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THE CHALLENGES OF QUANTITY SURVEYORS IN ASSESSING THE USAGE OF BIG DATA DURING THE MANAGEMENT OF CONSTRUCTION

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ABSTRACT

Big data is the process of gathering large amounts of data and analyzing it thoroughly to generate significant findings. By extracting the vast amount of data acquired, a few possibilities in the form of valuable insights may be produced. Despite this, past studies focusing on the potential application of big data, particularly in the construction sector, has not been done. Therefore, the expanded roles of Quantity Surveyors in assessing the usage of big data have become increasingly significant in the field of construction and project management. The objective of this study to determine the challenges faced by Quantity Surveyors in exposing of big data. A quantitative approach is used in this research and the data collected by using questionnaires survey to Quantity Surveyors consultant in Selangor, which allowed for comprehensive data collection. The key finding challenges revealed faced by Quantity Surveyors are the lack of knowledge, skills and understanding, lack of data sharing culture, lack of technology infrastructure, internet connection stability, data inaccurate and incomplete, complexity of data integration and only government initiatives available. Therefore, it is important for Quantity Surveyors to overcome these challenges to harness the full potential of big data. This study emphasizes the need for professional development and the integration of big data practices in the Quantity Surveying profession.

Keywords: *Big data, Challenges, Consultant, Quantity Surveyor*

INTRODUCTION

The fourth industrial revolution (IR4.0) have sparked a lot of attention in recent years, and it was predicted to achieve headway locally and internationally if they become part of various governments' major initiatives (Idris, 2019). During this revolution, there has been a big change in terms of technology and the nature of jobs. In the age of disruptive digital technologies, the speed with which data is generated and accumulated is remarkable (Munawar et al., 2022).

Companies are currently implementing a big data initiative, globally. As stated by (Maaz et al., 2018b), big data has been acclaimed as the leader of the new technological revolution. Unfortunately, a Global Construction Survey 2017 was piloted by FMI Corporation has found that roughly 96% of construction and engineering big data remain unused in 2018. The construction industry is known as a solo practiced skills industry. As an effect to this, construction stakeholders in construction industry don't prefer towards data sharing. Most construction organizations react negatively to 'data sharing' culture and remain timid upon the idea of confidentiality and data privacy (Maaz et al., 2018b).

By practicing a big data in a quantity surveying field, many advancements can be made. However, full research focusing on the potential application of big data, especially in the construction sector, has not been done (Bilal et al., 2016). Big data has a significant role to play in development because to its a combined experience in term of development and technology, and Korea is currently utilizing its maximum potentials, especially in construction industry. According to (Hajirahimova & Aliyeva, 2015) Korea is another excellent example of how to use connection and technology for economic growth, innovation, and competitive advantage. This country is also listed as the top 10 countries leading in big data adoption in 2023 (Ganesh, 2023). However, some companies from a particular countryes are slower than the rest of the world to adopt AI, such as Australian and New Zealand. A study by (Zulhusni, 2022) highlighted that out of all the countries surveyed, Australia and New Zealand are the least likely to have adopted AI and machine learning (ML) technology, with only 27% of the companies are doing so, falling behind the global average of 44%.

The previous studies indicating that developed countries in general have been slow in adopting big data. The same is true for Malaysia. According to (Maaz et al. 2018a), big data has begun to make breakthroughs into the construction industry, following in the footsteps of other industries that have long benefited from it. However, study by (Shamsuddin & Hasan, 2015) emphasized that there is a fear of sharing in the construction industry. In order to develop solutions for our slow rate of big data adoption, the challenges of adapting it needs to be identified. Eventually, this gap leads to the research question of this study. The title of this research is chosen with the purpose of identifying the challenges quantity surveyor's expanded job scope or roles of big data advancement in Malaysian construction industry.

LITERATURE REVIEW

Big Data Roles in Quantity Surveying Field

Big data assists QS firms typically store drawings provided by architects, created bill of quantities (BQ), bid documents and rate schedules from prospective bidders, supplier and catalogue information, labor rates, claims and communication records, interim payments, and more. This is supported by (Oh et al., 2019) who agree that the proposed big data framework can reduce the effort required for contract design in estimating the cost of materials.

Big data plays a role in assisting construction companies in bid preparation. Given the need to review individual bids and combine them into a final bid, QS teams often have limited time for preparation. With the use of big data, QS teams can develop their own internal database available for analysis. The easily accessible code book can expedite the bid process, and the data from big data sources provides more accurate information to obtain reasonably precise bids and reduce risks in later stages after the project is granted and carried out (Lu, 2018; Yu & Lin, 2010).

Big data plays an important role in analyzing bidder behavior. QS tasks include reviewing tenders and producing tender reports. If big data has collected bid documents from a large number of bidders, it can assist in analyzing their behavior (Lu, 2018). Valuable information can be extracted from the bidding documents. While a single bid from a contractor may not reveal much, comparing all the bids laterally against other bidders can provide significant insights.

Challenges of Big Data Adoption

(Hamzah et al., 2020) stated that there aren't enough thorough research studies to address the main big data challenges because the field of study is still developing and not fully established. Construction companies have realized that the potential of using big data in supporting and easing their tasks. However, to improve a big data development process, it is necessary to identify the big data challenges. As extracted from (Maaz et al., 2019), the main challenges for the big data adoption are categorized a technology issue, organization issue and the environment issue. In the other hand, (Hamzah et al., 2020) divided the challenges by its data life cycle, which are data challenges, process challenges and management challenges. However, this research is going to be highlighting on the challenges in the aspect of lack of knowledge, skills and understanding, lack of data sharing culture, lack of technology infrastructure, internet connection stability, data inaccurate and incomplete, complexity of data integration and only government initiative available.

Table 1: Challenges of big data adoption

Challenges / Author	Pei (2020)	Maaz et al. (2019)	Gupta (2019)	Maaz et al. (2018a)	Hamzah et al. (2020)	Tanwar et al. (2015)	Vikholm (2015)	Cai and Zhu (2015)	Shamsuddin and Hasan (2015)	Frequency
Lack of Knowledge, Skills and Understanding		/								1
Lack of Data Sharing Culture			/						/	2
Lack of Technology Infrastructure				/	/	/	/		/	5
Internet Connection Stability				/						1
Data Inaccurate and Incomplete				/	/					2
Complexity of Data Integration	/							/		2
Only Government Initiatives Available				/	/					2

Lack of Knowledge, Skills and Understanding

In addition, one of the QS roles for achieving big data adoption is skill loading in big data development with the presence of dominant competencies. (Maaz et al., 2019) has founded that there are to crucial intersections of big data skills among QS, including both QS abilities to develop big data systems and QS skills to operate big data systems. Regarding the abilities needed to develop big data systems, QS calls for a combination of technical, technological, statistical, and big data abilities.

Lack of Data Sharing Culture

(Gupta, 2019) believed that surveying is an important aspect of the construction industry, needed in the planning and execution of most forms of construction. Conventionally, surveying has been considered as being a field of individual brilliance. Although surveyors have been authentically good at collecting data, a culture of sharing it has not existed (Shamsuddin and Hasan, 2015). Due to that, understanding the big data system hasn't been a crucial matter for the company.

Lack of Technology Infrastructure

The second main challenge of big data adoption is technology infrastructure. (Maaz et al., 2019) stated that big data technology and infrastructure as the types, availability, and adoption of innovative big data technologies that support the creation and operation of big data systems. The technology hardware, such as high-

performance computers or storage data centers, which supports big data applications is referred to as big data infrastructure. According to (Hamzah et al., 2020), the issues that arise during data collection, processing, analysis, and synthesis as well as while interpreting and conveying the results are referred to as technology challenges. One of the technology challenges that are faced is in aspect of coping with the unstructured data.

Big data consist of structured data, semi structured data, and unstructured data. Structured data is a statistical data which exists in a form of relational database and spreadsheet. However, unstructured data can take any shape and can be found in video and photos as well as files from blogs, forums, tweets, emails, and other sources (Tanwar et. al, 2015). According to (Vikholm, 2015), the main disadvantage of unstructured data is that it requires data science expertise to prepare and evaluate it. Due to the undefined/non-formatted nature of unstructured data, a normal business user cannot use it as is.

Other than requiring the expertise to obtain the data, the unstructured data also requires a specialized tool. (Shamsuddin & Hasan, 2015) states that there are insufficient big data scientists who are responsible for the collection, analyzing, and presenting data. By needing a specialized experts and tool to operate, it will be leaving a data manager with only a few options for unstructured data tools, but some of which are still in the early stages of development. Structured data can be used by the average business user, but unstructured data requires data science expertise to gain accurate business intelligence (Vikholm, 2015).

Internet Connection Stability

Lastly, the internet connection is also counted as a technology and infrastructure challenge. A stable internet connection is important to support the development of big data and assisting QS to access the data conveniently. (Maaz et al., 2019) discovered that reliable internet connection is necessary for big data development, as is accessibility for the use of big data today. However, it is essential to guarantee the availability of a reliable, fast internet connection, especially to the company in rural areas, to provide seamless data exchange between various relevant parties and to fully utilize the modern big data potentials.

Data Inaccurate and Incomplete

As stated by (Maaz et al., 2019), data availability and quality are crucial for the concept of integrating a huge volume and variety of data on a single platform, as well as supporting the elimination of biased data before the big data analysis process. Data availability is a worrying issue in present big data context, until it is needed for the data to be secured by the government and local authority policy. (Maaz et al., 2019) also found that the data that are currently accessible are reported to be inaccurate and incomplete. This makes it more difficult for QS to fully comprehend the data, which leads to data being removed from big data systems because it is

unable to correlate the data with the results of the analysis. According to an analysis from The Data Warehouse Institute in 2003, data quality issues include user input errors, missing data, inaccurate data connecting, logic conflicts, inconsistent data, and duplicate data (Hamzah et al., 2020)

Complexity of Data Integration

Because big data displays the 4Vs characteristics, it becomes critical for organizations to find ways to extract true, high-quality data from the huge, complex, and variable data sets. Other than that, the issue that prevent the big data adoption are the diversity of data source results in a wide variety of data formats and complex data structures, which makes data integration more challenging. According to Cai and (Zhu, 2015), large amount of data makes it challenging to determine data quality in a reasonable timeframe. This is supported by (Pei, 2020) who believed that the data's reliability and accuracy aren't really assured. There is a problematic aspect in the data gathering and sample representativeness process. This leads to several issues, including large data inaccuracies and low security. Lastly, the data rapidly changes through time and its relevancy of the data is very short (Cai and Zhu, 2015). This is affected by the changes of market conditions and the economies. The company must gather the required data in a real time and manage data needed within a short period of time to avoid a risk of receiving and outdated and inaccurate information. If the data processed and analyzed is based on an outdated information, it will result in conclusion that are misleading or deceptive, that will eventually cause a poor decision making.

Only Government Initiatives Available

Government support is crucial to spur big data adoption among QS. This is due to the case of big data is relatively new to the multiple industry, most notably the local construction industry. The government support from local authorities, namely, Malaysian Construction Industry Development Board (CIDB) and Malaysian Public Works Department (JKR), is advantageous implying developing big data among QS and urging positive way forward for big data in this context (Maaz et al., 2019). The application of big data in public services was approved in the ministerial cabinet meeting in 2014. The Big Data Analytic (BDA) is the government's key strategy for ensuring the efficiency of its agencies and upholding its objectives to restructure the public sector to meet the standards of developed nations.

Other than that, MyN3C and Ratol initiatives by local government are represented in the current Malaysian big data scenario (Maaz et al., 2019). Both MyN3C and Ratol are online systems that provide local construction data, including building material prices, labor wage rates, machinery hire rates, equipment purchase prices, building material cost indices, building labor indices, and elemental construction costs based on a specific location and year. However, only government projects have been able to employ both initiatives to their full potential.

METHODOLOGY

This research is focusing on quantitative method only and obtained by using primary data sources and secondary data sources. The primary information will be obtained by providing a series of questionnaire surveys to QS consultants registered with BQSM. Meanwhile, the secondary sources were obtained from literature review and also journals, books, article, dissertation and other publications. The population size of QS consultant in Selangor was referred from BQSM websites and the total number is 147, hence the sample size given from the population size is 107. The sample size was determined by using Raosoft size sample calculator. Thus, all of the 107 questionnaires survey forms were distributed among them by emails and online platforms. The questionnaire response rate of a consultant firm in Selangor is 100 percent. The total of 107 answered responses are gained from QS consultant. However, there are 58 unusable responses due to the responses came from non-adopters of big data.

The questionnaire for this research were consisted of 40 questions. The questions were formulated via literature reviews from previous researches. It was divided by 4 sections which are Section A to Section D. In Section A of the questionnaire was discuss about the demographic of the respondents such as gender, age, working experiences, disciple or position and the number of construction projects involved. Then, Section B were designed to discuss about the roles of big data in quantity surveying field. After that, Section C was focus on the questions that based on the challenges of big data adoption in Quantity Surveying field. Lastly, Section D were to identify QS preparation to adopt and operate the big data technology.

After that, data analysis was made. Data analysis is important in order to obtain the result of the study. By analyzing the data, a conclusion of the study can be made. A descriptive statistic was used to analyze the feedback from the respondents who have answered the questionnaire given. The statistic was in the form of frequency, percentage, and average index by using Statistical Package for the Social Sciences (SPSS) software.

Additionally, there are some limitations when conducting the survey, such as time limitation to conduct this survey then a low response rate since some respondents choose not to participate or refuse to answer questions, which might impair the study's overall quality. Poor understanding of questions regarding big data technologies might lead to incorrect responses from respondents. This could result in inaccurate or incomplete data for the study.

FINDINGS AND DISCUSSION

For the next analysis, the in-depth analysis that focuses on 49 respondents from among the big data adopters was conducted. The decision to conduct an in-depth analysis focusing on 49 respondents who were big data adopters was made to gain deeper insights and understanding into the specific experiences and perspectives of this particular subgroup. By narrowing the analysis to those who have already adopted big data during the management of construction thus, researchers can explore their unique challenges, successes, and practical implications more comprehensively.

Based on Table 2, there are thirteen variables that have been determined in order to identify the challenges of big data adoption. The average mean for this section, which is 3.42 indicated that most respondents considered all the challenges of big data adoption as completely true.

Table 2: Challenges of big data adoption

	Statement	Mean	Agreement Level	Rank
1	I prefer using traditional method compared to big data system.	2.98	Neutral	13
2	I am not familiar with big data application in Quantity Surveying field.	3.00	Neutral	12
3	I don't have a skill in operating big data.	3.31	Neutral	9
4	There is a lack of expertise to control the big data system in a company.	3.73	Agree	2
5	I don't understand the process of big data.	3.12	Neutral	10
6	There is a lack of technology infrastructure to operate the big data.	3.51	Agree	8
7	I disagree with the data sharing culture in Quantity Surveying field.	3.08	Neutral	11
8	Big data is too complex for a data integration.	3.57	Agree	5
9	The internet connection at the company wasn't stable to develop a big data.	3.51	Agree	7
10	The data accessible are inaccurate.	3.57	Agree	6
11	The data accessible are incomplete.	3.61	Agree	4
12	The data relevancy time is short and changes every time due to the market condition.	3.80	Agree	1
13	I acknowledge the government support in implementing big data system.	3.67	Agree	3

At the first ranking, the majority of respondents (77.6%) agreed that the data relevancy time is short and changes frequently due to market conditions. This indicates that Quantity Surveyors perceive the challenge of keeping up with dynamic data in their work. The mean value of 3.80 suggests a general agreement among the

participants. These findings are in line with a previous study by Cai & Zhu (2015) highlighting that the data rapidly changes through time and its relevancy of the data is very short.

The second ranking indicated that the significant percentage of respondents (71.6%) acknowledged the lack of expertise in controlling the big data system within their companies. This highlights the need for developing skills and knowledge in handling and managing big data effectively. The mean value of 3.73 indicates a considerable agreement among the participants. This findings in consistent with a past study by Shamsuddin & Hasan, (2015) who stated that there are insufficient big data scientists who are responsible for the collection, analyzing, and presenting data.

The third ranking shows that notable proportion of participants (65.9%) recognized the importance of government support in implementing big data systems. This suggests that Quantity Surveyors value the role of external support and policies in facilitating the adoption and integration of big data practices. The mean value of 3.67 indicates a moderate level of agreement. This outcome is consistent with the conclusions drawn in a prior study conducted by (Maaz et al., 2019), which observed that utilization of initiatives has been limited to government projects. Moreover, there is currently no evidence of private companies actively pursuing the development and adoption of their own big data systems. This hesitation may come from the hesitation of local construction industry personnel, who tend to favor a risk-less procedures.

The fourth ranking indicated the incomplete accessibility of data was acknowledged by a considerable number of respondents (64.3%), indicating a challenge in obtaining comprehensive and reliable data for analysis and decision-making. The mean value of 3.61 suggests a moderate level of agreement. This finding correlated with a past research by (Maaz et al, 2019) who found that the data that are currently accessible are inaccurate and incomplete. This finding emphasizes the need for improved data collection and storage practices.

The complexity of data integration was identified as a challenge by a significant proportion of participants (59.0%) in the fifth ranking. This highlights the perceived difficulties in consolidating and utilizing data from multiple sources efficiently. The mean value of 3.57 indicates a moderate level of agreement. The findings of this study are consistent with the earlier research conducted by (Burger, 2017), which highlighted the inefficiency of utilizing big data due to the challenges associated with handling unstructured data. These findings are further supported by (Vikholm, 2015), who emphasized that the main disadvantage of unstructured data is the need for data science competency for its preparation and analysis.

The least significant ranking factor reveals that the preference for traditional methods over a big data system was rejected by a significant majority of respondents (51.2%). This implies that even while there is some reluctance to change, many quantity surveyors are aware of the potential advantages of using big data practices. The

mean value of 2.98 indicates a moderate level of disagreement This finding is inconsistent with a study conducted by. (Pei, 2020) stating that the Quantity Surveyor prefer a traditional method rather than big data.

These rankings shed light on the primary challenges faced by Quantity Surveyors in embracing big data, including the dynamic nature of data, lack of expertise, incomplete data accessibility, data integration complexities, and the need to overcome resistance to traditional methods. These insights can guide efforts to address these challenges and promote the effective adoption and utilization of big data in the Quantity Surveying field.

CONCLUSION

As a conclusion, the objective of this study has been identified because the survey results have provided valuable insights into the challenges faced by Quantity Surveyors (QS) in exposing big data. The respondents have highlighted a number of major challenges that prevent the efficient application of big data in the field of Quantity Surveying. The survey's challenges such as the scarcity of data sources, a lack of a culture of data sharing, a lack of technical know-how and infrastructure, the relevance of the data, and the need for government support present QS professionals with challenges they must overcome in order to fully realize the potential of big data. To address these issues, QS professionals, organizations, and important stakeholders must collaborate to promote sharing of data, develop IT infrastructure investments, and advance knowledge.

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Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar

Setuju.

27.1.2023

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