drivers to drive more safely (TechAmerica Foundation, 2012).

Kuketz (2013) showed 13 new business models created by big data analytics. The table below lists different business sectors, and how business could leverage big data analytics to create new and innovative business models.

Table 1: Big data and new business models.

Business Sector	Big data effect on the business model
Banking/Credit	loan approvals in seconds, flexible rates based on live market data
Finance And Control	profitability analysis, in any dimension, on Big Data, all in seconds
Healthcare	real time diagnostic monitoring analytics (improve service, predictive healthcare)
Manufacturing	text analytics to help identify product defects (prevent big business problems)
Oil & Gas	streaming sensor data monitoring
Pharmaceutical	analytics for on demand clinical trial management (speed time to market)
Public	transportation and traffic analysis from GPS data (helps keep the city running)
Recalls	real time monitoring of safety data instantly triggering a recall event
Retail	balancing point of sale (POS) data against production and logistics to minimize inventory
Retail	capitalize on trending sales data as it happens, using POS analytics to set pricing, create promotions in minutes, by region, by demographic, even create micro promotions
Retail	social media analytics and reporting, to set campaigns and promotions based on trending patterns and predictive analysis
Telecom	improve customer service and satisfaction via call detail records (CDR) analytics
Utilities	smart meter analytics (optimize rates, load balance the grid, offer discounts)

The opportunities mentioned above would encourage organizations to implement big data in order to achieve their goals or to gain competitive advantage over their rivals in the market.

BIG DATA CHALLENGES

Big data as any new technology involves uncertainty. This uncertainty is the output from the unknown opportunities as well as challenges / risks. Opportunities will create new values while risks will create a threat to the organization. In the previous section, we have covered some of the opportunities that organizations would achieve by implementing big data analytics. However, it is

assumed that big data would change people's everyday life and their work. Blasiak (2014) has made the case that big data analytics can be used to anticipate everyone's behavior with high accuracy. Most of the data used in the analytics are collected invisibly without the individuals' knowledge. This data might include phone logs, GPS track data, health records, buying records, etc. Analyzing these data would lead to deep insights into personal behavior and habits. Hence, it is clear that big data may pose a direct threat to individuals' privacy and security.

Because big data consists of large amounts of complex data, it is very difficult for an organization to sort this data while maintain the privacy levels and apply the required security controls (Ularu et al. 2014). Especially, when data collected from multiple sources, from different companies located in different countries, which have different laws set for privacy.

Although Manyika et al. (2011) argued that using big data analytics could improve organizations' performance as mentioned in previous section, on the other hand, Blasiak, (2014) argued against this point. The latter has made the case that organizations would use big data to monitor employees in details. This would create more pressure on employees and could change the hiring and firing culture within organizations. Consequently, this will threaten the organization's stability. Even more, organizations could use the analytics to enhance business process and the daily activities (Laney et al., 2012). Analyzing work to increase employees' productivity can lead to unbearable high pressure over the employees to perform tasks faster (Blasiak, 2014). Yet again, this will threaten the organization's stability. Therefore, it is possible to see how Blasiak (2014) disagrees with Manyika et al. (2011) and Laney et al. (2012) in the point of big data would increase employees' productivity.

It is obvious now how data privacy and security form major challenges that need to be tackled in order to have successful implementation. Therefore, there would be an urgent need for regulations and laws that control the use of big data and its impacts on individuals, organizations and the society in general. Alternately, the harm to the society would be greater than the gains in productivity (Blasiak, 2014).

Another challenge associated with big data is related to the data itself. The quality and availability of data are still huge challenges. Organizations will need to have information from different resources. In some cases, organizations might not have enough data to do the analytics. Consequently, organizations possibly would seek and buy data from third party. However, the third party might not have considered sharing the data (Manyika et al., 2011). One more challenge is that the collected information is not in a format ready for analysis. Hence, organization should run a data extraction process to get the required data in a form that is suitable for analysis. In addition to the effort spent to get the data, the data extraction process might neglect useful information (Labrinidis et al., 2012). It is obvious how data itself could be a challenge for big data analytics. It is necessary to ensure that data has the sufficient quality. Therefore, it is difficult to consider that big data analytics always gives correct results. Labrinidis et al. (2012) justified this point by referring to the problem causes. They argued that erroneous data could generate inaccurate results. Consequently, the analytics results might be misleading for the decision-making.

Another issue that can be considered as a challenge for implementing big data is the required skillset. As new technologies become available in the market, new skillset will be required to run

them. Big data proposed new jobs in the market such as data scientists, data analysts, data engineer and data analytics manager. These new jobs require professionals with skillsets and capabilities to deal with data effectively to get the proper insights. Davenport et al (2013) has made the case that big data analytics require creative IT skills. Although data analysts were always been needed in the organizations, the required analytics skills are different with big data. Besides the critical analytical skills, they need to be close to products and processes within organizations. Hence, they need to be organized in a different way than analytical staff was in the past. Those new analytical professionals are known as “Data Scientist”. These professionals can understand analytics, and usually they hold an advanced degree in computer science. They have a variety of skills such as programming, mathematical and statistical skills. Besides that, they need to have other business skills such as effective communication with decision makers. This combination of skills goes beyond what was required for data analysts over the past. As per Gartner (Laney et al, 2012), by 2015, four million new jobs will be created in the big data field, yet only a third of them will be filled. Another report by McKinsey (Manyika et al., 2011), stated that by 2018, US only would face a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts to analyze big data. The lack of big data expertise might due to the lack of schools around the world that are able to graduate professionals with the extensive knowledge of Big Data. Yet, it is also rare to find professional courses that cover the specialization of big data (Blasiak, 2014).

When introducing any new technology in the organization, it is important to obtain top management support. This is very essential if it involves changes in the organizational culture and structure. Hence, big data as any new technology needs support from top management and business leaders. Laney et al, (2012) pointed to the previous challenge as big data vision. The author has made the case that big data adoption should be supported by the chief executives and business leaders. Since investing on big data wisely would give organizations competitive advantage, top management should have the vision to see big data impact in the organization’s future. It is wrong perception to consider big data as a technology only. It involves innovation, cultural change, analytical mindset and new skillset (Laney et al., 2012). Blasiak, (2014) argued that the easiest part to the implementation is the IT part. However, big data adoption requires more difficult work with organizational change as well as cultural change. Furthermore, it requires more effort to educate people on how to treat the data.

THE PROPOSED MODEL

Big data implementation is surrounded by several factors that organizations should consider to ensure successful implementations. The review of the literature revealed some of the big data challenges. Those challenges would be considered as indicators that represent success factors if tackled properly. At the same time, they would be considered as obstacles or barriers that hinder the implementation. To close the gap in the literature about big data implementation and in response to the increasing use of the concept, the current paper proposes a holistic model to understand the success or failure indicators. These factors include:

1. Top management support: this factor is essential to any project's success and it is not limited to big data. Without top management support and clear vision of the objectives of implementing big data analytics, the project is doomed to fail.

2. Organizational change: implementing big data involves many changes in the organization. Besides the required changes in IT itself, there would be a change in the daily operations along with cultural change as well. These changes should be considered and planned to avoid any pitfalls.
3. Data availability and quality: organizations could use big data analytics with the available valid data to generate relevant insights that top management would use to take better decisions that could provide key competitive advantage for the organization. At the other hand, the result of using erroneous data would be misleading decisions, which will influence the organization stability.
4. Infrastructure: storing and analyzing the massive amount of data should be supported by a comprehensive technological infrastructure, including high-capacity storage mediums/server and powerful processors for huge data analysis.
5. The required skillset: the availability of staff with the required skillset and competencies is basic requirement. However, it is obvious that there is a lack in big data professionals as mentioned previously.
6. Privacy and security: This would include the compliance to laws and regulations that govern individuals or communities' privacy and security. Collecting data from multiple sources and analyzing it to identify hidden patterns without individuals' knowledge violates their privacy. Furthermore, organizations need to maintain sound security controls to ensure data security against internal and external attacks. Otherwise, data leakage would affect the organization's competitive advantage in the market.

The previous indicators could be considered as success factors that contribute towards big data successful implementation with proper planning. Conversely, the same indicators would be barrier or obstacles that hinder big data implementation. Figure 1 represents the proposed model.

Figure 1: Proposed Model of indicators.



The model consists of six main indicators, which were covered, in the previous paragraphs. These indicators have the same importance level. If organizations do not take all of these factors into consideration, big data project implementation would fail. For example, having top management support without having the data or the skilled professional would lead to the implementation failure. Yet again, having all those factors without having the infrastructure that could deal with

that massive amount of data would lead to the implementation failure. Once more, having all the factors without the controls that govern individuals' privacy could lead to legal difficulties.

It is clear that organizations would implement big data to possess a competitive advantage over its rivals. It is essential that top management is envisioning the benefits that the organization would achieve from big data implementation. Chief executives should support big data since investing early and wisely in such projects would give the organizations competitive advantage. At the same time, top management should consider the organizational changes that might be needed after the implementation. For example, big data analytics would be used to improve the business processes. Hence, there would be changes in the daily operations and this would affect the organization culture consequently. The success of big data implementation depends upon the extent of the top management's understanding about the concept, and how to apply the required changes.

Moreover, the data itself is a major concern. The availability of data constitutes an important factor for the implementation success. However, in the case of unavailability of data, organization could resort to buy the data from third party who might agree to sell it with very expensive prices or refuse the selling sometimes. This highlights a major concern about privacy, which is, do organizations have the right to use or sell their customers' information? Organizations should enforce the required controls to ensure data privacy. Furthermore, privacy of individuals, groups and communities should be maintained with compliance to the laws and regulations. Hence, there should be a balance between the data collection and the privacy of individuals, whether they are customers or employees. Furthermore, data security is a major concern. Organizations need to maintain sufficient controls to ensure the data protection against internal and external attacks.

Besides the data availability, the data quality is also important. In order to get valuable information, the data should be maintained with sufficient quality. Poor data quality is the result of poor data entry such as misspelling and typos or lack of databases integrity constraints. Using quality standards such as ISO 8000 might help in maintaining the data quality (Blasiak, 2014).

As defined earlier, big data is datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze. This means that handling this massive amount of data requires comprehensive technological infrastructure. This might require a significant change in the current IT infrastructure, which will cost the organizations extra costs. Demchenko et al. (2012) refer to the general infrastructure requirements that might be needed to support big data as follows:

- Support long running experiments and large data volumes generated at high speed
- Multi-tier data distribution and replication
- Support of virtual scientists communities
- Trusted environment for data storage and processing
- Data integrity, confidentiality, accountability
- Policy binding to data to protect privacy

Organizations could choose either to implement big data on premises or in the cloud. This depends on the organizations' requirements and other consideration such as cost, scalability, accessibility and data security. Big data as an emerging technology requires new staff with creative IT skills. "Data Scientist" is the kind of jobs that has been emerged because of big data analytics. These new

professionals should have a combination of skills such as IT background, analytical skills, programming, mathematical and statistical skills, and effective communication skills. However, there is a huge shortage in the available professionals. This lack of professionals constitutes a major obstacle for the organizations that want to implement big data. Schools of IT might need to offer new specialization in big data to meet the needs of the market. In addition, IT vendors such as Oracle, SAS and IBM might need to develop specialized professional courses in big data. Collaboration between industry and academia is very important in this regard, as universities might have limited tools/ computing resources/ datasets that can be used.

The proposed model provides contributions to both IT theory and practice. First, the paper addressed a research area that has received little academic research attention. This paper is, therefore, a first attempt to define a model of success/failure factors that affect the implementation of big data in organizations. The model can be considered the base for future research work where it can be tested or extended by IT researchers. Second, the model provides IT managers and decision makers the important indicators that they need to know and assess in order to implement big data project successfully as it requires planning, budgeting, training, change management (technological and cultural change).

CONCLUSION AND FUTURE RESEARCH

The current paper contributes to the existing body of knowledge on big data implementation by developing a holistic model of the indicators that could affect big data implementation. The above discussion showed the importance of each indicator for the implementation success. Failure in any of them would have a negative impact upon the implementation. This model provides IT managers and decision makers the important factors that they need to think of when deciding to implement big data to ensure that it achieves the competitive advantage and adds a business value.

This research has conceptually developed the model of success factors. Future research can go steps further in two directions: First, future research can use quantitative research methods (e.g. survey) to test the model and verify the validity of the assumptions developed in the model. Secondly, future research might evaluate the model by applying qualitative research methods using, for example, interviews with big data/business intelligence experts who work in different sectors with the aim to develop and extend the factors that affect the success of big data implementation. The proposed model in this paper is very generic. Therefore, a new extended model might be developed taking into consideration the particularities of different industries or business sectors where big data is implemented. A future research might provide in-depth insights about each factor and its level of impact on big data implementation in different sectors. It might be found that data availability or privacy are critical factors (i.e. barrier) that have more effect in some sectors (e.g. healthcare) more than others (e.g. retail). These research ideas worth further investigations.

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