Big Data Initiative in Government Sector: A Case Study Investigation

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ABSTRACT

Currently, firms are using Big Data to surpass their competitors. All current rivals and future entrants will use the strategies derived from the analysed data to compete, adapt, and derive value across various sectors. Numerous advantages might be recognized while executing a Big Data initiative. In Malaysia, the discourse and implementation of the Big Data concept remain limited. The study intends to explore the use of the Big Data initiative in the government sector of Malaysia. The research aims to address three main questions: (1) the factors influencing the effective implementation of Big Data initiatives in the government sector, (2) the benefits gained from these initiatives, and (3) the challenges faced during implementation. The implementation of Big Data initiatives within the Malaysian government sector at Organization X has been used as a case study. Organization X will serve as the case study, and a qualitative research approach was employed, utilizing interviews to gather insights on success factors, advantages, and obstacles associated with Big Data initiatives. Findings from three in-depth interviews reveal that Big Data initiatives enhance service delivery within the government sector and identify specific areas for improvement. The study concludes by offering strategic recommendations to enhance Big Data integration and impact in the Malaysian public sector, emphasizing the importance of supportive policies for data sharing reduced bureaucratic barriers, and expanding Big Data initiatives across sectors, in improving governmental efficiency and service delivery. These findings provide a foundation for policy development and strategic planning for Big Data implementation within government contexts.

Keywords—Big Data, effectiveness, benefits, challenges, government

INTRODUCTION

With the great advances that have been made in technology over the past few years, especially in the field of information and communication technology, commonly referred to as ICT, organizations have had to adapt to various challenges. The problem is how large volumes of data can be handled, managed, processed, searched, and analysed. With Big Data, we are referring to this great challenge for companies to handle and analyse large data repositories (Nikolai, Avada & Nureddin, 2018).

Big Data is a relatively new phenomenon involving the collection and widespread use of vast amounts of data across various sectors globally (Hamzah, et al, 2020). Big data is a term where data whose size or type is beyond the ability of traditional relational databases to capture, manage, and process. Khine and Shun (2017), defined Big Data as "a large volume of digital data which require different kinds of velocity based on the requirements of the application domains which has a wide variety of data types and sources for the implementation of the Big Data project depending on the nature of the organization." Schwarzkopf (2019) said in his paper that the political economy system relies on information, which fundamentally depends on data. This aims to monitor individuals' aspirations and anticipations. As an example, consumers' perceptions about their expenditures or their voting preferences. Consequently, data management is essential since the data generated by an organization is a valuable resource.

A change in governance is forthcoming. At now, 55% of the world's population lives in urban regions, a statistic anticipated to increase to 68% by 2050. Projections suggest that urbanization, the gradual shift of the human population from rural to urban areas, combined with global population growth, may lead to an additional 2.5 billion people living in urban environments by 2050, with nearly 90% of this increase occurring

in Asia and Africa. As urbanization continues, sustainable development increasingly depends on the efficient management of urban expansion, especially in low-income and lower-middle-income countries where urbanization is expected to accelerate swiftly (UN, 2018). Many countries will struggle to meet the needs of their growing urban populations, including housing, transportation, energy systems, and other infrastructure, as well as employment and key services like education and healthcare. It is essential to build integrated policies that improve the quality of life for urban and rural inhabitants, while strengthening the bonds between these areas, using their existing economic, social, and environmental interconnections. Seisdedos (2018). Blockchain might facilitate the development of solutions across many sectors, including infrastructure, transportation, education, and others. Consequently, everyone may own a smart city (Alnahari & Ariaratnam, 2022). Urban planning is a cornerstone that sustains the whole government. Information and Communication Technology (ICT) enhances the efficacy of service management. One of the blockchain's capabilities is to transmit just the information necessary for a participant while maintaining the confidentiality of all other data via encryption. Cryptography may be used to prevent manipulation, change of records, and violations of privacy (Guntara & Nurfirmansyah, 2023). Cities like Santiago de Chile, Toronto, Tel Aviv, Oslo, Milan, London, and Stockholm are now developing blockchain-based projects. Dubai has prioritized the objective of becoming the world's first entirely blockchain-powered metropolis by 2020.

Big Data's promises and potential for the transformation of digital government services, economies, and engagement among governments, people, and businesses are significant. Big Data will promote participation, create solutions in real time to problems in agriculture, health, and transport, and introduce a new era of policy and decision-making (Bertot & Choi, 2013). Furthermore, Big Data is one of the core factors that contribute to improvements in decision-making and business transactions. Big Data analytics enables faster and more effective decision-making (Pillay & Van der Merwe, 2021). The use of Big Data and technology development has led to growth in innovation, improved distribution capacity, and added value for industries, according to Sharon's report (Sharon, 2019).

According to Kim, Trimi & Chung (2014), there are lots of white papers, research articles, and business reports that have discussed ways in which governments may use big data to help them represent their people and address national problems. For example, the expenses of health care, creation of jobs, natural disasters, and terrorism. However, there are also some doubts as to whether government activities will be strengthened, as governments must build new skills and implement new technologies to turn data organization and analytics into information.

Kenya released the Open Data Portal in 2011. It provides a complete digital version of the 2009 census, 12 years of detailed government spending data, government household income reports, and school and health facility locations. The platform offers researchers, web and app creators, journalists, students, civil society, and the public unrestricted data access over the internet and via mobile phones. They are using it to improve understanding of population patterns, increase the transparency of governments, and map public services (World Economic Forum, 2012).

An article by Maciejewski (2016) stated that the Land Transport Authority (LTA) in Singapore has used Big Data approaches to build a system to enhance the operation of public transport. The Planning for the Land Transport Network (PLANET) project was initiated by the LTA in 2010. The system records statistics on 12 million 'transactions' in public transit per day and provides information about one or several trips from their origin to their destination by the same passenger. It is possible to obtain a thorough understanding of the issues and constraints by applying performance monitoring, impact evaluation, network analysis, and timely and detailed data for transport models. The system helps by increasing the frequency of bus services on the most common transit routes, the scheme helps recognize and mini-mise crowding on buses. Hence, because of its benefits, PLANET has won several awards.

Nonetheless, Malaysia still faces challenges due to rapidly changing technology in the development of digital infrastructure, including data centers. Omoola (2016) mentioned that in Malaysia, the development of the Big Data Analytical environment is the responsibility of the Malaysia Digital Economy Corporation (MDec), which aims to leverage the digital economy's foreign and domestic potential. The Agency also initiated Big Data knowledge and adoption initiatives and supported data science in Malaysia's academic curriculum.

The study aims to explore the implementation of the Big Data initiative in the government sector. The current study intends to investigate the factors that influence the effectiveness, benefits, and challenges of implementing Big Data initiatives in the government sector. Before this, a study was conducted but it does not fully cover the implementation of Big Data in our government and public sector. To solve the problems and give a clear picture of Big Data initiatives in the government sector, the author finally took a reasonable step by interviewing experts in Big Data. Therefore, this current study attempts to fill that gap.

LITERATURE REVIEW

This review of the literature was split into three areas to gain more insight into Big Data from various fields. These three areas are the factors influencing the effectiveness of Big Data implementation in the government sector, the benefits gained from the implementation of Big Data initiatives in the government sector, and the challenges of implementing Big Data in the government sector.

A. The factors influencing the effectiveness of Big Data initiative implementation in government sector

A multidimensional IS benefit framework is developed by Shang and Seddon. Shang and Seddon's framework was built on a large body of previous research and presents five benefit dimensions, which are IT infrastructure benefits, operational benefits, organizational benefits, managerial benefits, and strategic benefits (Wang, Kung, Wang & Cegielski, 2018). This framework helps us classify the benefit categories, which, in turn, enhances our understanding of the factors that influence the effectiveness of Big Data implementation and at once will affect the benefits of Big Data implementation in the government sector.

The organizational context may impact the efficient use of Big Data, including all aspects that facilitate or hinder its efficacy at the organizational level. The organizational aspect's theme comprises 13 factors: organizational cultural competence, talent management, change management, strategy alignment, project management, performance management, organizational structure and size, interdepartmental collaboration, communication, top management support, environmental impact, clear objectives, and emphasis on innovation (Surbakti et al., 2020).

According to Adrian, Abdullah, Atan, and Jusoh (2017), the efficacy of implementing Big Data Analytics (BDA) is significantly contingent upon human proficiency in comprehending the intricacies of Big Data. Human capacity included individuals with technical and managerial talents. Technical competence denotes an analytics professional's proficiency in executing designated duties inside the Big Data milieu (e.g., an individual possessing analytics expertise or knowledge). The technical competency included abilities in analytics, knowledge, innovation, and experience. The management capability pertains to the ability to synchronize and coordinate the use of Big Data. The features of BDA managers include their capacity for coordination, effective communication skills, and proficiency in comprehending and assessing Big Data output extraction.

Marr (2015) suggested that firms should employ innovative strategies to optimize the utilization of Big Data, as the scarcity of data scientists and the exorbitant cost of data science services necessitate them. He asserted that one of his banking clients disclosed that, although they employ numerous business analysts, these individuals do not possess the expertise of data scientists and do not possess qualifications in Big Data. Given the considerable overlap in competencies across the disciplines, he proposed that providing advanced Big Data training to the current staff would probably be more economical than hiring an entirely new team of specialists.

B. The benefits gained from the implementation of Big Data initiatives in the government sector

According to Kibe (2016), Big Data systems preserve digital records. Digital record storage on Big Data platforms increases record quality by reducing their wear and tear. This further leads to cost reductions related to keeping records usable for a longer period. Big data systems can have better protection than other digital or manual systems. In most public institutions records security is a vital concern. The findings demonstrate that Big Data technology has tremendous potential to help public organizations meet the needs of their stakeholders in an efficient, cost-effective, timely, and consistent manner.

Big data analytics is not unfamiliar to Accountant General's Department of Malaysia (AGD). Auditing program internal control conducted by the Internal Audit Management Division (BPAD) and an auditing program by the Accounting Office operated by the Accounting Office Operations Management Division (BPOPP) has used data analytics to get information on risk issues based on sample voucher payments for a short list of 9 government agencies to visit for auditing or inspectorate. This directly helps AGD to succeed implementation of strategies in implementing its accounting system and assisting in formulating appropriate corrective actions and then making a decision strategically (Jabatan Akauntan Negara, n.d.).

Education is a critical subject of discourse since it shapes the trajectory of a country's development. It is crucial to guarantee that the younger generation receives the optimal education for the future governance of the nation (Amirul Anwar, Elezanor & Norhidayu, n.d.). Nazarenko and Khronusova (2017) claimed that Big Data in higher education, researchers often examine many opportunities to enhance student learning as follows:

- Incredible opportunities to individualize and personalize the student's path towards mastery of content based on adaptive learning or skills-based education.
- Effective learning by quicker and more in-depth evaluation of the advantages of using learning needs or course trouble points, including skills assessment such as systematic thinking, collaboration, and problem-solving in the sense of in-depth, objective subject knowledge assessments.
- Targeted programs intended to enhance student achievement and minimize both student and institutional costs.
- Usage of game-based learning and evaluation environments where learning is given through complex knowledge and decision-making situations.

In healthcare services, Dr Achalakul from Thailand in her TEDx Talks mentioned that she and her team have developed a technology of healthcare by implementing Big Data technology for rural areas where they can track and trace information regarding individual patients. They developed a mobile application with patients' healthcare records such as their lab tests to trace patients' behavior data, so that doctors can see them later. The data were put in the dashboard where the doctors can analyse and provide recommendations for each patient (TEDx Talks, 2018).

C. The challenges of implementing Big Data in the government sector

Big data is a rapidly changing area of technology. Every week innovations or inventions that break ground are being made. A critical inquiry is how to navigate the technology transformation and make informed judgments about software adoption. This encompasses a robust comprehension of both information technology and business requirements. A prevalent worry is the shortage of Big Data expertise, as shown by the Descriptive Big Data Model. Enhanced technical and domain-specific knowledge is necessary since it is complex and crucial to combine many data sources and technologies such as NoSQL (Pospiech & Felden, 2016)

As the data available continues to grow and become complex, it is bound to increase the importance and ubiquity of Big Data. Even in public institutions, the increasing presence of digital technologies in record management would catalyze widespread adoption of Big Data in record management. Similarly, as communication and other information rights take center stage, migration to big data platforms will become more inevitable (Kibe, 2016).

Marz and Warren (2014) explained that Big Data storage technologies are referred to as storage technologies that address specific volume, velocity, or variety challenges in some way and do not fall within the category of relational database systems. This does not mean that relational database systems do not face these problems, but alternative storage technologies such as columnar stores and clever combinations of different storage systems are often more effective and less costly, such as using the Hadoop Distributed File System (HDFS).

Cavoukian & Jonas (2012) illustrated how current privacy concerns contribute to the strengths of creativity, competitiveness, and global adoption of ICT. Privacy risks to identifiable individual data can easily be resolved with the proper use of de-identification methods paired with procedures for re-identification. Such methods, while maintaining a high level of data consistency (a key to usability), can also minimize the risk of

accidental exposure and re-identification.

D. Theoretical Framework

The theoretical framework is based on the Technology, Organization, and Environment (TOE) Framework, developed by Tornatzky and Fleischer in 1990 and has been adapted for this study. This framework explains how organizations adopt new technologies, emphasizing three key components: technology, organization, and environment. However, in this study, the environment component was not tested, as it focuses on external factors affecting the organization's operations (Komathi & Sim, 2024), which are not relevant to the context of this research. The justification for selecting this framework is that it allows the researcher to examine the adoption of Big Data initiatives in the Malaysian government sector. In this study, the technology component refers to the organization's size, strategic-level attitude, and readiness to adopt new technology (Puklavec et al., 2018). The organization component plays a significant role in determining whether the organizational structure is compatible with the use of Big Data technology (Sharma et al., 2022). The following is the theoretical framework for this study:

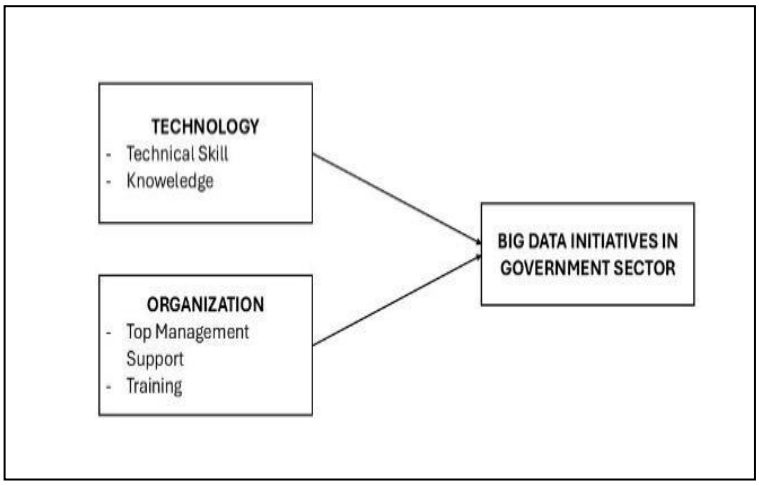

Figure 1: Theoretical Framework

MATERIAL AND METHODS

A qualitative study was conducted in the selected organization. Qualitative sources of data include evaluation and observation of participation (fieldwork), interviews, documentation and messages, and the experiences and reactions of the researchers. The researcher used the qualitative research method to allow spontaneity and adaptation of the interaction between the researcher and the respondents. The respondents were free to respond in their own words according to their individual experiences.

The most suitable respondents that can best inform the research questions and enhance understanding of this study were selected. There were three (3) respondents from Organization X with a Big Data background. Two (2) of them are from the same department which is Digital Government Division and one (1) of them is from Application Development Division.

Table I Respondent List

No.	RESPONDENT	DIVISION
1	Respondent 1	Digital Government
2	Respondent 2	Digital Government
3	Respondent 3	Applications Development
Total		3

The respondents from Organization X who were interviewed answered a few semi-structured questions regarding the subject matter of this study. The questions were developed by the variables and literature review throughout the process of undertaking this study.

Atlas was used as a method of data analysis, which a software that was used to extract the data and information in qualitative research. So, the data was extracted by using the software, and necessary information was collected and gathered to be used for analysis and for the outcome of the research.

Justification for choosing Organization X

Organization X was established in 1977 as a leading role in implementing modernization strategies for the Malaysian Public Service. In implementing its responsibility, Organization X focuses on initiatives that could upgrade the quality, efficiency, effectiveness, and integrity of Malaysian Public Service. All these initiatives encompass the areas of quality acculturation, organizational development, management integrity, ICT development, and enhancing the relationship between the public sector and the private sector. In line with the phenomenon of Big Data and the Government's intention to drive ICT services, the Government of Malaysia has announced the implementation of a pilot project. Organization X with other organizations has collaborated to implement Malaysia's Big Data Analytics (BDA). Hence, because of its background in implementing Big Data, Organization X was chosen to investigate the effectiveness of the Big Data initiative in the government sector.

RESULTS

The study intends to explore the use of the Big Data initiative in the government sector of Malaysia. Respondents were free to answer the questions given during the data collection according to their knowledge and experiences. The findings report the analysis and address the three research questions.

A. The factors influencing the effectiveness of the Big Data initiative implementation in the government sector

In response to the effectiveness, it is found that the support from top management itself plays an important role in the understanding of Big Data among the staff. Big Data nowadays is hype. Hence, everyone needs to understand the Big Data concept. Besides, the awareness in the government sector also increases.

The respondents emphasized that to implement the Big Data initiative, the staff need to have a basic understanding of Big Data. Even though the staff may not have the technical skills, it is essential for them to have basic knowledge of Big Data. This is to prevent them from being deceived by the irresponsible company that they appointed to develop the system.

Among the effectiveness, training is very important. This is because without proper training for the staff, they will have problem in using Big Data technology within their agency. The role of Organization X itself is to develop competency. They give training for agencies that want to implement Big Data initiative. Hence, the well-trained staff can develop something for their agencies. On the other side, to be in their section, whatever knowledge that they had before are the only things that they bring with them. There is no special training. However, for some of them that were from other places and were posted at Organization X, they have already joined courses at their previous places. Only if in the team they will start to develop their skills for training others. However, since they are from the same education background, which is science computer, there is no problem for them to catch up with each other and no miscommunication problem.

According to the respondents, the employee acceptance sounds satisfying. This is because the awareness regarding Big Data initiatives in the government sector is increasing. They agreed that Big Data is effective to be used and gives a lot of benefits. From 1-10, respondent 1 ranked it 6-7. Meanwhile, respondent 2 ranked it 7. They did not rank it higher because of some reason. One of the respondents mentioned that they have a lot of projects, but they do not sustain them. The issue is that they do not see the benefits after some time. Hence, they do not continue to obtain data. However, in terms of training, he said that it would be put in a high rank

because Organization X has gone to many places for training, and they are satisfied with the performance. The findings reveal that IT infrastructure, operational, organizational, managerial, and strategic influence the effectiveness of implementing Big Data in the government sector as stated in the multidimensional IS benefit framework.

B. The benefits gained from the implementation of Big Data initiatives in the government sector

Theoretically, Big Data gives a lot of benefits. This has been agreed by the respondents. According to them, there is no extraordinary benefit throughout their experiences. The respondents stated that Big Data can save cost, time, and speed up the process for decision making and it is quite well-documented.

C. The challenges of implementing Big Data initiatives in government

Technology is a common issue that will arise. In Organization X, in terms of platforms, infrastructure, software, and hardware are provided by them. However, they are using open source, and it is usually a little bit hard to learn when it comes to open source. Even though it is open source, it is usable. Hence, it is the agency that needs to invest their people to learn to use the platform. Then, they can go back to their agencies and plan something useful with the use of the Big Data initiative.

As mentioned in the Descriptive Big Data Model, inadequate Big Data expert is one of the most mentioned issues. This was proved when Organization X also emphasized expertise issues. In the government sector, it is normal for the staff to be reposted to other places. For example, because of promotion. If they trained the staff regarding Big Data, there was no guarantee that they would stick to the same place. Hence, this will cause problems in sustaining the project. If there is a change in the position, they need to start all over again.

Regarding privacy, an Organization X representative mentioned that there is no issue about it for now. This is because most of the agencies use the platform for internal use and the public does not have authorization to access the platform. Even though they are using the same platform, they cannot access or see files from other agencies. Organization X also has prepared security measures such as usernames and passwords to prevent data breaches.

In Organization X, they are using their storage. They have both their own cloud and traditional services. The respondent stated that no problem occurred regarding the storage. For the time being, the use of Big Data is not yet widespread. The usage of the storage is 20%-30% because only small projects are carried out. It does not involve terabyte data and still can be maintained.

Regarding the availability of data, some agencies might look excited about implementing Big Data initiatives at the agencies. However, they do not realize that data availability is the problem. If there is no data, there is nothing to be analysed and presented. Some cases might involve months to obtain the data.

Policy is an issue that has been highlighted globally when it comes to Big Data. In the government sector, there is an issue in data sharing because it is bound by the act. Even though the agencies are under the same ‘big umbrella’ which is the government, Organization X has a problem in obtaining the data. This will be time-consuming, and agreements need to be implemented among them.

DISCUSSION

For the purpose of this study, an interview session was done to give a better understanding of the implementation of Big Data in the government sector, particularly in Malaysia. Most of the findings regarding effectiveness, benefits, and challenges are significantly consistent with many previously conducted studies. From the findings, we can see that Big Data technology alone is not a silver bullet to improve the government sector’s services. Therefore, the new findings will help to provide useful insights and improve which areas the Malaysian government needs to upgrade especially those that have not yet implemented Big Data initiative in their agencies.

A. The factors influencing the effectiveness of the implementation of Big Data in the government sector

Theoretically, Big Data gives a lot of benefits. This has been agreed by the respondents. According to them, there is no extraordinary benefit throughout their experiences. The respondents stated that Big Data can save cost, time, and speed up the process for decision making and it is quite well-documented. The awareness of Big Data in the government sector in Malaysia nowadays is increasing. The findings found that top management support influenced the effectiveness of Big Data in an organization. Big Data has been talked about all over the world. The bosses also went to conferences and met leaders from other countries to discuss Big Data. This finding is the same as Surbakti, Wang, Indulska & Sadiq (2020) where they mentioned that organizational setting can influence the effectiveness of Big Data. There are 13 factors from the organization setting and one of them is top management support. Furthermore, there are a lot of researchers who stated that the participation of top managers in the process of production of new products is seen as one of the most important factors for its success. This includes the use of Big Data. A group of managers with official authority in an organization may make decisions that impact the operation or may even get personally involved where at the same time it can increase the level of effectiveness (Felekoglu & Moultrie, 2013).

In addition, the staff must have proper skills. The most basic thing that the staff needs to do is to go for courses, at least on 'Managing Big Data Project'. They need to know the concept, the benefits, and the issues to avoid being deceived if they want to appoint a company to develop for them. If the agency wanted to develop a Big Data project themself, of course, they need to have the technical skills to do the analytics, modeling, prediction, and tools that need to be used. Meanwhile, the managerial part also has been mentioned by the respondents where at Organization X level they do not have any problems coordinating the application of Big Data since they are from the same educational background. Hence, it is easier for them to communicate. This finding has been supported by previous research by Adrian et al. (2017), where the effectiveness of implementing Big Data Analytics is heavily dependent upon the human capability to understand the 30 complexities of Big Data. Human capability consists of people with technological and administrative competencies. Such skills help to organize tasks, fix conflicts, communicate efficiently, and consider the larger picture in terms of the front-line work that needs to be done.

From the findings, Organization X gives training to agencies that want to implement Big Data projects. This is because with proper training it would increase the effectiveness of Big Data. After the training session, well-trained staff can develop something for their agencies. Hence, this can save the cost of the implementation. The finding is slightly different from the previous research but related in terms of the cost with Marr (2020) who suggested that supplying their current employees with specialized Big Data training would almost certainly be cheaper than bringing in a whole new team of specialists. Training programs provide the staff with a tremendous opportunity to expand their knowledge base and increase their performance and profitability at work. Although training is an investment on the part of the organization, in the long run, it is worthwhile. In addition, preparation will improve the efficiency and effectiveness of the work, and less time and money are wasted. As productivity increases, the staff can work more independently and need less monitoring than they used to be.

B. The benefits gained from the implementation of Big Data initiatives in the government sector

The findings also verified that the implementation of the Big Data initiative has a lot of benefits. All the respondents agreed that the Big Data initiative benefits them a lot and has been mentioned everywhere either from previous research or online. At Organization X level, there is no benefit that is different from others. Big Data benefits Organization X by saving cost, and time, speeding up the process of decision-making, and being well-documented. This is the same with numerous previous research regarding the benefits of Big Data initiatives in various types of fields. For example, in records management, Big Data technology has huge potential to help public organizations meet the needs of their stakeholders in an efficient, cost-effective, timely, and consistent manner (Kibe, 2016). In healthcare services, Dr Achalakul from Thailand, implementing Big Data technology for rural areas, she and her team have developed healthcare technology to track information about individual patients (TEDx Talks, 2018). Big Data initiative allows organizations to interact effectively with their data and to use the data to find new opportunities. To predict from the data, different techniques and algorithms can be applied. Multiple strategies can be implemented resulting in smarter decisions, more

productive operations, and improved profits.

C. The challenges of implementing Big Data in the government sector

In terms of platforms or infrastructure, there is nothing much commented on by the representatives of Organization X. They are using an open-source platform which is usually difficult to learn because it is free. However, it is usable. Technology is changing. Hence, the agencies need to invest in people to learn something quite complicated, especially the technical part. The findings are the same as mentioned by Vaghela (2018) in previous research. Not all companies can keep up with real-time data, however, as they are not acquainted with the changing nature of the required tools and technologies. There are a few useful resources currently available, although many still lack the complexity required.

In terms of storage, Organization X has no issue with it. This finding is different from previous research. Kibe (2016) said that, in most public organizations, the number of records is so large that many record managers now must fight for storage space whether it is physical or digital storage. While the storage issues are being reviewed, the production and use of records have also expanded to the point that organizations cannot afford to rest and just wait as an information explosion occurs. In Organization X, the storage is still under control and is under the data center. The data center will do the acquisition and add the size of storage if required. The respondent stated that there is no problem regarding the storage because not many agencies put a lot of data. It does not involve terabytes of data. They still can maintain it for now. However, he cannot confirm in the future.

Moreover, Organization X does not have a problem regarding the privacy of data as mentioned by most of the researchers. This is included with Asogwa (2012) who stated that databases containing personal financial and medical data may be extremely useful to individuals themselves. It may also be accessed by others without adequate security measures, thus violating the privacy of the owners. Today, in an online world, people have an inherent right to privacy that can be intentionally or accidentally violated. According to Organization X, in the government sector, the data obtained is for internal use. The public is not allowed to access and most of the time the agency implemented it for its use. There are security measures according to the procedures and standards available. Hence, it will avoid being hacked or data breaches.

RECOMMENDATION

The author discovered that one of the biggest constraints in Organization X is because of the lack of staff in the Big Data section. Only 12 people were available and needed to cater to the needs of the whole country. My recommendation is that the government should play its role by appointing more civil servants to address the issue. At the same time, this can increase the job opportunities for people out there, especially for fresh graduates. We heard a lot from the top and the cabinet ranks and they say that the number of civil servants is now too many. Allegedly, the size of the administration in Malaysia is too large. By using information technology, computers, etcetera, the government can reduce this size. The fact is that everyone is doing the job that they are assigned to and cannot cater to everyone's needs. Other than that, Organization X also can outsource the analytics. For example, appoint a company to do it. Hence, they can solve problems regarding the shortage of staff.

Furthermore, at the agency level, the author would recommend civil servants to have at least basic knowledge regarding Big Data. The top management must play their role in providing information and knowledge to their staff. Based on the researcher's observation, there are still government employees who do not know the concept of Big Data, the benefits, and additional information regarding it while the government introduced it a few years ago to improve the quality of service.

Moreover, Organization X will have a problem to analyse data when they cannot obtain the data from other agencies because of privacy reasons. Hence, Organization X also can work on the policy regarding data sharing. This is because they are working under the same ‘big umbrella’ which is the government. It will be easier for them to obtain data if they can work on the policy. More benefits can be gained if such decision can be made faster and more precise. This even can solve the issue of the availability of data. The policy is also

important to avoid too much bureaucracy. Even during the interview session, they did mention that at the Organization X level, they are working on this issue.

Last but not least, the author would suggest the government expand the use of the Big Data initiative in the government sector. This is because only a few agencies, departments, or ministries in Malaysia are using the Big Data initiative. For example, we can implement healthcare services for the records management field and so many more. Hence, we can fully use and utilize the effectiveness of the Big Data initiative in our country, and at the same time, it also helps to improve service for the government and public sector.

CONCLUSION

The changes in the data and technology are quick and extraordinary. Big Data brings new and exciting opportunities to companies who utilize the platform available. It presents an opportunity to create unprecedented business advantages and better service delivery. It also can directly impact various disciplines, especially in the way the data is currently being handled in those disciplines. As the career paths available in Big Data continue to grow so does the shortage of Big Data professionals needed to fill those positions.

Big data professionals are the bridge between raw data and usable information. By integrating big data into the business decision-making question-and-answer process, you obtain not only a more comprehensive view of the answers but also a more reliable view. In terms of accuracy, it is hard to overestimate the advantages that Big Data offers. Working with data itself is always a risk that inaccurate or incomplete data could lead to uninformed or even misinformed decisions. Hence, by implementing Big Data, the government sector could increase the effectiveness and productivity of their services.

Even though Big Data offers so many promising benefits, it is no exception to having its challenges. It is critical that organizations work with more accurate insights to tackle these challenges and gain advantages over their competition. Thus, all those points from previous chapters need to be understood and caution should be taken if organizations are going to run any Big Data project.

Besides that, this study presents certain limitations, primarily due to limited sample diversity, which constrains the generalizability of the findings to a broader population. With only three interviews conducted within a single government organization (Organization X), the results may not adequately represent other government agencies or sectors within Malaysia, thereby limiting the study's broader applicability. The focus on a single organization also suggests that the findings may be shaped by the specific culture, policies, and operational challenges unique to Organization X, potentially differing from other governmental entities.

Future research should, therefore, explore Big Data initiatives across multiple government organizations in Malaysia to enable a more comprehensive analysis of the factors influencing success and facilitate cross-organizational comparisons. Additionally, longitudinal research could track the long-term impact and sustainability of Big Data initiatives over time, offering insights into the evolving challenges and benefits as these initiatives mature. Such future research directions would contribute to a holistic understanding of Big Data implementation in the public sector, thereby supporting evidence-based decision-making and improving future applications.

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