

Hindrance of Applying Big Data Technology for Construction Management in Thai Government

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Abstract—The ability to process large amounts of data and to extract useful insights from data has revolutionized society. Even in the construction industry, there are many researcher efforts developing this industry with Big Data Technology. Despite the accrual opportunities and benefits accruable from Big Data in this industry, some challenging issues remain of concern. This paper will discuss the overview of hindrance factors that affect the Thai government in implementing Big Data technologies across various domain applications of the construction industry. This research employed the qualitative research approach to find hindrance factors of applying Big Data Technology in construction management in the Thai government. Semi-structured interviews were used to collect data from 7 government departments in Thailand working with Big Data Technology. The typology analysis was used for analysis data. The findings show that the government has been creating a new policy effort to apply Big Data technology, but they should be improving the infrastructure for supporting Big Data technology to address the many issues in implementation.

Index Terms—big data technology, hindrance factor, Thai government, construction management

I. INTRODUCTION

Big Data is quickly deriving business value from a range of new and emerging data sources. The data generated by smartphones, social media data and much more [1]. In addition, the world is currently inundated with data due to the rapid growth of technology. Today, companies deal with petabytes of data. Every day Google processes above 24 petabytes and every hour Facebook gets more than ten million photos [2]. Even the construction industry is affected by this situation.

The construction industry has more significant data from management processing throughout the life cycle of a facility and many studies have been applying Big Data Technology [3]. K. C. Lam *et al.* found that support vector machines could produce accurate forecasts of contractor pre-qualification in the pre-construction phase. They have been using input variables such as financial

strength, current workload, quality management, environment, and health and safety considerations [4].

The challenges and opportunities that have been in consideration include data security, privacy and protection, data quality of construction industry datasets, cost implications for big data in the construction industry, internet connectivity for big data applications and exploiting big data at its full potential [5]. However, these are not of large importance for construction management so much.

The Thai government is limited in success with Big Data Technology so far because there are many problems including data disruption, lack of a decent data management system, lack of available data as well as the ability to collect data in electronic files, conflict between organizations which are not willing to share their data, and many more. For these reasons, development for Big Data Technology has been slow [6].

To understand hindrance factors of applying Big Data Technology for construction management of the Thai government, we must study and push for the Thai government to collect and produce data for this study as well as protect and study the possibilities for Big Data Technology.

II. BACKGROUND OF STUDY

This literature review represents an overview of Big Data Technology and its performance in its application in the construction industry field.

A. Big Data Technology

Big Data refers to large and complicated data. There are structured and unstructured types which traditional processing techniques and/or algorithms are unable to operate on. The objective is to reveal hidden patterns and has led to an evolution from a model-driven science paradigm into a data-driven science paradigm [7].

Many attributes have been added to Big Data since 1997. Among these attributes, three of them are the most popular and have been widely cited and adopted. The first one is called Gartner's Interpretation, or 3Vs; the root of this term can be traced back to February 2001. It was

casted by Douglas Laney. The Three attributes are as follows: Volume, Velocity, and Variety [8]-[10].

B. What Is the Big Data Problem?

Big Data has come about because technologies are advancing. Big Data has come about because technology is changing quickly and in turn make larger data, so processing is requiring technology to support them. However, there are many problems form the technology transformation “Fig. 1” [2].

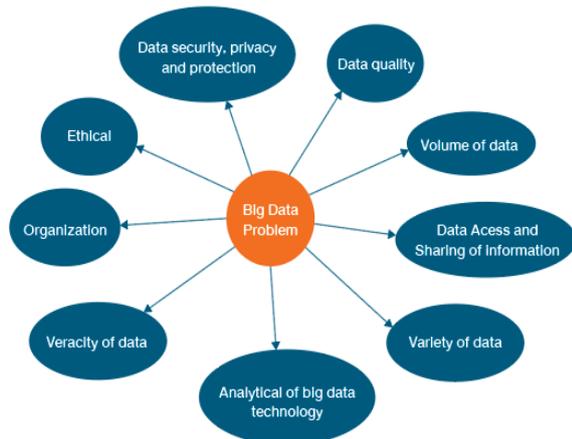


Figure 1. Big data problem.

1) Data security, privacy and protection

The Big Data analytics makes data security and privacy violations easier. These make people concerned with privacy on Big Data Technology. Thus, a sufficient security apparatus must be created to solve the issue of privacy preservation [11].

2) Data quality

Data quality is very important for all data analytics problems. Big Data needs to make sure it does not experience the negative impacts that can accompany “bad” or “dirty” data [12].

3) Volume of data

Data overcrowding increases data redundancy and makes Big Data management one of the serious challenges in the smart era [13].

4) Data access and sharing of information

Data and its resources are collected and analyzed for storing and sharing [14].

5) Variety of data

Variety is the result of the growth of virtually unlimited heterogeneous data [15]. This data is in various forms such as structured, semi-structured, unstructured, image and multimedia. Data is collected from various sources such as documents, emails, social media, and sensor devices [5].

6) Analytical of big data technologies

Data analysis enables an organization to handle abundant information that can affect the business [14].

7) Veracity of data

In the currently, the data is growing increasingly. Then, it is also important to concern for “where is the data source?” and “can these data be trusted?” [13].

8) Organization

As an organization is new to Big Data, many issues occurred such as inadequate staffing or skills, lack of governance or stewardship, data integration complexity, cost, and overall inadequate data management infrastructure [16].

9) Ethical

Data issues pertaining to the characteristics of the data itself, challenges may occur resulting from the ethical/unethical management of this data [17].

10) Velocity

The velocity of Big Data technology has a large impact of implementation. Data need to be acquired quickly and processed a faster rate. [8].

III. RESEARCH METHODOLOGY

This research is a qualitative research [18] used a case study for more than thirty persons were interviewed from six governmental agencies including the Comptroller General’s Department, Department of Rural Roads, Department of Public Works and Town and Country Planning, Department of Lands, Office of the National Water Resources, and Royal Irrigation Department. Each of which works with Big Data Technology concept related to the new policy of Thailand as the unit of analysis [19].

Interview guidelines were designed and used to conduct in-depth interviews and participatory and non-participatory observations. The reliability and validity of the qualitative interview tool were determined by expert checking procedures. Data were collected using semi-structure interviews. The process includes select topic, focus question, design study, data collection, data analysis and validation [20]

The study planned the interview sheet to reflect the current situation of Big Data Technology to define the questions and objective. The question identified key study points, which included: (a) Application of Big Data Technology in construction management. (b) Hindrances to the application of Big Data Management Technology in construction management. The possibility of current data from government could be integration with Big Data Technology (In the case of the government did not apply)

For the in-depth interview, before interview the research team explained the purpose of the interview, and the expected benefits from the study and the interview and to ensure the participant, the data gained that be kept from the researchers have been use for stated purpose only.

The information of participants has been recorded in filed note for prepare to analysis step. The analysis data techniques conducted interpret data and process includes: first step - read the interview sheet to code the sentence that relate with the ten factors form previous studied, second step - review the result of coded, third step - write a draft summary, discussion of summary with previous studied, fourth step - review interpretations with participant, final step written the conclusion and summary the study [21], [22]. The transcribed recordings and field notes were fed into Microsoft Excel and Nvivo software.

IV. RESULT AND DISCUSSION

Table I shows the amount of coding of each factor from highest to lowest. The high of coding is volume of factor.

TABLE I. CODING NUMBER OF HINDRANCE FACTOR

No.	Factor	Amount of coding
1	Volume	50
2	Data quality	37
3	Variety	36
4	Analytical	35
5	Veracity	31
6	Organization	28
7	Data access and share	23
8	Velocity	16
9	Data security and privacy	15
10	Ethical	9

The interviewer mentioned the volume of data in construction for the Thai government. The government understands this; however, they don't have the infrastructure to apply Big Data Technology immediately. The new policy of the Thai government application of Big Data Technology is hoping to improve the country [20]. This relates to the Russom's study [16].

The government has issues of data quality due to lack of technology to collect and policy to conduct. If the Thai government would like to develop their country with BD Technology, they should be focused on quality data such as storage rather than having very large irrelevant data so that better results and conclusions can be drawn [23].

The Thai government currently collects the data with traditional policy, so the variety of data needed is very complicated to apply and integrate with the new policy. Another study of Katal *et al.* explains the data being produced is not of a single category as it not only includes the traditional data, but also the semi-structured data from various resources and this is difficult for the analytic systems [23].

So, the analytical in the Thai government of big data technology should be clear with their goal because the question of Big Data Technology is "What if data volume gets so large and varied and it is not known how to deal with it? [23].

The evaluation of data issues is that currently most couldn't be processed because the Thai government doesn't have technology to support collection techniques of Big Data Technology.

The organizations must increase their knowledge of this technology for the officers because the government must also address legality, security, and compliance requirements when using data [15]. Since Big Data in its youth and an emerging technology, it needs to attract organizations and youth with diverse new skill sets [23]. Data access and sharing in the Thai government between different departments pose a problem. That is a conflict with the theory of Big Data Technology [9].

The velocity of support collection data is a concept which deals with the speed of the data coming from various sources and also speed at which the data flows [23]. The interviews explain that the Thai government should improve the infrastructure technology to support the speed of data in the construction industry. That trend will increase from the disruptive technology crisis.

Throughout Big Data Technology exists issues of data security and privacy [5]. This is the hindrance factor that should be evaluated by the management team because privacy and security regarding Big Data are important. However, in its absence, data can always be compromised easily [24]. The Thai government should be kept open records to ensure authority and legitimacy for accessing database and data records [15].

The ethical concerning factor from the interviews will make many problems in the future between the government and citizens due to the sharing of data between organizations.

Fig. 2 summarizes the relationship between factor of problems in Big Data Technology and the amount of coding represent from the interviewer.

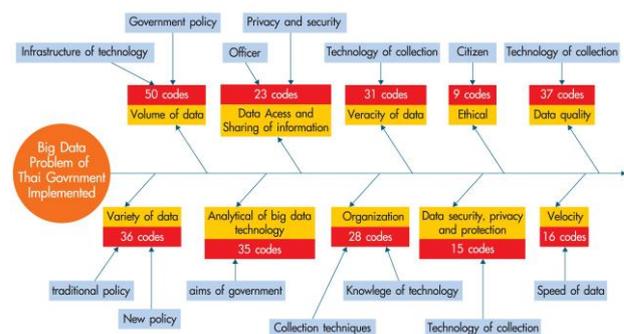


Figure 2. Factor of problems in Big Data Technology.

V. CONCLUSION

The conclusion of hindrance factors of application of Big Data technology in the Thai government are as follow. We found the result related with our literature review, but the higher impact concern is sharing and access between organizations and the infrastructure of technology. However, the infrastructure is being addressed by impletion of Thai government projects.

The infrastructure of Big Data technology is one of importance to support the objective of application such as storage to support Big Data Technology to collect data. Although the Thai government project is underway, the application of Big Data Technology to improve bus service and management in university areas and the issue from their project is the infrastructure storage needs to be large because of data from public transportation is large if they would like to be apply it to the capital city.

Finally, the Thai government could be improved with the Big Data Technology if they proceed with the policy of the country and define the responsibility of their goal to decrease hindrance factors for applying Big Data Technology with construction.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

B. Chonpitakwong and W. Kusonkhum conducted the research; T. Chaitongrat and P. Charnwasununth analyzed the data; K. Srinavin supervised the research; all authors had approved the final version.

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