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**RESEARCH ON BIG DATA IMPLEMENTATION TOWARDS FACILITY
MANAGEMENT INDUSTRIES IN MALAYSIA**

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ABSTRACT

This study was conducted to assess the big data implementation towards facility management industries in Malaysia. A mono method quantitative approach for the data collection using quantitative approaches has been adopted. Specifically, an explanatory case study was used to help the researcher look closely at all surface (quantitatively) data to clarify the issue of big data implementation in the facility management industry. The results of this study indicated that the benefit of big data implementation to be key elements in driving the successful implementation of big data implementation in the facility management industry. In addition, the results of this study have indicated that most of the facility management industry in Malaysia should be serious about implementing big data at their workplace. Consistency of most of the findings of previous research has shown that big data factor will give benefit to company and organization.

ABSTRAK

Kajian ini dilakukan untuk menilai pelaksanaan data besar terhadap industri pengurusan kemudahan di Malaysia. Pendekatan kuantitatif kaedah mono untuk pengumpulan data menggunakan pendekatan kuantitatif. Secara khusus, kajian kes penjelasan digunakan untuk membantu penyelidik melihat semua data permukaan (secara kuantitatif) untuk memperjelas isu pelaksanaan data besar dalam industri pengurusan fasiliti. Hasil kajian ini menunjukkan bahawa manfaat pelaksanaan data besar menjadi elemen kunci dalam mendorong keberhasilan pelaksanaan pelaksanaan data besar dalam industri pengurusan fasiliti. Di samping itu, hasil kajian ini menunjukkan bahawa sebahagian besar industri pengurusan fasiliti di Malaysia harus serius dalam melaksanakan data besar di tempat kerja mereka. Ketekanan sebahagian besar penemuan penyelidikan terdahulu telah menunjukkan bahawa faktor data besar akan memberi keuntungan kepada syarikat dan organisasi.

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CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

Over the past 20 years, data have significantly expanded a large scale in various dimensions. According to a report from International Data Corporation, the overall created and copied data volume in the world was 1.8ZB (≈ 1021 Bytes), which had increased by nearly nine times within five (IDC, 2011) (Gantz, J, 2011). This figure will double at least every other two years (Min Chen, 2014). Every day, 2.5 quintillion bytes of data are generated and 90% of the data today were created within the last two years (Jacobson, 2013). Expect data volumes to reach 35 Zettabytes (270 bytes) by 2020 (Zikopoulos et al., 2013). In 2009 nearly all sectors in the US economy had at least an average of 200 Terabytes of stored data per company with more than 1,000 employees and many sectors exceeded more than one Petabyte in mean stored data per company (Manyika et al., 2011)

Big data is a term that refers to big data whether structured or unstructured. The size is so thin that it is difficult to process using traditional databases or software. Big data is very useful for organizations to do research because it improves operations and work efficiency while also helping to make wise decisions. Big data is also handled by suppliers as one technology that is the combination of tools and processes required by organizations to manage big data and their needs.

It is also possible that the emergence of big data terms can be linked to the activities of companies facing the challenge of querying the various type of data. There are several examples of big data such as petabyte size data (1,024 terabytes) or exabytes (1,024 petabytes) that contain millions of information coming from various sources. This kind of data is not neat, incomplete or partially inaccessible. Organizations will have trouble creating, customizing all the data. The main problem when it comes to big data is analysing everything it has because most businesses lack the technology and expertise to handle this big data (flydata, n.d.). Organizations cannot avoid managing them well as

they can be useful to help increase sales, attract more customers or improve quality of operation.

Big data can make business value increase. Indicates that big data analytics can generate value in the form of better targeted such as influencer marketing more varied and accurate business insights, recognition of business opportunities, automated decisions for real-time processes, definitions of customer behaviour, customer retention, detection of fraud, quantification of risks, trending for market sentiments, understanding of business behaviour changes, better planning and forecasting, resources optimization, identification of root causes of cost and understanding consumer behaviour (Russom, 2011)

According to (Mc Afee et al., 2012), the main managerial challenges for Big Data are in:-

- i. Creating leadership teams that set clear goals, define what success looks like, and ask the right questions.
- ii. Talent management of the professionals competent in capturing, analyse, inferring from and presenting Big Data sets.
- iii. Management of technology; hardware, which is becoming cheaper and software that are becoming open-source but also generally are out of the skill sets of IT departments.
- iv. Effective decision making through a flexible organizational structure.
- v. Sustaining a company culture that underpins the data organization.

1.2 PROBLEM STATEMENT

Sometimes companies include data as a critical business asset. Compete with other company in the 21st century that must have a data strategy and data leadership. Big data have successfully captured the imagination and attention of senior business decision making. As a result, organizations have made significant commitments to enhance these activities and give them business priorities. Managing big data is one of the most challenging factors (Vian Ahmed et al., 2017).

Finding the right talent that can work, interpreting the process of architecture, engineering and construction is the most important obstacle (Vian Ahmed et al., 2017). As we know data in the company will grow day by day, managing large scale data is difficult and will require companies to have the latest technology to ensure that all data can add value to the company. This is important to ensure that the company is in good shape at the age of IR 4.0 and artificial intervention. Finding someone who has the talent to manage big data is extremely difficult. As an initiative the company can take is to send employees to attend courses and come up with exposures related to these topics that are frequently visited around the world.

Organizations need to put the right talent in place and structure workflows and incentives to optimize the use of big data. To access the data is critical, companies will increasingly need to integrate information from multiple data sources such as from third parties and the incentives have to be in place to enable this thing. Taking advantage of big data opportunities is a challenge for organizations (Berber, 2014). Because of all the issues, this research only focuses on an acknowledgement of staff in company facility management on important of big data.

1.3 RESEARCH QUESTION

1.3.1 CENTRAL RESEARCH QUESTION

How to promote the benefit of the big data to facility management industries staff?

1.3.2 SECONDARY RESEARCH QUESTION

- i. What are the factors of big data to influence staff in the facility management industry company?
- i. How to determine the level of awareness of big data in facility management industries staff?
- ii. How to increase awareness among staff of facility management industries?

1.4 AIM AND OBJECTIVES OF THE RESEARCH

1.4.1 AIM

To promote awareness and importance of big data for all staff in facility management industries.

1.4.2 OBJECTIVES

- i. To identify factors that influence employee of big data in their workplace.
- ii. To determine the level of awareness of big data among company employees.
- iii. To encourage the staff in company of facility management to increase their awareness of the importance of big data.

1.5 SCOPE OF THE RESEARCH

The scope area of the study is at Klang Valley area in Kuala Lumpur Malaysia. This study is conducted on the sampling of big data implementation. The limitation is only to know the awareness among staff in company of facility management and benefit of big data for the core business.

1.6 THE IMPORTANCE OF RESEARCH

This study contributes to ensuring that employees are aware of the importance of all the data in the building as it can give benefit to the company in many ways. Big data technologies can provide substantial cost advantages to companies. Comparisons between big data technology and traditional architectures are difficult because of differences in functionality and price comparison. Big data technologies are using augment for the companies and not to change the current technologies. Rather than processing and storing vast quantities of new data in a data warehouse, and moving data to enterprise warehouses as needed for production analytical applications.

Because of that, the researcher comes to realize the significance to study on staff awareness towards big data to ensure all the data that they have can give benefit to their company. It is because we cannot predict a huge amount of data that will they get day by day. Hence, if the staff does not alert towards the big data method to give more value to their company.

However, before we can jump a conclusion on the attitude of staff toward the big data, we have to evaluate their level of awareness first. Other than that, responsible for top management of the company to approach their staff. It will be easier for an alternative suggestion constructed to enhance staff awareness towards big data in their company.

1.7 SUMMARY OF THE CHAPTER

This research will analyse through human behaviour of their awareness level to big data. The chronology of research will work such we evaluate people's level of alert towards big data. This is important because in global issue it has been proven for this problem has worse each year.

Despite the big data if very huge and serious around the world, the importance of evaluation of people's awareness of big data still having a difficulty of limitation. The limitation is influenced by the building's condition, privacy and confidential issue in the building.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Big Data has been utilized in an oversized. The top ten business verticals are unit (Sivakumar, 2015) banking and securities, communications, media & entertainment, providers of healthcare, education, manufacturing and natural resources, government, insurance, retail and wholesale trade, transportation and energy and utilities. Several research studies may be found in these domains, particularly in the healthcare industry (Raghupathi, 2014), (Bains, 2016). Finally, the popularity of social media has also attracted strong interest from the scientific and business communities. Studies on how to explore data from various social networks and the semantic analysis of this information have arisen in recent years (Olshannikova, 2017)

To understand the whole structure of the research, it is essential to understand first all the sources of research will be done. It is including the issue, approach, standard procedure, and background of the location. It will help to understand more about the research method and flow. This literature review will consist of all the data collection sources. It will also divide the research story to structural parts and will understand briefly throughout the research cycle.

The overall goal of this research is to establish the significance of awareness among occupant in a building. It encompasses the importance of big data. In other words, any of the data that they get in the building should be explained in detail with the specific method and procedure that applied in the building. The awareness is towards the building facility management. All topic and cycle of this research will consist of the detail of a data, it's the data that they get day by day.

The result of this research later will then come with an alternative solution to approach facility management industries. This is to give a campaign on awareness of big data for facility Management Company. It is because the issue that built this research study is about people's lack of awareness towards big data in a building. Most easily, this research encompasses a building and

will consist of all the details in the big data approach in the building for all staff in it.

2.2 OVERVIEW OF BIG DATA

Big data has become one of the most important frontiers for innovation, research and development in computer science (Kumar B. , 2015), (McKinsey, 2014), industry and business (Zhang C. P.-Y., 2014). Big data has also been a key enabler for exploring industry insights, business intelligence and service economics. This has drawn an unprecedented interest in industries, universities, governments and organizations (Gartner, 2016). Big data and its emerging technologies including big data analytics (Morris, 2015) have been not only making big changes in the way the business operations but also making traditional data analytics and business analytics bring about new big opportunities for academia and enterprises (Finnie, 2010)

2.2.1 PHILOSOPHY OF BIG DATA

This section first addresses what is the philosophy of big data, then it poses philosophical questions and philosophical principles of big data. The philosophy of big data can be defined as the study of foundations, methods, and implications of big data (Swan, 2015), based on the definition of philosophy of science, the latter is a sub-field of philosophy concerned with the foundations, methods, and implications of science (Wikipedia, 2018). The foundation of big data at least consists of mathematical foundations, computational foundations, cognitive foundations, social philosophical foundations, economic foundations, technical foundations and managerial foundations, to name a few. The methods of big data at least consist of mathematical methods, statistical methods, computational methods, philosophical methods, economic methods, technical methods and managerial methods, to name a few. The implications of big data at least consist of its implications on industry, society, governments, organizations, enterprises and individuals. It also includes the implications of big data on other disciplines such as computer science, data science, artificial intelligence, mathematics, management, and education. To name a few. The

central questions of the philosophy of big data should at least consist of what is big data as a science, the reliability of big data theories, and the ultimate purpose of big data as a science, taking into account (Wikipedia, 2018).

However, different from big data as a science and technology, the philosophy of big data prefers to explore the foundations, methods, and implications of big data at a strategic level or higher level, rather than at a very detailed level (similar to the operational level in the management science). Only one sentence, although we, including the author, have published a significant number of articles in the past 4 decades (Sun & Finnie, 2004; 2010). This strategic level's examination differentiates the philosophy of big data from the detailed analysis or in-depth analysis of algorithms of big data, then science and technology of big data.

One of the philosophical questions is as follows:

- i. Is big data good?
- ii. What is the biggest data?
- iii. What is big data thinking? Or what is the big data thought?

Two of the answers for the first question are yes. It is. Furthermore, the bigger the data is, the better it is. For one answer to the second question, see (Sun & Wang, A Mathematical Foundation of Big Data, 2017). The author does not believe that the big data scientists have answered this simple question although they have been indulged in the beauty, technology and management of big, bigger, and biggest data.

In general terms, philosophy is a most abstract science that uses empirical inquiry to deal with the highest degree and most common phenomena. Therefore, the theory of big data is at the root of all the following:

- i. The computational philosophy of Big Data.
- ii. The cognitive philosophy of Big Data.
- iii. The social philosophy of big data.
- iv. The economic philosophy of Big Data.

2.2.2 EVOLUTION OF BIG DATA

i. 20th Century

The first big data project was developed in 1937 and authorized by the US government of Franklin D. Roosevelt. The State had to keep track of contributions from 26 million Americans and more than 3 million employers after the Social Security Act became law in 1937. IBM has been awarded the contract to build a punch card- system for this major bookkeeping project. The first data processing machine appeared in 1943 and was developed by the British during World War II to decode Nazi codes. This tool, called Colossus, was looking for patterns in intercepted messages at a rate of 5,000 characters a second. This reduces the job from weeks to mere hours. The National Security Agency (NSA) was established in 1952 and more than 12,000 cryptologists' contract within 10 years. In the Cold War, they are faced with information overload when they continue to rapidly gather and process intelligence signals.

In 1965, the United State Government agreed to create the first data centre to store more than 742 million tax returns and 175 million fingerprint sets by moving these documents to a magnetic paper tape that had to be stored in a single location. For ' Big Brother ' the project was later dropped out of fear, but it is widely agreed that it was the beginning of the era of electronic data storage. British computer scientist Tim Berners-Lee finally created the World Wide Web in 1989. He wished to promote knowledge exchange through a ' hypertext ' framework. He could know nothing of the effect of his innovation at the time. As of the nineties, data production is accelerated as more and more computers are connected to the internet. The first super-computer was designed in 1995 and could do as much work in a second as a calculator run by a single person would do in 30,000 years.

ii. 21th Century

In 2005, the word Big Data was first invented by O'Reilly Media's Roger Mougallas, just a year after they developed the word Web 2.0. This applies to a broad collection of data which can hardly be handled and analyzed using a conventional business intelligence software. In 2005 is also the year Yahoo! developed Hadoop on top of Google's MapReduce. The aim was to index the entire World Wide Web and nowadays a lot of companies are using the open-source Hadoop to crunch through a huge amount of data. When more and more social networks are beginning to emerge and the Web 2.0 is taking off, more and more data is being generated every day. Innovative startups are gradually beginning to tap through this vast volume of data and governments are now starting to work on Big Data initiatives. The Indian government agreed in 2009 to take an iris scan, fingerprint, and photograph of all 1.2 billion its inhabitants. Such data are all stored in the world's largest biometric database.

In 2010 Eric Schmidt speaks at the Techonomy Conference in Lake Tahoe in California and he notes that "between the dawn of humanity and 2003 there were 5 exabytes of knowledge generated by the entire planet. Now the same amount is generated every two days." The McKinsey study on Big Data in 2011: The next frontier for creativity, competitiveness, and growth reports that the US alone will face a shortage of 140,000 – 190,000 data scientists and 1.5 million data managers in 2018 alone. Throughout the past few years, Big Data startups have expanded exponentially, all trying to deal with Big Data and helping businesses understand Big Data, and more and more enterprises are slowly embracing and moving towards Big Data. Yet although it seems like Big Data has been around for a long time now, Big Data only is as far as the internet was in 1993. We still have the big Big Data revolution ahead of us and much can change in the coming years. Let the Age of Big Data start.

2.3 THEORY OF BIG DATA

2.3.1 Types of Big Data

2.3.1.1 *Structured Data*

Structured data which can be processed, stored and retrieved in a fixed format. This refers to highly organized knowledge that by simple search engine algorithms can be conveniently and efficiently processed and retrieved from a database. For example, the employee table in a company database will be structured as the information of the employee, their job positions, their wages, are present in an organized way (Rai, 2019).

2.3.1.2 *Unstructured Data*

Unstructured data is categorized into machine-generated or human-generated data based on their source. All the satellite images, the scientific data from different experiments and the radar data collected by different facets of technology are accounted for by computer-generated data. The abundance of human-generated unstructured data is contained throughout the internet as it includes social media data, mobile data and material on the website. This means that the photos we upload to the handle of Facebook or Instagram, the videos we watch on YouTube, and even the text messages we send all add to the gigantic heap of unstructured information (KnowledgeHut, 2016).

2.3.1.3 *Semi-Structured Data*

Semi-structured data refers to the data comprising both the aforementioned formats, that is, structured and unstructured data. To be precise, it refers to the data that, although not specified in a particular repository (database), still contains vital information or tags that segregate individual elements within the data (Rai, 2019).

2.3.2 Sources of Big Data

Big data is a synthesis of the different granular data types. The applications that are the main sources of producing voluminous amounts of data, namely, Internet of Things (IoT), self-quantified, multimedia, and social media data.

2.3.2.1 *Internet of Things Data*

IoT data are generated by GPS devices, intelligent/smart cars, mobile computing devices, PDAs, mobile phones, intelligent clothing, alarms, window blinds, window sensors, lighting and heating fixtures, refrigerators, microwave units, washing machines, and so on (Hashem et al., 2016). As big data, these data have different characteristics because IoT data does not show complexity, variety and redundancy. HP projected that while the current volumes of IoT data are low, the number of sensors will exceed 1 trillion by the end of 2030; at that time, IoT data will become big data.

2.3.2.2 *Self-Quantification Data*

Self-quantification data are generated by individuals by quantifying personal behaviour. Data from wristbands used to monitor movements and exercise and sphygmomanometers utilized to measure blood pressure are examples of self-quantification data. This type of data helps build a connection between behaviour and psychology (M. Chen et, 2014).

2.3.2.3 *Multimedia Data*

Multimedia data is created from various sources, including text, images, and objects such as audio, video, and graphics. The rate of growth for such data form is very fast. Multimedia data is generated by

each person connected to the Internet (Bello-Orgaz et al., 2016) (Yaqoob et al., 2016)

2.3.2.4 Social Data

Social media data are generated by Facebook, Twitter, LinkedIn, YouTube, Google-, Apple, Brands, Tumblr, Instagram, Flickr, Foursquare, WordPress, and so on. The use of social media causes a surge in data generation (Bello-Orgaz et al., 2016) (Yaqoob et al., 2016). Table 2 shows the growth rate of social media data.

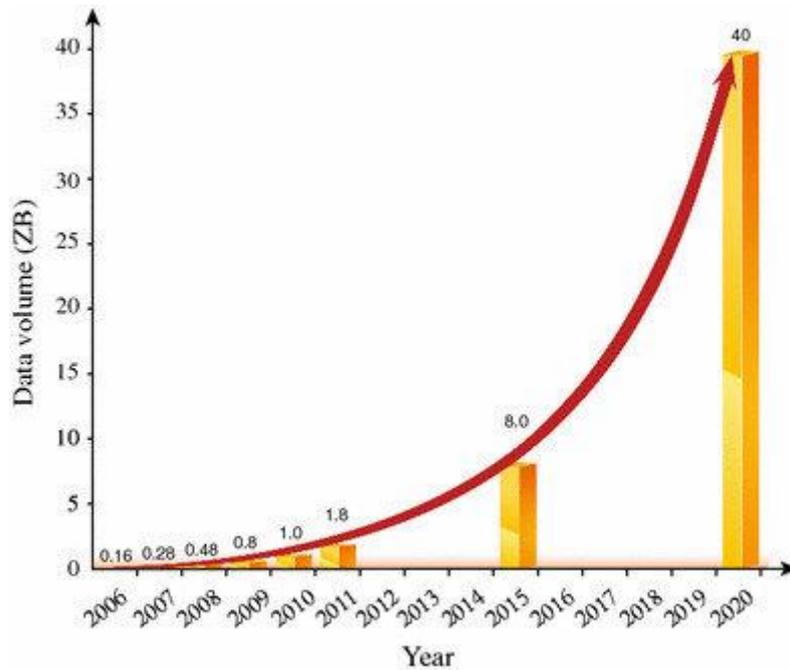


Figure 1: Global growth trend of the data volume, 2006-2020

2.3.3 Characteristic of Big Data

Big Data is a relatively new concept, and academics, organizations, and individuals have given it a number of meanings. According to (Laney, 2001) articulated the mainstream of definition of Big Data as the three Vs; Volume, Velocity and Variety. SAS, SAS considered two additional dimensions when thinking about Big Data: the Variability and Complexity according to (Troester, 2012). Big Data in terms of four Vs – Volume, Velocity, Variety and Value (Oracle, 2013) .Having gone through the literature of Big Data, in this paper, we will like to carry the concept of Big Data to a new state based on its origin, bogusness and values. We describe Big Data in terms of five Vs and a C. These constitute a reasonable test to determine whether the Big Data approach is the right one for a new era of analysis. The five Vs are:

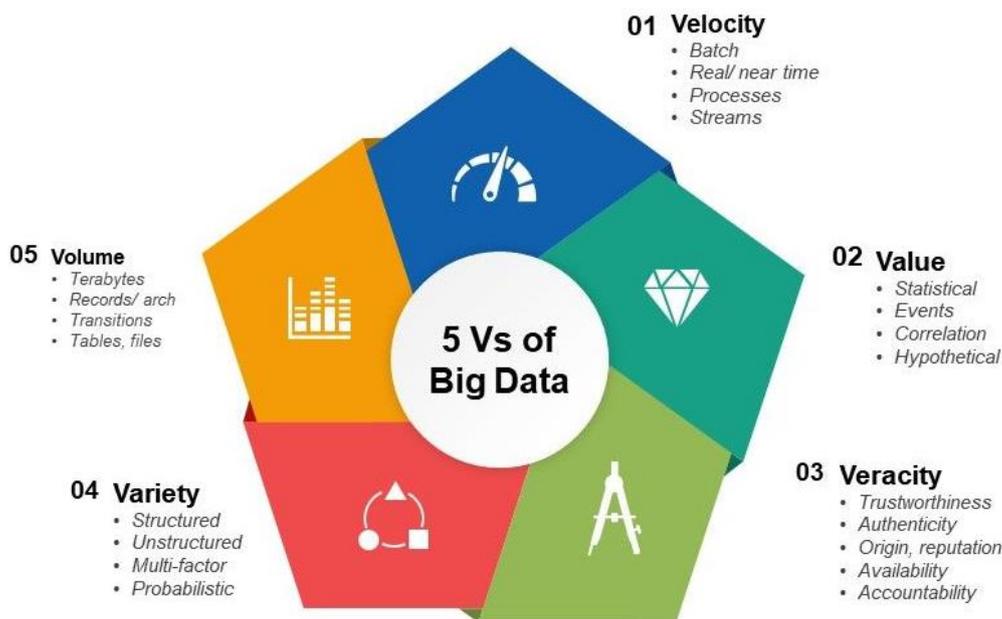


Figure 2: Characteristics of Big Data

2.3.3.1 Big Velocity

Big velocity is related to throughput and latency of data (A. Sathi, 2013). For throughput, big velocity means that at a big speed, data in and out from the networked systems in a real-time (Zhang C. P.-Y.,

2014), (Belanger J. B., 2013). In other words, it is the high rate of data and information flowing into and out of interworked systems with real-time (Gartner, 2016), (Borne, 2014). The big velocity of big data is more important than big volume for many real-world applications (Mc Afee et al., 2012). In some developing countries, some internetworked systems cannot be running normally because of low speed, although big data are available there. Latency is the other measure of velocity. Low latency is the requirement of modern businesses and individuals. For example, Turn (www.turn.com) is conducting its analytics in 10 milliseconds to place advertisements in online advertising platforms (Sathi, 2013). IBM's Info Sphere Streams has been successfully used for low-latency, real-time analytics (Sathi, 2013).

2.3.3.2 *Big Value*

The big value indicates the importance and context of big data (N. Vajjhala et al., 2015). It characterizes the big business value, ROI, and potential of big data to transform an organization to have more competitiveness in the global platform (Borne, 2014). Big data has extremely big value for increasing productivity, efficiency and revenues, lowering costs and reducing risk in businesses and management (Zhang C. P.-Y., 2014), (Loshin, 2013), (Wang, 2012). For example, big data and big data analytics have brought big value for Facebook, Google, and Amazon and made them become the top companies in the world (Court, 2015). It has also big value for a scientific breakthrough in science and technology that have given and will give us a big number of opportunities to make great signs of progress in many fields. For example, many medical studies are based on big data to find better solutions to cure diabetes and hypertension (M. Minelli et al., 2013). The big social value means that big data has been revolutionizing the society in terms of working, living and thinking (Cukier, 2013). The thinking methods have been changed because of big data, for example, learning heavily relies on books, library, schools, newspapers in the past whereas in the big

data age, learning is based on search, learning as a search (LaaS), I learn using LaaS whenever and wherever I am.

2.3.3.3 *Big Veracity*

Veracity refers to the accuracy, reality and veracity of big data. Veracity was introduced by IBM researchers as the 4th V for characterizing big data (IBM, 2015). The reality is that there exists big ambiguity, incompleteness, the uncertainty of big data (Borne, 2014), (IBM, 2015). This might be the reason why vagueness has been considered as one of the challenges of big data (Borne, 2014). Accuracy and reliability are less controllable for many forms of big data, for example, Twitter posts a number of tweets with hashtags, abbreviations, typos and colloquial speech. Thus big veracity is a big characteristic of big data, this is particularly true in big data analytics for business decision making (Finnie, 2010). Therefore, in order to get big veracity, we have to use big data technology to remove the ambiguous, incomplete, uncertain data. Fuzzy logic and fuzzy sets have developed significant methods and techniques to address ambiguity and incompleteness of data and therefore they will play an important role in overcoming big ambiguity and incompleteness of big data (Zadeh, 1965), (Kantardzic, 2011).

2.3.3.4 *Big Variety*

Big variety means that big diversity or big different types of data sources with different structures from which it arrived, and the types of data available to everyone (Kumar B. , 2015), (Belanger J. B., 2013) (Loshin, 2013). Big data can be classified into three types: structured, semi-structured, and unstructured at a higher level. The data stored in relational database systems like Oracle are structured. The data

available on the web are unstructured. 80% of the world's data is unstructured (Kumar B. , 2015), (Sathi, 2013). Blogs and tweets on social media are not structured data because they contain a large number of slang words, with a mix of languages in a multi-ethnic, multi-language environment (Sathi, 2013), (Bakshi, 2014). The big variety exists in the data on the Web. For example, in the WeChat world (<https://web.wechat.com/>), one can interact with his/her friends anywhere in the world using a variety of media such as text, sound clips, photos and videos. The big variety brings about the big challenge for storage, mining and analytics (Kumar B. , 2015). NoSQL databases have been used to overcome this challenge from a big variety (Kumar B. , 2015). There are 225+ NoSQL databases on the market (<http://nosql-database.org/>, retrieved on 08 July 2016). Variety of big data has to do with large venue and uncertainty. The big venue of big data includes distributed big data, heterogeneous big data from multiple platforms, from different owners' systems, with different access and formatting requirements, private vs. public cloud (Borne, 2014). Big variety of big data is also related to big variability which, e.g. consists of dynamic big data, evolving, spatiotemporal big data, time-series big data, seasonal big data, and any other type of non-static data sources.

2.3.3.5 *Big Volume*

The large volume of big data represents the size of the data set, usually in exabytes (EB) or ZB (Borne, 2014), (N. Vajjhala et al., 2015), although many, as a child, would find that 10 as an integer is high. Most data-driven companies now work daily with petabytes (PB) of data. Google processes data by more than 20 PB per day (Pence, 2015). Every hour, Walmart gathers over 2.5 PB of unstructured data from its 1 million customers. Big data repositories for parallel and distributed future generation systems currently surpass EB and are growing at a rapid scale (N. Vajjhala et al., 2015). Big data amount has gone up from EB or ZB (Kumar B. , 2015). To address the challenge presented by large volumes of big data, a massively parallel computing model is a practical

choice because its underlying principle is the distribution of workload across many processors as well as the storage and transmission of underlying data across a collection of parallel storage units and streams (Sathi, 2013), (Volonino, 2011). With a large volume of hundreds of terabytes and even PB (Kumar B. , 2015), Hadoop has become the standard for storing, processing and analyzing data Hadoop clusters at Yahoo!, for example, span over 40,000 servers, which hold 40 PB of application data (Kumar B. , 2015).

2.4 CONCEPT OF BIG DATA

2.4.1 Benefit of Big Data

2.4.1.1 *Increased Value Delivery*

Value delivery, according to King III, is optimising expenditure and proving the value of IT in an organisation (Report, 2014). By making use of big data, organisations will be able to gain intelligence from data and translate this intelligence into business value (McAfee, 2014). The business value of using big data lies in the fact that very large amounts of data from different sources can be analysed effectively to provide actionable information. Big data techniques are also specifically optimised for effectively transforming unstructured data into useful information (Johnson J et al., 2013), improving the effectiveness of data and information management even further. Being able to transform large quantities of complex data from different sources effectively will result in reduced expenditure for the organisation because less time is spent on analysing the data (Johnson J et al., 2013). By reducing expenditure big data will increase the value of IT for the organisation.

2.4.1.2 *Better Predictions*

Big data fundamentally changes the way decisions are made within an organisation (Brown B et al., 2012). By making use of controlled experiments on the available data, the organisation can better predict the behaviour of their customers and use this knowledge to their advantage (Brown B et al., 2012). This results in the organisation adding more value to their customers because they can better predict what their customers want (Kaisler S et al., 2013) enabling them to make better business decisions (Johnson J et al., 2013) that will lead to a competitive advantage in the marketplace. By being able to better anticipate the future behaviour of their customers the organisation will be able to be more proactive in their business approach. The variety of data sources available to organisations and the appropriate analysis of this data can be a powerful tool for business managers in analysing customer

behaviour and trends to make more accurate decisions about innovations in their products and services to give them an edge above their rivals.

2.4.1.3 *Improved Ability to Adapt To Change*

The interconnectedness and interdependence of the structures within big data will enable business managers to determine the effect of possible changes more easily (Kaisler S et al., 2013). If an organisation is able to determine the effect of possible changes, it will be more ready to adapt or react to these changes if they do occur.

2.4.1.4 *Benefit of Scale*

Organisations that are able to capture large volumes of valuable data and use the data effectively at scale will have a competitive advantage above other organisations (Brown B et al., 2012). By implementing big data, organisations are able to capture data from different sources within the business and to acquire data from outside sources (partners and customers), giving them the ability to integrate the data and derive useful information from it by using analytics (Brown B et al., 2012). A further benefit of the scale of big data, according to (Johnson J et al., 2013), is the fact that other departments can benefit from the big data system used by one department by gaining access to the data stored or information already generated by that department. By having open access to big data and to the information and reports already generated from this data the organisation will experience cost and time savings because there is no duplication of work in various departments. If there is access to all the data from both internal and external sources, more useful information can be derived from the data. Consequently, decision making will be improved and the organisation will be able to achieve their strategic objectives more easily by gaining a competitive advantage over their rivals through improving their customer satisfaction by creating a better customer experience.

Considering the abovementioned benefits on their own might not be sufficient for an organisation to identify accurately whether they would be able to benefit from the use of big data. These benefits can, however, be used to identify and define the business imperatives distinctive to an organisation that will benefit from the use of big data. By comparing these business imperatives to their own set of business imperatives, organisations will be able to get a more accurate indication of whether their organisation will benefit from the use of this technology or not.

2.5 OPPORTUNITIES WITH BIG DATA

In a broad to determine if a Big Data approach is the right one to a range of application areas, data is being collected to adopt for a new era of analysis. The five Vs are; unprecedented scales. Volume, the size of the data. With technology, it is models of reality can now be made based on the data often very limiting to talk about data volume in itself. Such Big Data analysis now drives nearly every any absolute sense. As technology marches aspect of our modern society, including mobile services, forward, numbers get quickly outdated, so it is retail manufacturing, financial services, life sciences and better to think about volume in a relative sense physical sciences (Deptula, 2014).

Scientific research has been revolutionized by Big Data. The Sloan Digital Sky Survey has become a landmark for astronomers around the world. The field of astronomy is being transformed from one where taking pictures of the sky was a large part of the work of an astronomer to one where the pictures are all already in a database and the task of astronomers is to find interesting objects and phenomena in the database (Divyakant Agrawal et al., 2014).

There is now a well-established tradition in the biological sciences to deposit scientific data into a public repository, and also to create public databases for other scientists to use. Indeed, there is a bioinformatics discipline which is largely devoted to curing and analyzing such data. As technology advances, particularly with the advent of next-generation sequencing, the size and number of experimental data sets available are increasing exponentially (Divyakant Agrawal et al., 2014).

Big Data has the potential not only for research but also for education to revolutionise. A recent comprehensive quantitative analysis of the various approaches adopted by 35 NYC Charter schools showed that one of the top five policies associated with measurable academic effectiveness was the use of data to direct instruction. Imagine a world in which we must access a huge database in which we collect every comprehensive measure of the academic performance of every student. In particular, there is a strong trend for the massive deployment of educational activities on the web, and this will generate an increasing amount of detailed data about the performance of students. It is widely believed that the use of information technology will minimize healthcare

costs while at the same time improving its quality by making treatment more efficient and personalized and focused on broader (home-based) continuous monitoring. McKinsey estimates a savings of 300 billion dollars every year in the US alone (Divyakant Agrawal et al., 2014).

The use of big data will become a crucial foundation for individual companies to compete and expand. From the profitability standpoint and the potential value capture, both companies need to take Big Data seriously. In most industries, both established competitors and new entrants will leverage data-driven strategies to innovate, compete, and capture value from both deep and real-time information (James M et al., 2011). Use of Big Data will be essential across industries, some markets are expected to benefit more. Computer and electronic products and technology sectors, as well as finance and insurance, and government are poised to make substantial gains from the use of big data (James M et al., 2011). Similarly, compelling arguments have been made for the importance of Big Data for urban planning, smart transportation, environmental modelling, energy-saving, smart products, digital social sciences, financial system risk analysis, homeland security, computer security (Deptula, 2014).

Massively parallel processing (MPP) and Analytic databases are the final categories. These are designed for any rapid data aggregation but not for fast data loading. It makes them ideal as a backend to a reporting and data science system but not as a front-end transactional database. There is also a sub-category of SQL on Hadoop tools which are basically MPP databases which use HDFS as their complete system and sit on the same hardware as HDFS and Map Reduce processes. Such databases usually require loading the data into proprietary database file formats to achieve the speed advantage (Deptula, 2014). There are Big Data tools designed for batch processing of large amounts of data, designed for ingestion and access of data in real time but not for processing, and designed for data aggregation speed of thought but not for quick load. Need to find out what your business needs need (Deptula, 2014).

2.6 CHALLENGES IN BIG DATA

Nonetheless, on closer inspection, only two or three main issues appear to be capable of making or breaking Big Data's pledge, and these relate to solution strategy, personal privacy and intellectual priority (IP). The first issue deals with technology, deployment and the organizational context, while the latter two large-ticket items raise concerns about the nature and applicable use of information or big data (Runciman, 2014).

Other potential threats to the full use of Big Data are heterogeneity and incompleteness, scale and timeliness; data security is another closely related concern (Divyakant Agrawal et al., 2014).

2.6.1 Heterogeneity

When humans consume the information they comfortably tolerate a lot of heterogeneity. Indeed a natural language's complexity and richness can provide useful depth. Machine analytics algorithms, however, expect homogeneous data, and cannot understand nuance. As a consequence, data must be carefully organized as a first step to an analysis of the data. Computer systems work best if they can store multiple items, all of which are identical in size and structure. More work is required for effective representation, access, and analysis of semi-structured data (Divyakant Agrawal et al., 2014).

2.6.2 Scale

Another major challenge for Big Data is scale or volume as identified above. The first thing that anyone has in mind with Big Data is its size. The word "Big" is on the very name, after all. Managing massive and fast-growing volumes of data has been a difficult issue for decades. In the past, processors were mitigating this challenge by getting faster, following Moore's law, to provide us with the resources needed to cope with a growing volume of data.

These unprecedented changes require us to rethink how we component, construct and operate data processing (Divyakant Agrawal et al., 2014).

2.6.3 Timeliness

The flip side is pace. The larger the volume of data to be analysed, the longer it takes to analyse it. It is also possible that the design of a system that manages the size efficiently would result in a system that can process a given size of data set more quickly. However, it is not just this speed that is usually meant when you talk about velocity in the Big Data context. Rather, there is a challenge of the acquisition rate and of timeliness. There are many cases where the findings of the study are instantly needed. For example, if a fraudulent credit card transaction is suspected, it should preferably be flagged prior to completion of the transaction-potentially preventing the transaction from happening at all. Clearly, a complete analysis of a user's buying background is unlikely to be feasible in real-time. Instead, partial results need to be formulated in advance, so that a small amount of incremental calculation with new data can be used to make a fast conclusion (Divyakant Agrawal et al., 2014).

2.6.4 Personal Privacy

Consider of all the personal information that ISPs, mobile network providers, retailers, local councils, medical and financial service organizations (e.g. hospitals, banks, insurance and credit card agencies) store and send. Not to forget also information shared and stored by religious organizations, educational institutions and or employers on social networks. Every company has the headache of coordinating, securing and leveraging its business, customer and operational data (Runciman, 2014).

2.6.5 Lack of Skill

Taking advantage of big data opportunities is a challenge for organizations (Berber, 2014). To ensure the effectiveness of the data, organizations need to store the data reliably across several databases. Once the data is distributed, and when the needs arise, the organization must find a

way to extract the data again, identify which data is needed, assemble it and analyze it. The challenge now is how to capture relevant data from this massive amount of data, which can deliver values to support organizations knowledge. The real issue is not how the organizations will acquire the huge volume of data, but how they can harness the value of this data that counts (Davenport T. H., 2013). Therefore, having an understanding and ability to analyse the data in a timely fashion can ensure a competitive edge for efficient decision-making.

2.6.6 Cost

Challenges that face the utilisation of big data is finding the right talent that is capable of working with new technology and interpreting the AEC processes is the most significant barrier. This was followed by the cost of technology and meeting the high cost of recruiting technologists (Vian Ahmed et al., 2017). Therefore, seems that organizations lack the technological talents that are capable of understanding the balance between the AEC processes and aspects of the technology that can enhance these processes, and that without a good understanding of the business value that Big Data can bring, organisations may be missing out on the long term investment in Big Data.

The benefits of using big data techniques are quite wide. Two main groups of benefits emerge (Mohan, 2016) cost savings and competitive advantage. In terms of cost savings, Big Data tools allow businesses to store massive volumes of data at a much cheaper price tag than a traditional database.

2.6.7 Management

It can be argued that the majority of these challenges are somewhat interlinked, whereby changing the way people work, and appreciating the business value of the processes they engage in and how these processes can be a vehicle to provide the organisation with the relevant business intelligence, this may then help with the way data is handled, exchanged and stored. Obtaining, structuring, managing the data is one of the most challenging factors (Vian Ahmed et al., 2017).

Big Data offers a competitive advantage for businesses by offering them the possibility of exploring new business opportunities. New products, services, and even business models can emerge from an analysis of Big Data (Manyika et al., 2011). Executives also state the top five areas that have benefited from the adoption of Big Data are (Porres, 2013) increasing insights into consumer behaviour, increasing sales, increasing sign-ups and registrations, Increasing Return on Investment (ROI), increasing customer satisfaction and increasing sales leads.

2.7 FACILITY MANAGEMENT

The last and longest phase of a buildings lifetime is the Facility Management (FM) phase, which starts when the construction is completed. The FM phase is to maintain and develop the function of the building, during which, the building is under constant physical change process and how it is used (Nordstrand, 2000) (Shalabi, 2017). FM emerge from the actual practice and was formed as a concept with the combination of Facility Management, Facility Operations, Facility Maintenance and Office Administration (D, 1994). Further (Nordstrand, 2000) have distinguished FM into two tracks, the technical and the administrative. The technical track handles the maintenance and practical operations while the administration handles rental management, accounting and procurement of services and products.

Facility management technical track, which is Facility operations and maintenance. Operations are described by (Nordstrand, 2000) to make sure that the building functions and solves the daily needed from the tenant, such as daily activities like cleaning, waste management and fixing of small issues. Maintenance is, on the other hand, the efforts to retain the value and function of the building by caring for it. Maintenance can further be broken down into urgent and planned actions, where the urgent care to immediately fix things that are reported broken by unforeseen events which affect the daily operations in the building. The planned maintenance then measures that are planned in advance, either by a periodic plan or from a condition from something in the building, for example, the run time on some equipment.

Facility management requires knowledge about the facility that is to be managed, which means to have information as (A A. B., 2014) state, data holds value. To keep track of the information needed to manage a facility, different FM systems are used, these can control a buildings HVAC-system (Heat, Ventilation and Air Conditioning), handle maintenance information etc. Traditional systems are very good at keeping track of data with high quality and complexity but lacks when they are to communicate with other systems and visualize the data and information (Shalabi, 2017).

2.7.1 Facility Management as a Service

According to (Högberg, 2000), a service provider can achieve success by creating the most value possible for the customer, a Facility Manager can succeed in this by utilizing the existing utilities properly and by focusing on the customer's value-creating processes. By understanding the needs for these processes, the facility can be adapted and developed to suit the customer better. (A A. B., 2014) further states that facility management is a service sector of its own and has helped to create a new professional discipline with its own principles, standards, codes and technical vocabulary”.

2.7.2 Roles in Facility Management

In the FM sphere, there are several different roles that take work within the company, some of them are: The Facility Manager is responsible for the relationship with the customer and the economical result; The Technical (Property) Manager have the short and long term responsibility for the development of the property; The Property Developer is responsible for leading project for new properties and to adapt existing facilities to current or new customers; The Facility Technician is responsible for the building's operation, to make sure it constantly functions and are experts in optimizing and operating their property (Yrkesroller Vasakronan, 2018).

2.7.3 Productivity in Facilities

It is stated by many authors that the cost to employ people is much higher than it is to rent or own and operate a building (Clements-Croome, 2000) (Haynes, 2008), therefore the payback to improve the work environments is higher than the payback to save cost of energy or other facility costs. This is the case since the effect of increasing the productivity of people result in a larger effect on the company's profitability (Clements-Croome, 2000). Every investment in improved indoor environment can almost always be cost-effective since the benefits from it will exceed the investment within a few years (Roelofsen, 2002).

According to (Haynes, 2008), it is hard to measure the improvement in productivity since it does not exist a universal method of measuring productivity, but self-assessed is often used since it offers something instead of nothing. Studies have found that people participating in self-assessment of productivity report increased productivity of up to 10 % when the indoor climate was improved (A A. B., 2014). Further, they state that it is important to consider that the correlation between productivity and the physical setting is not small just because it is hard to measure it. Since it is easier to measure the work quantity compared to work quality does not mean that a certain action helps the overall productivity for employees since both quality and quantity are needed and expected by companies today. It has also been found that the ability to individually control the indoor climate increases productivity, mainly the two attributes of temperature and air quality. (A A. B., 2014) found in their research six aspects of work environment which are seen to influence the productivity: Indoor air quality; noise control; thermal comfort; privacy; lightning comfort; and spatial comfort.

Indoor environment connects to how humans perceive the surrounding environment, the indoor environment is good when the people residing in it perceive it as neutral (Boverket, 1998). The perceived comfort depends on the human body's difference from the surrounding climate and always strives to be in equilibrium (Munker, 1982). Different aspects that affect how the indoor climate is perceived include:

- i. Humidity (Penttonen, 2016)
- ii. Air velocity (Munker, 1982)
- iii. Noise (Munker, 1982)
- iv. Light (Ljuskultur, 2016)
- v. Temperature (Boverket, 1998)
- vi. Air Pollution (Boverket, 1998)
- vii. CO₂ (Boverket, 1998)

2.8 DEFINITION OF BIG DATA IN FACILITY MANAGEMENT INDUSTRIES

Big information provides vital opportunities for enterprises to impact a large variety of business processes in organizations (Izhar et al., 2013). Organizations will produce a huge volume of information in their daily business activities. The matter though' is that this information was created and captured in many various formats, that create it nearly not possible to grasp the prevailing relationships between totally different information. As a result, this huge volume of knowledge could get redundant and exhausting to spot that data has relevancy to the organization's goals. Massive information is also created in petabytes or Exabyte scale and far of that can't be integrated simply. As an example, the government agencies, the large, medium and tiny personal enterprises in several domains like engineering, education, producing, ar drowning in an associate ever-increasing deluge of information. Corporations like Google, eBay, LinkedIn, and Facebook were engineered around massive information from the start (Davenport T. H., 2013). Although information scientists were trained to research information, however with the massive volume of knowledge generated each day makes it tougher to spot that data has relevancy to the organization's specific activity. As a result, it poses a difficulty on the way to effectively utilize this information to support decision-making processes (Izhar et al., 2013).

Effectiveness of huge information emphasizes if organizations have with success manage big information in their organizations to extract insights (Galbraith, 2014). At identical, by managing huge information organizations will improve their competitive edge, decision-making, innovation and structure capital (Andreou et al., 2007). More practical huge information analyses will cause a lot of assured call-making and a higher decision will mean bigger operational efficiencies in organizations (Davenport T. H., 2013). It'll drive the method of information, creation and conjointly perceive their knowledge culture (Erickson, 2014). In the end, it'll resolve the matter of information pitfalls and make knowing culture in their organizations as a part of structure culture itself. Effectiveness of huge information analytics is taken into account an important facet to be more improved to extend the operating margin of each public and

personal enterprises and represents the future frontier for his or her innovation, competition, and productivity (Esposito et al., 2015)

2.8.1 Benefit of Big Data Implementation

In the past number of years, we've seen a big increase within the use of massive knowledge analytics that brings knowledge underneath management (Davenport, 2014). Huge knowledge provides important opportunities for enterprises to impact a large variety of business processes within the organizations. Organizations produce an immense quantity of information in their daily business activities. The matter is that this knowledge is formed and located in many various forms like databases, paper-based mostly document, mobile applications, numerous websites and social media. Of these knowledge captures completely different formats and makes it virtually not possible to know the present relationship between different knowledge. The dimensions and complexness of knowledge build it tough for corporations to unlock the true worth of their data. Some knowledge is to this point out of date that it doesn't belong in vigorous knowledge storage in the slightest degree. A key challenge in the current setting is crucial a way to determine the knowledge that also relevant for data professionals UN agency receive an output of research supported this knowledge. Sadly, this knowledge can't be treated with disparate data. As a result, this knowledge could be redundant with an immense volume of knowledge and build it laborious to analyse relevant data into information. Organizations have to be compelled to use this assortment information and make significant information and gain knowledge out of it. High structure and top quality of information are important. It's the inspiration for organizations to analyse relevant knowledge into data informal reports and dashboards. This data must be accustomed to build actions and choices supported facts. This stage is understood as the data spectrum and it's vital to use this stage across the organizations within the consistent action. Therefore, the complete organization will profit. There is three main part that the researcher wants to research to find the effectiveness of big data towards facility management industries in Malaysia:

2.8.2 Experience Level of Big Data

Understanding massive information is extremely necessary and it will be gained through personal expertise. Personal expertise includes knowing the definition of huge information, perceive the creation of huge information and knowing the kinds of information in their organizations. At constant, to investigates if their structure information is a part of massive information itself. Personal expertise on massive information will be thought-about necessary to gauge the amount of massive information awareness as a result of expertise will prepare the organization with a higher strategy in managing big information. although some leading firms are actively adopting massive information analytics to strengthen market competition and to open up new business opportunities, several organizations are still within the early stage of the adoption curve because of lack of understanding of and knowledge with massive information (Kwon et al., 2014). Understanding massive information will gain insights from the created information and it's a key to competitive advantage (Assuncao et al., 2007).

At present, the training orientation of big data professionals is mainly based on the demand for talents, focusing on the cultivation of “talent with big data thinking, data analysis and data application”. In the process of cultivating students, students are familiar with data acquisition, data storage, data analysis, data visualization and other technologies, with the ability to design, implement and maintain big data application systems, and to discover, analyse and solve practical engineering problems. At the same time, it can coordinate, communicate, organize and manage engineering projects, understand the development of data science, information technology and big data industry, and can continuously learn and adapt to development. Combining with the characteristics of the school, in the new engineering background, around the direction of computer science and artificial intelligence, carry out the connotation construction of data science major, optimize the curriculum system, break the regular school-running mode, and rely on the school-enterprise cooperation unit to build a big data professional laboratory and The curriculum platform, the construction of the training base, to enhance the students'

practical operational ability, the service place as the starting point, explore the talent training model of "big data and industry" demand.

2.8.3 Usefulness of big data

Evaluating the utility level huge information can assist organizations to know big information in their daily endeavour. It emphasizes if huge information produce worth in their organizations by making helpful data and information for higher decision-making in supporting organization bound priorities (Davenport T. H., 2013) (Manyika et al., 2011). The analysis of utility can confirm if huge information is a matter in their organizations from the side of tools analysis, up to information analysis and up and optimizing higher decision-making. The foremost seemingly to initiate huge information technologies area unit either existing analytics teams or innovation teams among IT organizations (Davenport T. H., 2013). Level of utility includes if understanding huge information will improve the method in managing a giant volume of knowledge in organizations.

The difference between big data and ordinary data is mainly the data set with large capacity, multiple types, fast access speed and high application value. Big data can collect, store and correlate data in a large number, scattered sources and diverse formats, and then discover new knowledge, create new value, enhance new capabilities, and provide technology and services for information construction and industry.

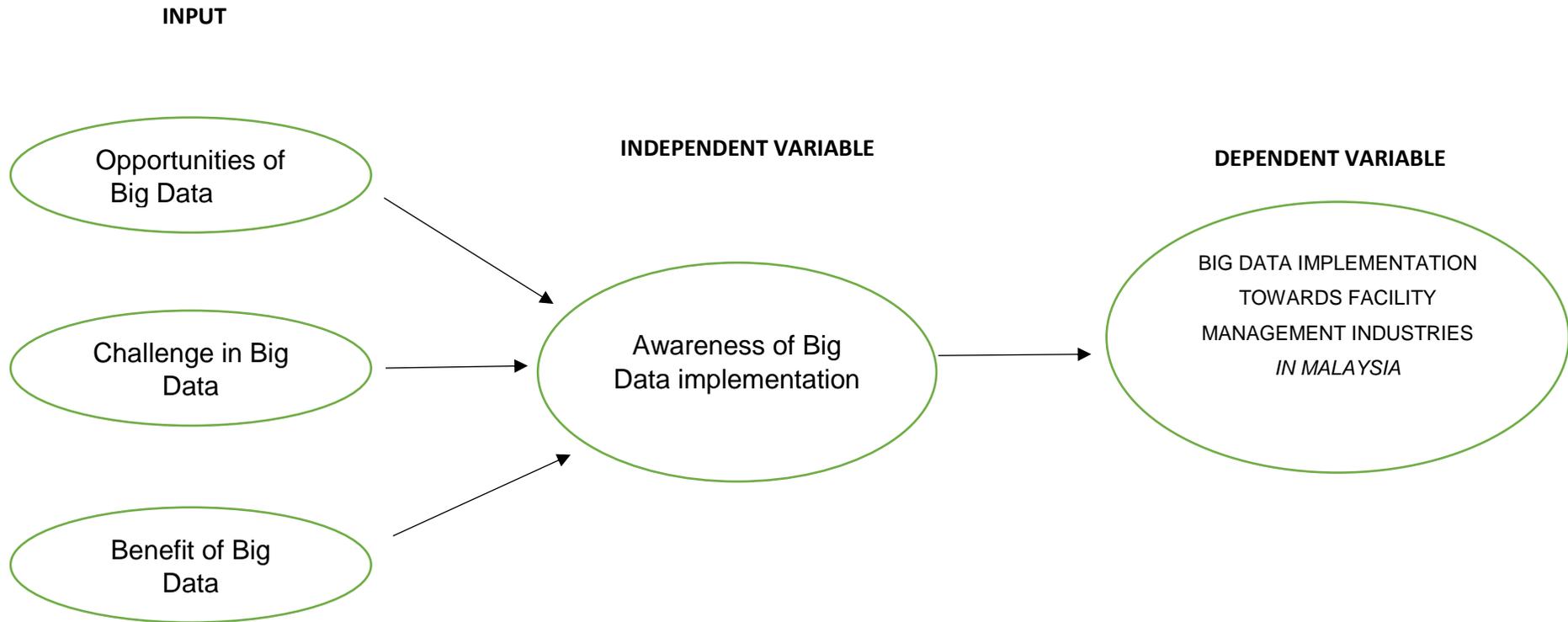
2.8.4 Effectiveness level of big data

Effectiveness of huge information emphasizes if organizations have with success manage big information in their organizations to extract insights (Galbraith, 2014). At an equivalent, by managing massive information organizations will improve their competitive edge, decision-making, innovation and structure capital (Andreou et al., 2007). Simpler massive information analyses will result in additional assured call-making and a higher decision will mean bigger operational efficiencies in organizations (Davenport T. H., 2013). It'll drive the method of information creation and conjointly perceive their knowledge culture (Erickson, 2014). In the end, it'll resolve the matter of

information pitfalls and build knowing the culture in their organizations as a part of the structure the culture itself. Effectiveness of massive information analytics is taken into account an indispensable facet to be more improved to extend the operating margin of each public and personal enterprises and represents the future frontier for his or her innovation, competition, and productivity (Esposito et al., 2015).

2.9 DESIGN CONCEPTUAL FRAMEWORK OF THE RESEARCH

Figure 4: Conceptual Framework



2.9.1 Conceptual Framework of the Research

Independent variable that is stable and unaffected by the other variable that is used for measure. It refers to the condition of an experiment that is systematically manipulated by the explorer. It is the presumed cause. Dependent variable that depends on the other factors that are measured. These variables are expected to change as a result of experimental manipulation of the independent variable of variables. It is a presumed effect.

Figure 3 describes the theoretical framework of the study wherein the input is consisting of the following: philosophy, evolution and theory of big data. This will enable the researcher to better understand what will be done in the future study. In addition, it will facilitate the researcher to know the exact purpose of the study.

Figure 4 describe the conceptual framework of the study wherein the input consisting of the following: challenge in big data and benefit of big data for the independent variable of awareness of big data implementation. On the other side, the process being used is through a questionnaire. The dependent variable for this research is a big data implementation in the facility management company.

2.10 SUMMARY OF THE CHAPTER

In this chapter, basic information on the research background and flow has been explained. The cycle of research starts with analysing the detail of characteristics, challenge and benefit of big data implementation. It will then generated with collecting data of people's knowledge and awareness towards the big data implementation

The research subject has been briefly explained based on one independent variable input such as:-

- i. Awareness of big data implementation
 - a. Characteristics of big data.
 - b. Challenge in big data.
 - c. Benefit of big data.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The research methodology is the main root of the research view and structure implementation. It consists of the procedure and guideline in collecting data and completion of analysis for the research as a whole. Selection of the appropriate method is essential to ensure that the result of the research is dependable, valid and precisely related to the research topic. There are four main elements in research which are research design, conceptual framework, data collection method and data analysing method (Kumar R. , 2014) These all aspects are important to ensure research executed smoothly according to plan and systematic as well as produce high-quality structural research.

This chapter will encompass all the research methodology used in determining the result based on the topic. It begins with a literature review of all theoretical facts regarding this issue that they will be evaluated and analysed by the tools used in data collection. The result will then be analysed with Statistical Package for the Social Sciences (SPSS). SPSS is a software package used for data analysis that generates into a statistical format based on data collected for the research (Daniels, 2012).

Data analysis by SPSS will generate effective data management. It is because the collected data from numbers of the source will be recorded in ineffective data management. The data arranged will then provide a wide range of options for the research result. Hence, a better output of analysis generated by using the system. The system and analysis then will help to achieve the objective of the research.

3.2 PHILOSOPHY AND RESEARCH

There is a various pattern of philosophy and research methodology. In this research, the researcher adopts the Saunder's Research Onion Model version 2011 as the base of the methodological approach. The model presents six layers of research methodology namely: (1) philosophies, (2) approach, (3) methodological choice, (4) strategy (ies), (5) time horizons, as well as (6) techniques and procedures (Saunders et al., 2012)

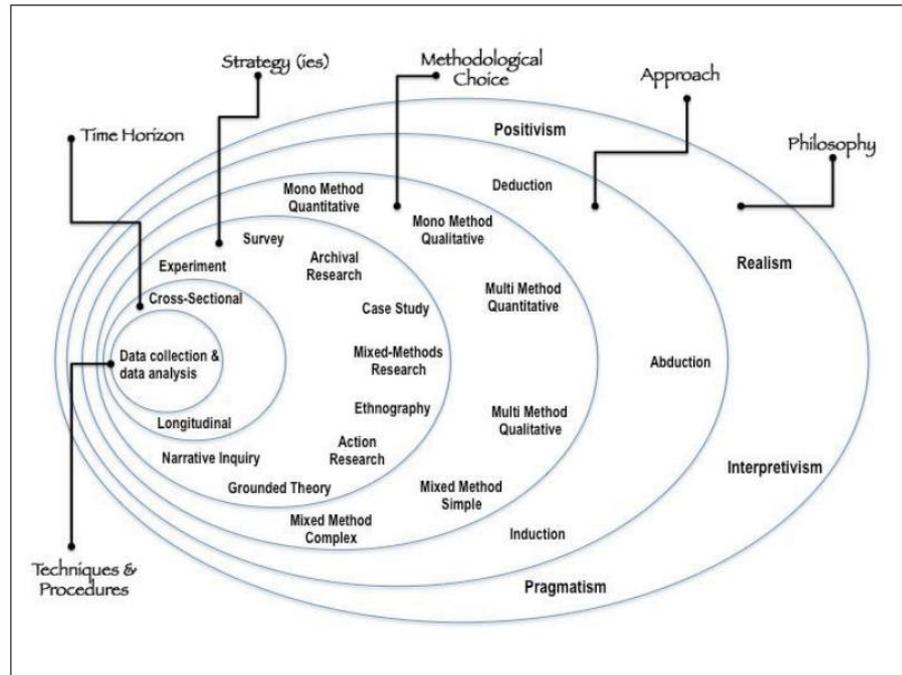


Figure 3 Saunder's Research Onion Model version 2011

3.2.1 Research Philosophy

Based on the onion, pragmatism philosophy is the most that comply for the research topic. It is because pragmatism allows the researcher to prove the ideology or proposition claimed based on data collected and method approach for the research. (Morgan,2014). A proposition can be judged as true or false only based on result collected from data collection. It will be evaluated by the satisfactorily that the reality of the result will give consequences of accepting it or to be rejected.

In pragmatism, There are 3 types of pragmatism approach can be selected by the researcher (Saunders,2011):

i. Deductive approach

Research that used a quantitative approach. The deductive approach allows the researcher to develop a hypothesis based on the existing theory that the research conduct to test the hypothesis. In simplest word, deductive approach is most appropriate for quantitative research design.

ii. Inductive approach

An inductive approach is research that used a qualitative approach. The approach needs a researcher to evaluate the result based on the essential quantity to test the research claim. The result observes by numbers of result collected and depends only on qualitative data. Hence, this research approach can be used for qualitative research only.

iii. Abductive approach

Abductive approach is developed with the observation of the real situation in the world. For example the behaviour of a human or the human interpretation towards a certain situation. Hence, to determine the pattern of the situation, both qualitative and quantitative approach needed. The result based on both observation in qualitative and quantitative data. In other words, the abductive approach allows the researcher to evaluate result based on more than one angle of observation.

As researcher will evaluate the implementation of big data in the company of facility management, factors that used are pointed implementation of big data. Factors are constructed from the explanatory study (existing research conduct for the same topic) and exploratory study (observation).

In this research, the researcher needs to use a deductive approach to analyse data for the topic of big data implementation in facility management industries. Quantitative data collection is needed to know big data implementation in facility management industries. Method of research conduct is mono quantitative. The researcher will refer to the mono method of quantitative research (John. Cresswell, 2014)

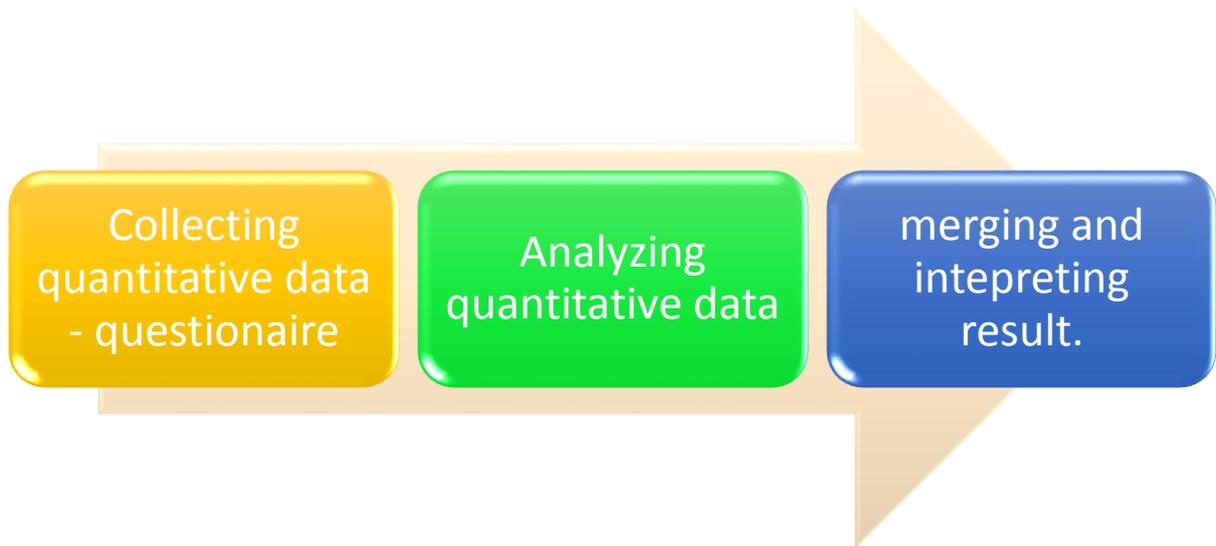


Figure 4: Quantitative Flow Chart

3.3 RESEARCH DESIGN

Quantitative analysis ways area unit those ways within which numbers area unit won't justify findings (Kowalczyk, 2016). The analysis procedures area unit through "experiments" and "quasi-experiments", with collected knowledge being applied mathematics (Creswell, 2003, p. 13; Maxwell & Delaney, 2004). Victimization numbers imply that the investigator needs to have honest data of each descriptive and inferential applied mathematics parameters, like calculations and interpretations of ordinary deviations, ANOVA, correlations, etc. CRQ (2015a) explains that the final purpose of quantitative analysis is to clarify, predict or investigate relationships, describe current conditions, or examine doable impacts on nominative outcomes.

A good quantitative methodology analysis follows the procedure delineated in Maxwell & Delaney (2004). The investigator isn't an area unit of the analysis instruments and close-ended queries are used. In line with Creswell (2003), the data being researched is "conjectural" (p. 7), which means that there's no absolute truth of it. Quantitative analysis ways would be utilized in things within which the investigator desires to check however a nominative variable affects another, regardless of the consequences of different variables. Such a way is appropriate within the sciences, and quantitative ways are utilized in the sciences for an extended time compared to the opposite analysis ways (Creswell, 2003).

This analysis methodology is advocated by the "positivists" and thus is also mentioned because of the "scientific method" (Creswell, 2003, p. 6). Such a look methodology, once utilized in the social sciences, would be wont to check hypotheses. Creswell (2003) asserts that with quantitative analysis the investigator starts with a theory, collects knowledge that either supports or contradicts the speculation, makes revisions, and conducts extra tests. The benefits of quantitative analysis ways area unit that it concludes giant numbers of individuals, it employs economical knowledge analysis, it examines grounds and impact, bias is controlled, and folks typically like numbers. Its limitations area unit that it's impersonal, the words of the participants don't seem to be detected, there's a restricted understanding of the context of participants, and it's mostly research-driven (Creswell, 2013).

3.3.1 A type of educational Research

A type of instructional analysis within which the research worker decides what to study; asks specific, slender questions; collects quantitative information from participants; associated analyses these numbers mistreatment statistics; and conducts the inquiry in an unbiased, objective manner. Many options of quantitative options will facilitate the research worker to conduct the study:

- i. Emphasis on grouping and analysing info within the variety of numbers.

- ii. Emphasis on grouping scores that live distinct attributes of people and organizations.
- iii. An emphasis on the procedures of comparison teams or relating factors concerning people or teams in experiments, reciprocally studies, and surveys.

3.3.2 Method of the data

In this research, there is a methodical approach for data collection. Each of it will measure different angel of the topic.

a) Questionnaire

A questionnaire is a set of question that will distribute to collect several answers from numbers of the respondent. The number of respondents is varied depends on the population of the building. The number of questionnaires needed to distribute depends on the sample table suggested for a research sample.

This research questionnaire is a set of question that will be distributed to the company employee to evaluate their direct answer based on their observation for the implementation of big data. Sets of the questionnaire will be distributed by a sample in a building that will consist of questions that align with the constructed framework for the research. Significance of a questionnaire will enable the researcher to evaluate the implementation of big data in facilities management industries.

3.4 SAMPLING

3.4.1 Sampling Technique

The sampling techniques are divided into two types:

- i. Probability or representative sampling
- ii. Non-probability or judgmental sampling

The chance or possibility of each case being selected from the population is known and is usually equal if use the probability samples. This means that it is possible to answer research questions and to achieve

objectives that require to estimate statistically the characteristics of the population from the sample. (Saunders et al., 2009) Probability sampling is often associated with survey and experimental research strategies.

The probability of each case being selected from the total population is not known and it is impossible to answer research questions or to address objectives that require to make statistical inferences about the characteristics of the population for a non-probability sample. It may still be able to generalize from non-probability samples about the population, but not on statistical grounds. However, both types of samples can be used to answer other forms of research questions (Saunders et al., 2009). In this study, a simple random technique derived from probability sampling techniques is being used.

3.4.2 Sampling Size

Determining the sample size needed to be representative of a given population is increasing demand for research has created a need for an efficient method. In the article, the research division of the National Education Association has published a formula for determining sample size.

$$S = \frac{X^2 NP(1-P)}{d^2 (N-1) + X^2 P (1-P)}$$

S= required sample size

X²= the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N= the population proportion

d= the degree of accuracy expressed as a proportion.

3.5 SUMMARY OF THE CHAPTER

Once we decide to conduct a survey, the respondents may be an individual, an organization. We have to collect information regarding these individuals or organizations, analyze it and report it to somebody else. Here the question of ethics arises. As an organization or individuals are subject to get affected by our action. Cooper and Schindler (2008) have defined ethics as the norms or standards of conduct that guide moral choices about our behaviour and our associations with others. The way we select the research topic, research design, survey method, collect and analyze data affects research ethics. This means that we will have to make certain that the way we design our research is both methodologically sound and ethically defensible to all those who are involved. The behaviour of the researcher shall be as per the social rules of the society of the respondent (Zikmund 2000). A social norm decides the way a person behaves in a particular situation. (Robson 2002; Zikmund 2000). In this research, while conducting a survey we have considered ethical issues by maintaining the confidentiality of respondents and assuring them that data collected will be used only for research purpose.

CHAPTER FOUR

DATA COLLECTION

4.1 INTRODUCTION

Data collection is conducted to obtain the requisite information for the purpose of the study. In any analysis, the most important aspect is data collection (Creswell, 2014). Methods of data processing have to be things that can discuss and solve problems of study. The selection of data collection techniques and methods should be focused on avoiding errors in the choice of suitable data collection techniques. A successful data-gathering tool or instrument can decide the efficiency of the analysis. This chapter will explain the sampling method, the sample size used and the rationale for particular data collection instruments.

4.2 SAMPLE STUDY

The design of the sample size is based on the intention of this analysis, the sample required, the cost and the time allocated to the research. The sample size is a category of whether it is an organization, place or phenomenon which serves as a source of knowledge for the researcher. The researcher finds it difficult to do so because of factors such as large population size, diverse population and large population (gain selection as needed). Approaches exist in designing a sample design of a study that acts as a benchmark and simplifies the data collection process and is split into two i.e. probability sampling and non-probability sampling.

Researchers usually use non-probability sampling approaches in both qualitative and quantitative studies. Non-probability sampling involves selecting samples from a population defined on the basis of specified criteria (Fraenkel, 2006). As the research technique employs a qualitative approach, the researcher is only addressing non-probability sampling.

4.2.1 Population Size and Sample size

In each study, the population is different, since the sample size and the design analysis are different (Haji Awi, 2013). This is due to the study sample being the respondents selected to represent a population (Gay et al., 2003). The population in the study must be determined, as it will decide how and a number of samples to be selected by the researcher.

Samples are a small group of populations selected by the researcher to do the study. The researcher will take an approach to avoid significant errors when determining which sample size is acceptable for the population. Both table (morgan, 1970)decide the sample size.

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Table 1: Krejcie, Robert V., Morgan, Daryle W., 1970. "Determining Sample Size for Research Activities", Educational and Psychological Measurement

4.2.2.1 Population Type

The population's focus in this research is on employees employed in Facilities Management (FM) companies. For more than five (5) years,

each selected company has been involved and developed in the Facilities Management industry, and has headquarters in Klang Valley. Selected companies that involved 3 companies from a different industry type must have used information and data in day-to-day activities. Healthcare industry and commercial business are the main sectors to be active.

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	160	750	256	2600	336	100000	384

Table 2: Population and Sample for the Research

No	Item	Total
1	Companies involved in the questionnaire session	3
2	Population size (N)	125
3	Sample Size (S)	97
4	Total responded questionnaire for this research	120

Table 3: Research Sample Size

For this research, the sample size is selected by following the Krejcie and Morgan Table, based on 2, three Facilities Management company with a population of 125 participated in the questionnaire session. As the questionnaire session is conducted through Google Form online platform, the questionnaire link is sent to each person in charge of the organization before it is an internal blast to the selected group of respondents.

4.3 DATA COLLECTION INSTRUMENT

The instrument is one of the data-gathering tools or methods used. A questionnaire distributed to the respondent as required for the data collection process is among the data collection instruments for the case studies used in this research. Data collection techniques are very important steps in the analysis process since (Yeop, 2003) stated that the main objective of the study is to analyze the data obtained.

4.3.1 Questionnaire

In this research, the questionnaire is used to obtain respondent opinions on the implementation of big data in Malaysia's facilities management industries. The lists of questions are followed and constructed by the researcher according to the conceptual framework and literature review. All the answers obtained via the survey questionnaire are strictly confidential and will be used for research purposes only.

Section	Title
A	Respondent's Demographic
B	Data and information factors to influence employees in the facility management industry
C	Awareness of Big Data in the facility management industry
D	Improvements in the importance of data and information in the Facility Management Industry

Table 4: Questionnaire's Section

As stated in Table 4.3.1, Section (A) focuses on demographic respondents, which surveys the academic qualification of the respondent, the place in the business, years of work experience and which business they operate. Within this segment, important questions

are also being asked which decide whether they will continue to respond to the survey. The concerns are about how their routine handling of current data and information is collected.

In Section B, questions related to opportunities for big data in Facilities Management is a query to the respondent. This is to acknowledge the researcher the way they store the data and information.

In Section C, consists of inquiring the respondent about the knowledge of big data in facilities management industries. Questions included in this section are the opportunities that the company will gain by using all the data and information in the right way as to how they manage all the information and data and the benefits company will get.

In Section D, is to acquire opinion from the respondent regarding the improvement of the importance of data and information in the Facility Management Industry.

Section	List of Questions
<p style="text-align: center;">A</p> <p>Respondent's Demographic</p>	<ol style="list-style-type: none"> 1. Academic qualification 2. Post in the organization 3. Years of working 4. Which company did serve 5. Mode to store existing data and information obtained
<p style="text-align: center;">B</p>	

<p>Opportunities of big data in facilities management industries in Malaysia</p>	<ol style="list-style-type: none"> 1. Do you agree that existing information and data can help employees perform a job 2. Do you agree that existing data and information will provide additional skills and knowledge to new employees 3. Do you agree existing data and information will help employees to know the current condition of equipment and machines 4. Do you agree that existing data and information make it easier for employees to maintain equipment and machinery 5. Whether existing data or information can help employees provide good services to users 6. Do employees feel there are obstacles that will be encountered to obtain data and information
<p style="text-align: center;">C</p> <p>The awareness of Big Data in the Facility Management industries in Malaysia</p>	<ol style="list-style-type: none"> 1. Do you agree that existing data or information can increase opportunities for your company 2. Do you agree that existing data and information can add value to a company 3. Do you agree that existing data and information can help a company achieve its set goals

	<ol style="list-style-type: none"> 4. Do you agree that the data and information obtained allows the company to make predictions about obstacles that will be encountered or problems that will occur 5. In your opinion, does all the information and data recorded to have an advantage in the future
<p style="text-align: center;">D</p> <p>Improvements in the importance of data and information in the Facility Management Industry in Malaysia</p>	<ol style="list-style-type: none"> 1. Do you agree that data and information should be stored 2. Do you agree that data and information should have the ability to be easily accessed 3. In your opinion, the support system factors and structured processes are the most important to ensure that all the data obtained can be used properly 4. In your opinion, provide training and seminars for employees on the importance of data or information to increase the awareness of each employee

Table 5: List of Question in the Questionnaire

Statement	Scale
Strongly Agree	5
Agree	4
Disagree	3
Do not Agree	2
Strongly Disagree	1

Table 6: Likert Scale

Questionnaire Title in Google Form	Google Form Online Link
<i>Big Data di dalam industry pengurusan fasiliti di Malaysia</i>	Short Link
	https://docs.google.com/forms
	Full Link
	https://docs.google.com/forms/d/e/1FAIpQLSdYSeUjSplU4iVZ2ss_6EC0r6_YzhBPM3qqx4Eqc1iusSjPXA/viewform?vc=0&c=0&w=1

Table 7: Questionnaire Link on Google Form Platform

4.4 PILOT STUDY

Before the actual study was conducted the researcher had conducted a pilot study. The research was performed on involving 30 employees. This pilot study aims to assess the validity of the items that have been established for the survey questionnaire. Following this pilot test, the researcher will decide the characteristics of the issue need to be changed or retained according to the specific research problem. It may also help the researcher recognize some incorrect or inaccurate procedure or instrument of analysis.

In this study, it randomly selected 30 related staff to perform this pilot test. The aim of this study was to review and ensure that the survey questions

were answered and answered when they were filled in with simple and easy to understand directions for respondents. Additionally, reliability testing of the manufactured products is also conducted. The researcher concludes that the constructed questionnaire has high reliability when the coefficient value is greater than 0.7 (Najib, 1999). Uses the SPSS software for this reliability test.

4.5 SUMMARY OF THE CHAPTER

It covers the design and data collection techniques used by researchers in this chapter, based on the explanations outlined in this chapter. Instruments for the method of data collection used in this study are also clearly mentioned in this chapter. The right selection of the instruments is very critical in the process of data collection. Using the Microsoft Excel program, the data obtained will be analysed using the process chosen. The study's findings will be discussed in the next chapter.

CHAPTER FIVE

DATA ANALYSIS AND DISCUSSION

5.1 INTRODUCTION

In this chapter, it describes the analysis process based on the findings obtained from the sample using the instrument method selected as the questionnaire. This questionnaire has been sent to three company of facilities management in Malaysia namely Ambang Wira Company (AWC), Global Facility Management (GFM) and Anjalan Jaya Sdn Bhd. This data analysis is an activity to answer the research questions and objectives once all data has been collected and processed (Paul Gill et al, 2008).

In this analysis, respondents were selected to address the objectives of this study, the respondent is represented from top to lower management in the company. All question was distributed using google form in April to get their feedback. A total of 125 were distributed and only 120 questionnaires were returned and samples were studied and analysed. Its means 95% of the total respondent answered the questionnaire.

The return of the copy has been examined by mistakes, omissions, completeness, and inconsistencies and is found to be adequately completed and therefore used to carry out the analysis. The results will be presented in the form of charts and tables. Data obtained will be analysed using SPSS. The analysis method used is in the form of a per cent, mean, frequency and reliability.

5.2 RESPONDENT DEMOGRAPHIC

Part of these respondent demographics explains the background of respondents involved in this study by answering a distributed questionnaire. A total of 120 questionnaires have been received to achieve the objectives of this study. In the demographic part respondent's need to answer the following question

- i. Qualification
- ii. Position
- iii. Experience
- iv. Company
- v. How to store data and information

All information on the findings and respondents' information obtained from the results of the questionnaire distributed will be shown in the diagram.

5.2.1 Respondent Analysis Based on Qualification

This section will describe the qualification of respondents from different part of management. The percentage method used to analyze the qualification of the respondent and the figure below shows the number of respondents.

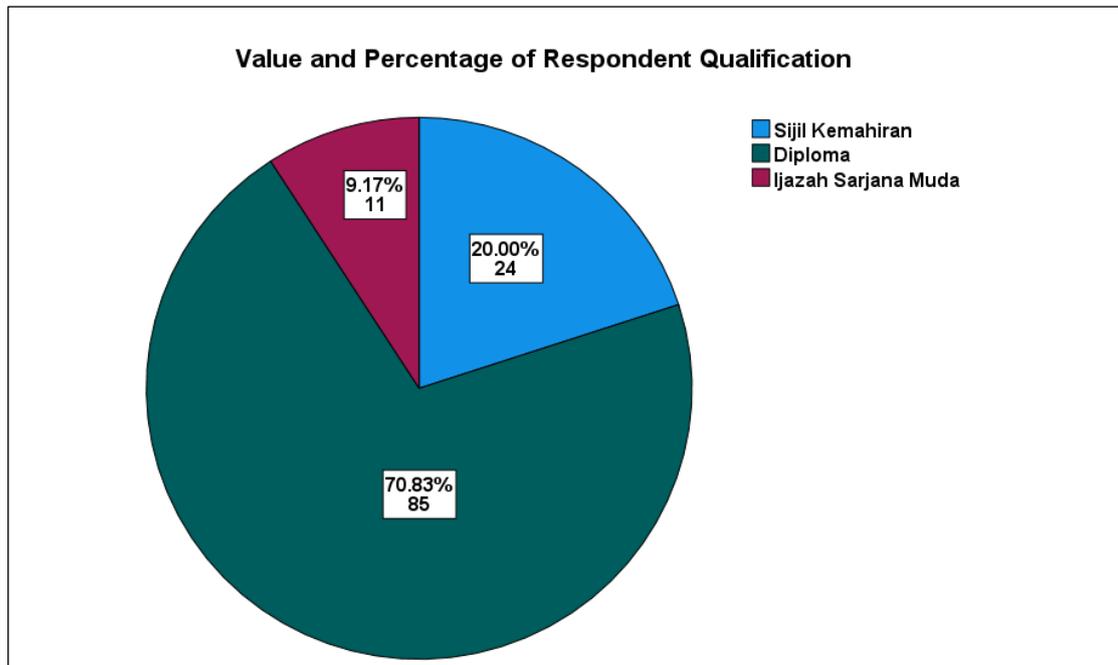


Figure 5: Value and Percentage of Respondent Qualification

Figure 5, above shows the number of respondents for facility management company staff. The total number of respondents who answered the questionnaire and sent it back was 120 from 125 people from the facility management company. The findings show, respondents that have diploma have the highest percentage 70.83%, 20.0% respondent have skill certificate and the lowest is 9.17% that have a degree for the qualification. Therefore, it can be concluded that respondents that have diploma are the highest involved for answering this survey because in the part or lower management has a lot of vacancy than middle and top management.

5.2.2 Respondent analysis based on position

This section will describe the position of respondents. The percentage method used to analyze the position of the respondent and the figure below shows the number of respondent's according to position in the company.

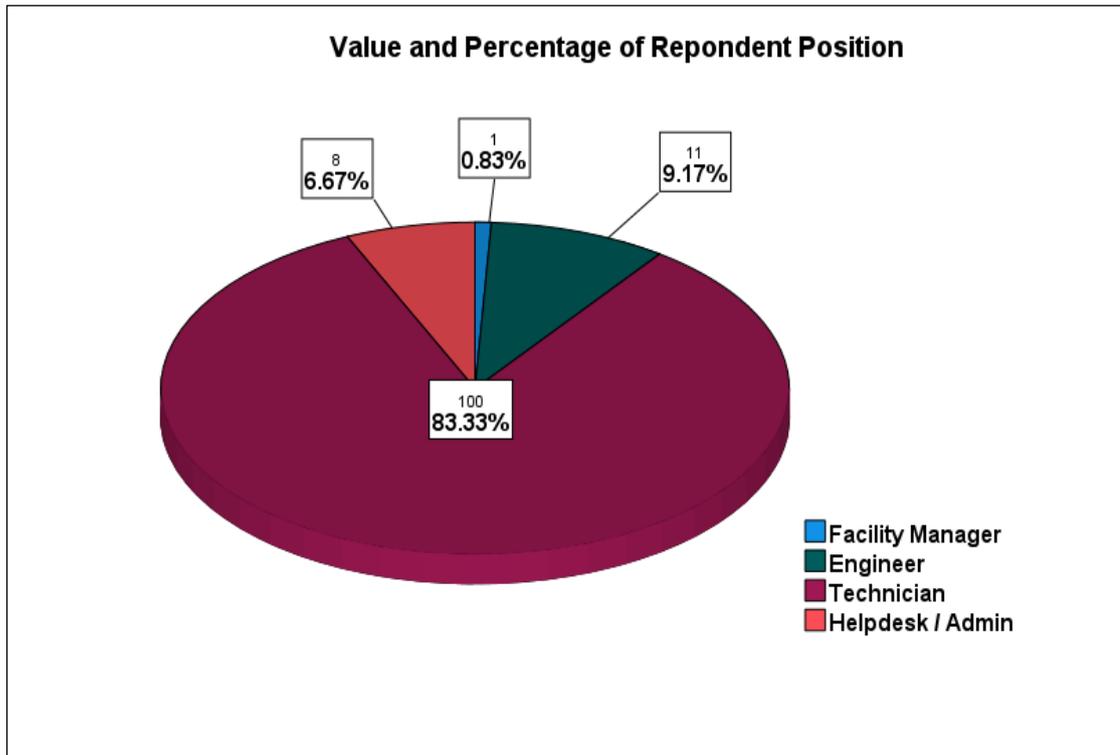


Figure 6: Value and Percentage of Respondent Position

Figure 6, above shows the number of respondents for facility management company staff. The total number of respondents who answered the questionnaire and sent it back was 120 from 125 people from the facility management company. The findings show, respondents in technician position have the highest percentage 83.33%, 9.17% respondent are in engineer position, 6.67% as a helpdesk or admin and the lowest is 0.83% that is facility manager. Therefore, it can be concluded that respondents that in technician position are the highest involved for answering this survey because in the facility management company operation team need more person than the management team.

5.3.3 Respondent analysis based on experience

This section will describe the experience of respondents. The percentage method used to analyze the position of the respondent and the figure below shows the number of respondent's according to their experience.

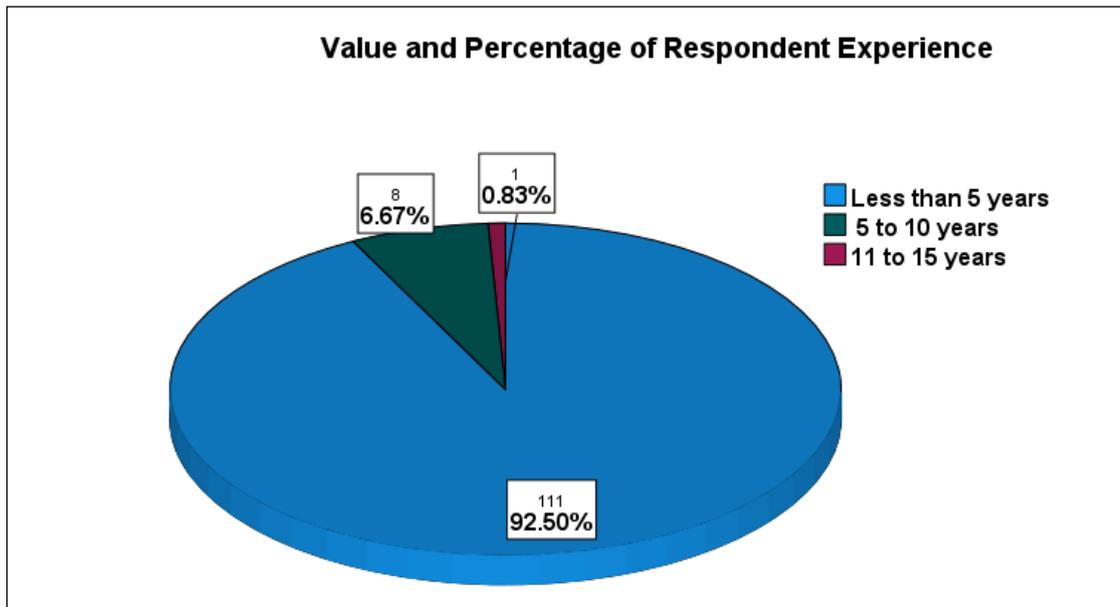


Figure 7: Value and Percentage of Respondent Position

Figure 7, above shows the number of respondents for facility management company staff. The total number of respondents who answered the questionnaire and sent it back was 120 from 125 people from the facility management company. The findings show, respondents that have less than 5 years of experience are the highest answering this survey with 92.50% person, 6.67% respondent have the 5 to 10 years of experience and 0.83% have 11 to 15 years of experience. Therefore, it can be concluded that respondents that have less than 5 years of experience are the highest involved for answering this survey.

5.3.4 Respondent analysis bases on Company

This section will describe the company of respondents. The percentage method used to analyze the company of the respondent and the figure below shows the number of respondent's according to their experience.

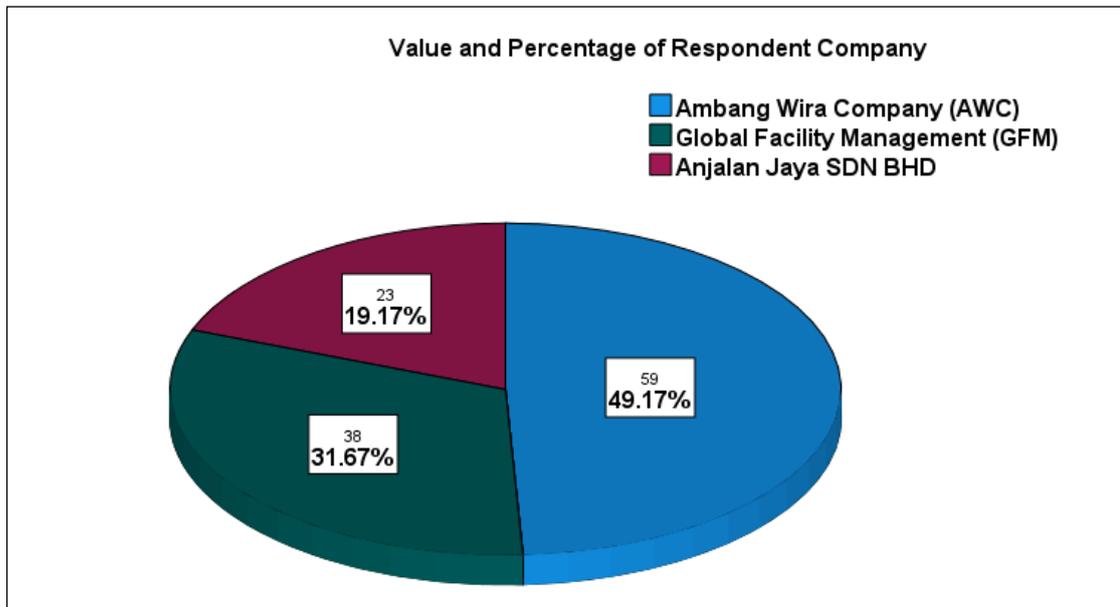


Figure 8: Value and Percentage of Respondent Company

Figure 8, above shows the number of respondents for facility management company staff. The total number of respondents who answered the questionnaire and sent it back was 120 from 125 people from the facility management company. The findings show respondents from Ambang Wira Company (AWC) have the highest respondent 59 people with percentage 49.17%, Global Facility Management (GFM) have 38 people responded this survey with the percentage 31.67% and Anjalan Jaya SDN BHD with the lowest 23 people respond with percentage 19.17%. Therefore, it can be concluded that respondent that in Ambang Wira Company (AWC) was the highest involved in this survey because the staff that participate in this survey more than other company.

5.3.5 Respondent analysis bases on how data and information store

This section will describe how respondent store data and information. In this part, researcher state three type how to store all the data and information such as

- i. Record data or information in a book
- ii. Computerized maintenance management system (CMMS)
- iii. Hand phone

No. of Respondent	120	120	120
Type of Mode	120	120	120
Record data or information in a book	✓	✓	✓
Computerized maintenance management system (CMMS)	✓	✓	✓
Hand phone	✓	✓	✓

Table 8: Mode to store data and information

Table 8 above shows the number of respondents for facility management company staff. The total number of respondents who answered the questionnaire and sent it back was 120 from 125 people from the facility management company. The findings show the respondent was using all the type that are stated in the questionnaire survey. Therefore, as concluded that all respondent use all this type to store all the information and data on a daily basis.

5.3 OBJECTIVE 1: TO IDENTIFY FACTORS THAT INFLUENCE EMPLOYEE OF BIG DATA IN THEIR WORKPLACE

This section aims to analyse the data to achieve the first objective of the study which is to identify the factors that influence employee of big data in their workplace towards big data. The data obtained were quantitative and the data were analysed using SPSS software. The instrument used to obtain the data was to disseminate survey forms to selected respondents. The findings obtained from this first objective are also used as a support tool to get more specific answers for the second objective.

Through the instruments used, the researcher analyzed the data received to answer the first objective and state the findings obtained from the study which is to identify factors that influence employee of big data in their workplace. The researcher uses mean analysis to answer the first objective of the study. Mean is defined as the sum of scores in the distribution divided by the number of scores. By performing the mean analysis, the study will be able to identify the average value generated from a data set. In this questionnaire, mean analysis was used to obtain the average value of each data related to big data implementation in Facility Management Industries in Malaysia.

In this study, the respondent is all the staff in the facility management company. This section will show the result based on the survey was conducted for the first objective is to identify the factors that influence employee of big data in their workplace.

5.3.1 Data Analysis for Factors That Influence Employee of Big Data in Their Workplace

This analysis is designed to study the factors that influence employee of big data in their workplace. Six point scale has been set as Table 9.

NO	QUESTION	N	Ambang Wira Company			Global Facility Management			Anjalan Jaya Sdn Bhd		
			Mean Score	Mode	Range	Mean Score	Mode	Range	Mean Score	Mode	Range
B1	Do you agree that existing information and data can help employee to perform the job?	120	4.42	5	2	4.89	5	2	4.26	4	2
B2	Do you agree that existing data and information will provide additional skills and knowledge to new employees?	120	3.42	3	2	4.89	5	1	4.91	5	1
B3	Do you agree that existing data and information will help employees to know the current condition of equipment and machinery?	120	4.10	5	2	4.94	5	1	4.35	4	1
B4	Do you agree that existing data and information make it easier for employees to maintain equipment and machinery?	120	4.34	4	2	4.83	5	2	4.83	5	2
B5	Can existing data or information help employees provide good service to users?	120	3.40	3	2	4.54	5	1	3.91	3	2
B6	Do employees feel there are barriers to accessing data and information?	120	3.19	3	2	4.06	5	2	4.26	4	2

Table 9: Mean Score analyse for factor that influence employees of big data in their workplace

The findings shown in table 9, indicated respondents agree that the most important factor influencing selection benefit of data and information is easier for employees to maintain equipment and machinery with the highest mean score of 4.58. Secondly, the factor that influences the employees is existing information and data can help employees to perform a job with a mean score of 4.53. Furthermore, the factor existing data and information will help employees to know the current condition of equipment and machinery were the third-highest with a mean score of 4.39. Besides that, after the fourth-highest factor, existing data and information will provide additional skills and knowledge to new employees have the 4.13 mean score. In addition, a factor that existing data or information help employees provide good service to users has a high mean score after the fourth-highest factor with a mean score of 3.83. Lastly, 3.65 was the lowest mean score for the factor that employees feel there are barriers to accessing data and information.

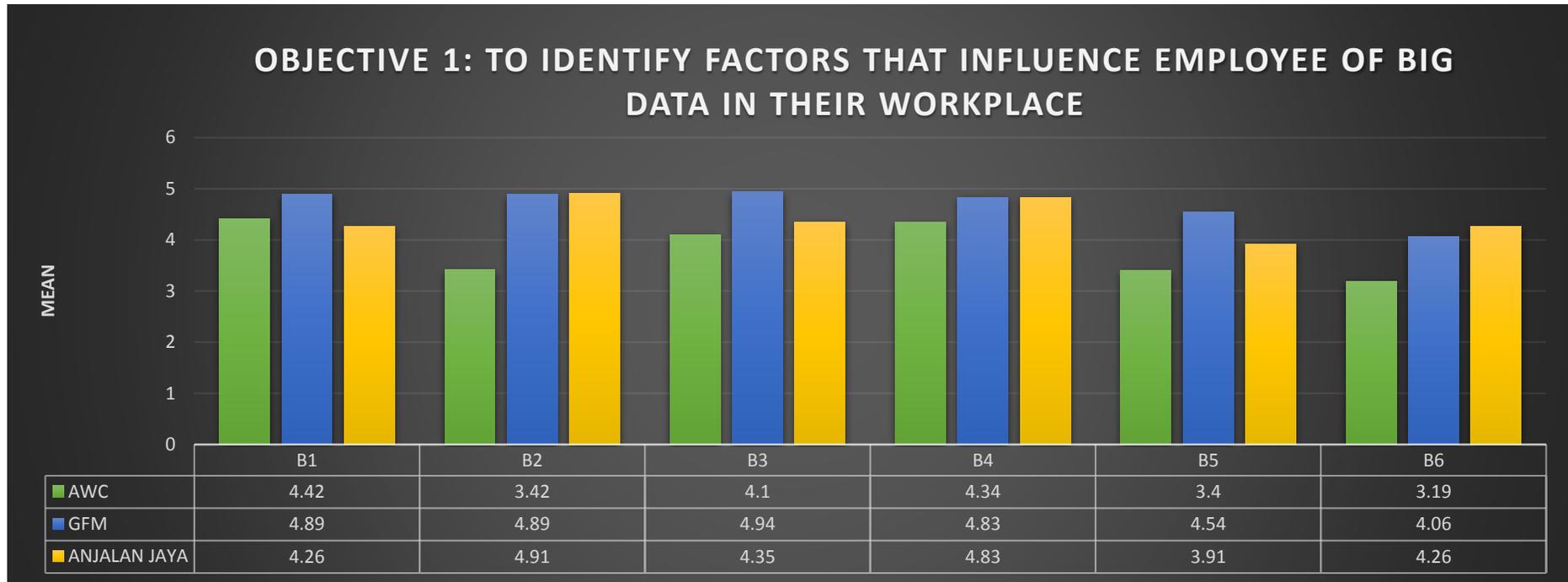


Figure 9: Mean Score analyse for factor that influence employees of big data in their workplace

The findings shown in figure 9, indicated respondents from GFM Company strongly agree that data and information can help employee to perform the job (B1) with mean score 4.89. Besides that, respondent from Anjalan Jaya Sdn Bhd Company strongly agree that data and information will provide additional skill and knowledge to new employees (B2) with mean score 4.91, according to (Johnson J et al., 2013) effectively transforming unstructured data into useful information. In addition, respondent from GFM Company strongly agree that data and information will help employees to know the current condition of equipment and machinery (B3) with mean score 4.94. Furthermore, existing data and information make it easier for employees to maintain equipment and machinery (B4) respondent from GFM and Anjalan Jaya Sdn Bhd are strongly agree with this statement with mean score 4.83. Lastly, GFM Company respondent agree existing data and information help employees provide good services to users (B5) with mean score 4.54, according to (Kaisler S et al., 2013) can better predict what their customers want. Lastly, respondent from Anjalan Jaya Sdn Bhd strongly agree that existing data and information GFM company respondent strongly agree data and information will help employees to know the current condition of equipment and machinery with mean score 4.94. Finally, respondent from Anjalan Jaya Sdn Bhd strongly agree that employees feel there are barriers to accessing data and information (B6) with mean score 4.26.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.810	.813	6

Table 10 : Cronbach's alpha that influence employees of big data in their workplace

Based on the Table 10, for these items selected, the Cronbach's Alpha is 0.810 that indicated the factors that influence employees of big data in their workplace is reliable. As a result, can concluded that the findings obtained from this first objective are also used as a support tool to get more specific answers for second objective.

5.4 OBJECTIVE 2: TO DETERMINE THE LEVEL OF AWARENESS OF BIG DATA AMONG COMPANY EMPLOYEES

NO	QUESTION	N	Ambang Wira Company			Global Facility Management			Anjalan Jaya Sdn Bhd		
			Mean Score	Mode	Range	Mean Score	Mode	Range	Mean Score	Mode	Range
C1	Do you agree that existing data or information can increase opportunities for your company?	120	3.31	3	2	3.43	3	2	3.78	4	2
C2	Do you agree that existing data and information can add value to a company?	120	3.77	4	2	3.37	3	2	3.96	4	2
C3	Do you agree that existing data and information can help a company achieve its set goals?	120	3.21	3	2	4.00	3	2	4.22	4	2
C4	Do you agree the data and information obtained allows the company to make predictions about obstacles to be faced or the problems that will occur?	120	3.19	3	2	4.00	3	2	4.74	5	2
C5	In your opinions, does all the information and data recovered have an advantage in the future?	120	3.73	4	2	4.06	5	2	5.00	5	0

Table 11: Mean Score and analyse for level of awareness of big data among company employees

The results presented in Table 11, suggested factors that contribute to employee awareness of big data among company employees. The highest mean score for this section analyses is all the information and data recovered have an advantage in future with mean score 4.07. As to conclude, according to (Johnson J et al., 2013) enabling them to make a better business decision with all the data and information that facilities management company have.

Secondly, for the awareness factor, the data and information obtained to allow the company to make predictions about obstacles to be faced or the problem that will occur have a mean score 3.73 is the second high mean score. As the researcher fined that, company organizations have better predictions with all the data and information they have. According to, (Kaisler S et al., 2013), the interconnectedness and interdependence of the structures within big data will enable business managers to determine the effect of possible changes more easily.

Factors such as increase opportunities, value and achieve set goals for the company as outlined in the questionnaire were consistent and supported by related theories. According to (Borne, 2014), it characterizes the big business value, ROI, and potential of big data to transform an organization to have more competitiveness in the global platform. Respondent agrees with that existing data and information can help a company achieve its set goals, with mean score 3.69. Furthermore, existing data and information can help a company achieve its set goals with mean score 3.63 and that existing data and information can increase opportunities for your company with mean score 3.69. According to (Zhang C. P.-Y., 2014), (Loshin, 2013), (Wang, 2012), big data has extremely big value for increasing productivity, efficiency and revenues, lowering costs and reducing risk in businesses and management. Lastly, existing data or information can increase opportunities for your company with mean score 3.43

OBJECTIVE 2: TO DETERMINE THE LEVEL OF AWARENESS OF BIG DATA AMONG COMPANY EMPLOYEES

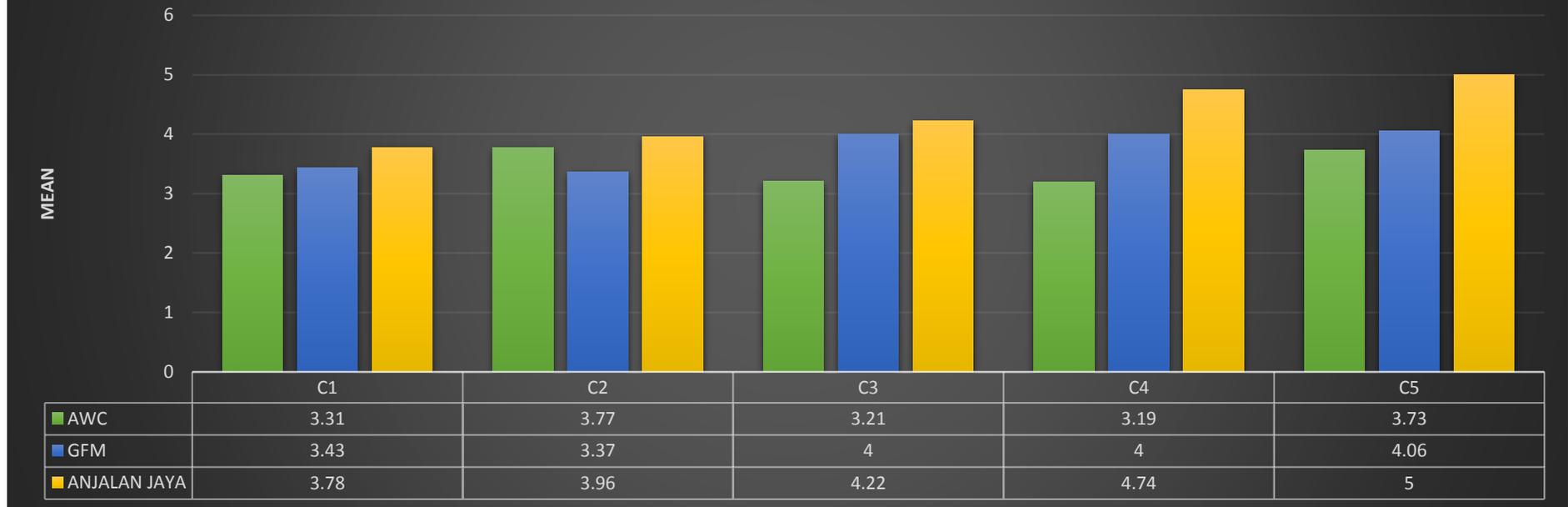


Figure 10: Mean Score and analyse for level of awareness of big data among company employee

The findings shown in figure 10, indicated respondents from Anjalan Jaya Sdn Bhd respondents strongly agree that all the information and data recovered have an advantage in the future (C1) with mean score 3.78. Besides that, according to (McAfee, 2014) organisations will be able to gain intelligence from data and translate this intelligence into business value to support respondent from Anjalan Jaya Sdn Bhd Company strongly agree that existing data and information can give added value to company (C2) with mean score 3.96. In addition, according to (Johnson J et al., 2013) enabling them to make better business decisions to support respondent from Anjalan Jaya Sdn Bhd Company strongly agree that existing data and information can help company achieve its set goals (C3) with mean score 4.22. Furthermore, according to (Kaisler S et al., 2013) enable business managers to determine the effect of possible changes more easily, will support Anjalan Jaya Sdn Bhd respondent strongly agree that data and information obtained allows the company to make predictions about obstacles to be faced or the problem will occur (C4) with mean score 4.74. Lastly, according to (Kaisler S et al., 2013) can better predict what their customers want to support respond from Anjalan Jaya Sdn Bhd respondents strongly agree that all the information and data recovered have an advantage in the future (C5) with mean score 3.78.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.819	.814	5

Table 12: Cronbach's alpha that determine the level of awareness of big data among company employees

Based on the Table 12, for these items selected, the Cronbach's Alpha is 0.819 that indicated that determine the level of awareness of big data among company employees is reliable. As a result, can concluded that the findings obtained from this second objective can support with the reliable Cronbach's alpha.

5.5 OBJECTIVE 3: TO ENCOURAGE THE STAFF IN COMPANY OF FACILITY MANAGEMENT TO INCREASE THEIR AWARENESS OF THE IMPORTANT OF BIG DATA

The content analysis approach used to accomplish the third objective using the results of the analysis described in the conclusions of the first and second objective studies. In addition, the study used the suggestions submitted by the respondents in the survey forms.

The findings of the third study were made in order to encourage the staff in company of facility management to increase their awareness of the importance of big data. Suggestions submitted by respondents from the Department of Facilities Engineering Management System (FEMS) are described below.

NO	QUESTION	N	Ambang Wira Company			Global Facility Management			Anjalan Jaya Sdn Bhd		
			Mean Score	Mode	Range	Mean Score	Mode	Range	Mean Score	Mode	Range
D1	Do you agree that data and information should be stored?	120	3.68	3	2	4.06	5	2	3.78	4	2
D2	Do you agree that data and information should be easily accessible?	120	4.15	5	2	5.00	5	0	3.96	4	2
D3	In your opinion, the support system factors and structured processes are the most important to ensure that all the data obtained can be used properly?	120	4.27	4	2	4.11	5	2	4.22	4	2
D4	In your opinion, provide training and seminars for employees on the importance	120	3.24	3	2	4.00	3	2	4.74	5	2

	of data or information to increase the awareness of each employee?										
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Table 13: Mean Score and analyse to encourage the staff in company of facility management to increase their awareness of the important of big data

The results presented in table 13, suggested factors that contribute to encouraging the staff in company of facility management to increase their awareness of the importance of big data. The highest mean score for this section analyses is the data and information should be easily accessible with a mean score of 4.56. As to conclude, according to (Johnson J et al., 2013) enabling them to make a better business decision with all the data and information that facilities management company have.

Secondly, for the support system factors and structured processes are the most important to ensure that all the data obtained can be used properly have a mean score of 4.37 is the second high mean score. As the researcher fined that, company organizations have better predictions with all the data and information they have. According to, (Kaisler S et al., 2013), the interconnectedness and interdependence of the structures within big data will enable business managers to determine the effect of possible changes more easily.

Furthermore, that data and information should be stored have a mean score of 3.92. The average mean score for this part is all the data and information need to be stored. As conclude, the leader must force the employee to implement big data without asking whether they are really interested or not. For me, once you have involved, you have to be more responsible and have to seriously exercise it.

Lastly, the lowest mean score is 3.66 it is provide training and seminars for employees on the importance of data or information to increase the awareness of each employee. This was because of the respondent stated in the survey form that one of the effective ways for management to encourage their employees in any big data implementation program is by forcing them to join. If organizational members, at all levels, are not forced to join, they will not be aware of and are not really committed to running the program successfully.



Figure 11: Mean score analyse to encourage the staff in company of facility management to increase their awareness of the important of big data

The findings shown in figure 11, indicated respondents from Anjalan Jaya Sdn Bhd respondents strongly agree that data and information should be stored (D1) with mean score 3.78. Besides that, AWC and GFM company respondent strongly agree that data and information should be easily accessible (D2) with mean score 4.15. In addition, respondent from AWC and GFM strongly agree that the support system factors and structured processes are the most important to ensure that all the data obtained can be used properly (D3) with mean score 4.27. Lastly, respondent from Anjalan Jaya Sdn Bhd strongly agree that provide training and seminars for employees on the importance of data and information to increase the awareness of each employee (D4) with mean score 4.74.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.794	.794	4

Table 14: Cronbach's alpha that how to encourage the staff in company of facility management to increase their awareness of the important of big data

Based on the Table 14, for these items selected, the Cronbach's Alpha is 0.794 for objective three on how to encourage the staff in company of facility management to increase their awareness of the important of big data.

5.6 SUMMARY OF THE CHAPTER

In conclusion, it was clearly explained and analyzed on the basis of the results of the research analyzed by the researcher through the questionnaire form. All data are collected and analyzed using SPSS. The results of this study are discussed using tables and diagrams made using Microsoft Word and Microsoft Excel. Level estimates, percentages and comparisons of mean scores have been made in series. Based on the results of the study, the researcher has the answers to all three of the objectives outlined in chapter one.

CHAPTER SIX

CONCLUSION AND SUGGESTION

6.1 INTRODUCTION

This chapter will discuss the findings and draw conclusions from this study. The conclusions are focused on the overall study, which includes the conclusions and implications that can be taken from the study. In addition, the recommendations of the new research are especially recommended for future researchers to identify the best approach to implement big data in facility management industries in Malaysia.

This chapter also the final chapter of this study, and all findings of the study will be presented and summarized in order to achieve the three objectives set out in the previous chapter. As a conclusion to this study, this chapter will briefly outline the findings of the research issue, the implications of the study, the limitations of the study and recommendations and scope for future researcher to improve the management of the company facility services.

6.2 SUMMARY FINDING FOR THE RESEARCH QUESTION

This part will show the findings based on the research question from this study. The part will be focused on the factor that influence staff in the facility management industry company, to determine the level of awareness of big data in the facility management industry company and to increase awareness among staff of facility management industries.

6.2.1 What are the factors to increase staff interest on big data in the facility management industry company

The findings for research question one indicated that respondents agree that all the factor can influence staff in the facility management industry company. Respondents agree that the most important factor influencing selection benefit of data and information is easier for employees to maintain equipment and machinery. Besides that, the lowest important factor is that employees feel there are barriers to accessing data and information. As to conclude, the respondent shows that respondent does not know about the obstacles that will be experienced while to get data and information while performing their work in their workplace.

6.2.2 How to determine the level of awareness of big data in facility management industries staff?

The findings for research question two indicated that respondents agree that all the factor can determine the level of awareness of big data in facility management industries staff. Respondents agree that most things to increase the level of awareness staff in a facility management company are all the information and data recovered have an advantage in the future. Besides that, the respondent answer shows that existing data or information can increase opportunities for their company because most of the respondent is from operation department. Most of the respondent due to the large respondent included in the operation department, they are unaware of the importance of data and information that can increase opportunities for their company.

6.2.3 How to increase awareness among staff of facility management industries?

The findings for research question three indicated that respondents agree that data and information should be easily accessible to the level of awareness among staff in facility management industries in Malaysia because when it is easy to access data and information can further increase their level of awareness by the way they know about the maintenance of data and information to perform work and for the management of the company.

6.3 IMPLICATION OF THE RESEARCH

This research has to find the factor that can influence staff in facility Management Company on important of big data. The findings show big data can give a lot of benefit to staff and their company such as

i. Increased value Delivery

By making use of big data, organisations will be able to gain intelligence from data and translate this intelligence into business value (McAfee, 2014). The business value of using big data lies in the fact that very large amounts of data from different sources can be analysed effectively to provide actionable information. Big data techniques are also specifically optimised for effectively transforming unstructured data into useful information (Johnson J et al., 2013), improving the effectiveness of data and information management even further.

ii. Better predictions

Big data fundamentally changes the way decisions are made within an organisation (Brown B et al., 2012). By making use of controlled experiments on the available data, the organisation can better predict the behaviour of their customers and use this knowledge to their advantage (Brown B et al., 2012). This results in the organisation adding more value to their customers because they can better predict what their customers want (Kaisler S et al., 2013) enabling them to make better business decisions (Johnson J et al., 2013) that will lead to a competitive advantage in the marketplace.

iii. Improved ability to adapt to change

The interconnectedness and interdependence of the structures within big data will enable business managers to determine the

effect of possible changes more easily (Kaisler S et al., 2013). If an organisation is able to determine the effect of possible changes, it will be more ready to adapt or react to these changes if they do occur.

iv. Benefit of scale

Organisations that are able to capture large volumes of valuable data and use the data effectively at scale will have a competitive advantage above other organisations (Brown B et al., 2012). By implementing big data, organisations are able to capture data from different sources within the business and to acquire data from outside sources (partners and customers), giving them the ability to integrate the data and derive useful information from it by using analytics (Brown B et al., 2012).

6.4 LIMITATION OF THE RESEARCH

Only a few limitations have been identified in this research. One of them was time restrictions. As this study was carried out during the MCO, the researcher must juggle or manage time well. From the researcher's experience, it took quite a long time for the researcher to gather the data, as the response from the respondents or informants from the selected facility management industry was slow due to research scope was in the healthcare sector and the respondents involved to support front-liner.

6.5 RECOMMENDATION AND SCOPE OF FURTHER STUDY

Continuation of the research can be done on the topic of the barriers that prevent organizations to influence staff about the importance of big data implementation compares to European countries that have pioneered the Facilities Management industry.

6.6 SUMMARY OF THE CHAPTER

To sum up, this chapter discussed the summary of the whole study from beginning to the end, discussions on the main findings, and discussions on the implications and as well recommendations that were suitable for every part in the facility management company.

As this study was conducted using a mono-method quantitative approach, some interesting findings emerged from this study. In addition, the findings of this study helped the researcher to conclude that the importance of big data implementation in facility Management Company driving the success of good management to do things and all work. As a result, the researcher stressed that these elements need to be focused and addressed by management and operation department within the company.

Besides that, the consistency of most findings with past studies and related models or theories has shown that big data implementation has played an effective to give benefit to facility management. Furthermore, the findings of this study could also be used for future researchers to make further comparisons by looking at which facility management agencies are implementing big data seriously. The researcher, therefore, hopes that this study will provide more insight into the effectiveness of the benefit of big data in facility management industries in Malaysia.

STRUCTURE QUESTIONNAIRE FORM

BORANG KAJI SELIDIK



***BIG DATA IMPLEMENTATION TOWARDS FACILITY MANAGEMENT
INDUSTRIES IN MALAYSIA***

Bachelor of Technology in Facility Management with Honours

Terima kasih kerana meluangkan masa untuk mengambil bahagian dalam kajian ini. Tujuan kajian ini adalah untuk mengkaji ***BIG DATA IMPLEMENTATION TOWARDS FACILITY MANAGEMENT INDUSTRIES IN MALAYSIA***. Kerjasama anda dalam memberikan maklumat dengan menjawab soalan ini sangat kami hargai. semua maklumat yang diberikan oleh responden adalah SULIT dan digunakan untuk tujuan penyelidikan sahaja.

BAHAGIAN A: MAKLUMAT DEMOGRAFIK

Arahan: Bahagian ini merupakan soal selidik mengenai latar belakang responden. Sila tandakan ✓ pada ruang yang disediakan.

1. Tahap Pendidikan Sijil Pelajaran Malaysia Sijil Kemahiran
 Diploma Ijazah Sarjana Muda
 Ijazah Sarjana
2. Jawatan Pengurus Fasiliti Jurutera
 Juruteknik Helpdesk / Admin
3. Pengalam Bekerja kurang dari 5 tahun 5 hingga 10 tahun
 11 hingga 15 tahun lebih dari 15 tahun
4. Anda Berhidmat di Syarikat Ambang Wira Bhd Company
 Global Facility Management
 Anjalan Jaya SDN BHD
5. Bagaimankah anda menyimpan data dan maklumat sedia ada yang diperolehi setiap hari (dibenarkan memilih lebih dari satu jawapan)
- Rekod data atau maklumat di dalam buku
- Sistem Computerized Maintenance Management System (CMMS)
- Telefon Bimbit

Arahan: Bagi bahagian B, C, dan D sila baca setiap pernyataan dengan teliti dan tandakan sejauh mana ini berlaku dalam organisasi anda berpandukan skala seperti di bawah.

Skala:-

- 1 = Sangat Tidak Setuju
- 2 = Tidak Setuju
- 3 = Kurang Setuju
- 4 = Setuju
- 5 = Sangat Setuju

BAHAGIAN B: FAKTOR DATA DAN MAKLUMAT UNTUK MEMPEGARUHI PEKERJA DALAM INDUSTRI PENGURUSAN KEMUDAHAN

NO	QUESTION	SKALA				
		1	2	3	4	5
1	Adakah anda bersetuju maklumat dan data sedia ada dapat membantu pekerja melaksanakan sesuatu kerja?					
2	Adakah anda bersetuju data dan maklumat sedia ada akan memberikan kemahiran dan ilmu tambah kepada pekerja baharu?					
3	Adakah anda bersetuju data dan maklumat sedia ada akan membantu pekerja untuk mengetahui kondisi semasa peralatan dan mesin?					
4	Adakah anda bersetuju data dan maklumat sedia ada memudahkan pekerja untuk menyelenggara peralatan dan mesin?					
5	Adakah data atau maklumat sedia ada dapat membantu pekerja memberikan perhidmatan yang baik kepada pengguna?					
6	Adakah pekerja merasakan terdapat halangan yang akan dihadapi untuk mendapatkan data dan maklumat?					

**BAHAGIAN C: KESEDARAN TENTANG BIG DATA DI DALAM INDUSTRI
PENGURUSAN KEMUDAHAN**

NO	QUESTION	SKALA				
		1	2	3	4	5
1	Adakah anda bersetuju data atau maklumat sedia ada dapat meningkatkan peluang untuk syarikat anda?					
2	Adakah anda bersetuju data dan maklumat sedia ada dapat meningkatkan nilai untuk sesebuah syarikat?					
3	Adakah anda bersetuju data dan maklumat sedia ada dapat membantu sesebuah syarikat untuk mencapai matlamat yang ditetapkan?					
4	Adakah anda bersetuju data dan maklumat yang diperolehi membolehkan syarikat membuat ramalan tentang halangan yang akan dihadapi ataupun masalah yang akan berlaku?					
5	Pada pendapat anda, adakah semua maklumat dan data yang direkodkan mempunyai kelebihan di masa akan datang?					

BAHAGIAN D: PENAMBAHBAIKAN TENTANG PENTINGNYA DATA DAN MAKLUMAT DI DALAM INDUSTRI PENGURUSAN FASILITI

NO	QUESTION	SKALA				
		1	2	3	4	5
1	Adakah anda bersetuju data dan maklumat perlu disimpan?					
2	Adakah anda bersetuju data dan maklumat harus mempunyai keupayaan untuk diakses dengan mudah?					
3	Pada pendapat anda, faktor sistem sokongan dan proses yang tersusun paling penting untuk memastikan semua data yang diperolehi dapat digunakan dengan sebaiknya?					
4	Pada pendapat anda, menyediakan latihan dan seminar untuk pekerja tentang kepentingan data atau maklumat bagi meningkatkan kesedaran yang ada dalam diri setiap pekerja?					

THANK YOU

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