

Barriers to the Adoption of Data Analysis tools

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Abstract

Business Intelligence and data analysis has become a critical aspect for many organizations, and is considered as one of the key drivers for business growth. Data analysis tools can be functioned for dashboards, interactive report, statistic and data mining, localization, analysis, data management, data visualization, and sharing information. In spite of several benefits and functions of data analysis tools, there are some issues regarding the adoption of the tools. This research aims to study the barriers to the Adoption of Data Analysis tools focusing on small and medium-sized enterprises (SMEs). The research process consists of three stages: 1) Literature review 2) Observation and interview of 30 SMEs in Thailand, and 3) Analysis and conclusion. According to the results, barriers to the adoption of data analysis tools are technology barrier, data barrier, human barrier, and organization barrier. The approach to overcome these barriers is proposed. The result can be a guideline for the implementation of BI system to improve profitability and attain the competitive advantages in the organization.

Keywords: Business Intelligence, BI, Data Analysis Tools

1. Introduction

Over the last several years, business intelligence (BI) and data analysis have attracted great interest from the research community and the industry [1-5]. Organizations have involved in the rapidly increasing volume, velocity, and variety of data generated by both internal and external resources. Therefore, BI has become a critical foundation for many organizations and has consistently been ranked among the top elements of senior executives [2].

BI systems are now applied extensively in many areas of business that involve making decisions to create value [6]. Difference size enterprises over the world have chosen BI or data analysis tools to process and analyze information [7]. Regarding small and medium-sized enterprises (SMEs), big data and BI is considered as one of the key drivers for business growth. Big Data is a new paradigm shift for SMEs which helps analyze and predict market and customer behavior to increased flexibility, productivity, responsiveness, anticipation and ability to meet customer need and making better decisions [8].

In order to implement BI in the enterprises, data analysis is employed to help analyze, manage, and visualize data. However, in various enterprises, users do not adopt the tools due to many reasons. Consequently, this research aims to study the barriers to the Adoption of Data Analysis tools focusing on SMEs. The result will be a guideline for the implementation of big data and BI by applying the tools to improve profitability and attain the competitive advantages.

The rest of this paper is organized as follows. Section 2 presents literature review of BI and Big Data. In Section 3, research methodology is provided. The results and discussion of this research are described in Section 4. Finally, Section 5 concludes the paper.

2. Business Intelligence and Big Data

The umbrella term “business intelligence (BI)” has been used to describe a family of business analysis techniques ranging from standard reports to highly sophisticated advanced statistics. More recently, terms like “big data” and “cognitive business” have been introduced into the business and technical terminology. Actually, the newer term is about the same thing as BI: analyzing the vast amounts of data that companies generate and/or purchase to improve profitability and competitiveness [3].

BI tools or data analysis tools can be the general purpose BI platform which relies on a team to build the BI application according to the requirements or vertical BI platform which is a designed packages for a particular industry. The functions of these tools includes dashboards, query and interactive report, statistic and data mining, localization, what if analysis, data management, data visualization, sharing and distributing information to users in easily interpretable format [1, 3].

According to literature review, the success factors /barriers to BI and Big Data are composed of technology, human, data, and organization as illustrated in Table 1.

Table 1: the success factors / barriers to BI and Big Data

Category	Sub category
Technology	Infrastructure [9] [4]
	Investment of technology/ IT Budget [10] [4] [5]
	Analytic [5]
	Technology driven strategy [11]
	Perceived usefulness and Perceived ease-of-use [11]
Data	Master Data Management [9] [10]
	Data sources, i.e., the source systems that provide the data the BI system processes. [4]
	Data quality [10] [2] [5] [11]
	Integration [10] [2] [12]
	Data Security [10]
	Data Protection and Privacy [10]
Human	Skill/ Development of skill and training [9]
	Data science skill [8]
	Analytic capability [12]
	Behavioral barrier (Bias) [13]
	Privacy [9]
Organization	Data driven mindset [10]
	Culture [9] [8] [13]
	Change Management [10] [11]
	Risk Management [2]
	Organizational Structure [10]
	Collaboration between IT and business [10]
	Information Process [2]
	Top management support [4]
	Corporate strategy, e.g., a customer-oriented strategy and quality-focused strategy vs. a cost-cutting Strategy [4]
	User involvement [4]
	Vision, Size [5]
	Analytic decision making culture [12]

3. Research Methodology

This research is a qualitative research. As shown in Figure 1, the research process is composed of three stages: 1) Literature study including Business intelligence (BI), Big Data, Data Analysis/ BI Tools, and Success factors/ Barriers 2) Empirical study which includes observation and interview of 30 SMEs whose businesses are in a service or production sector in Thailand, and 3) Analysis and conclusion of this research. The data acquired from literature study is applied to develop framework for the study. After observation and interview, the analysis and conclusion is conducted.

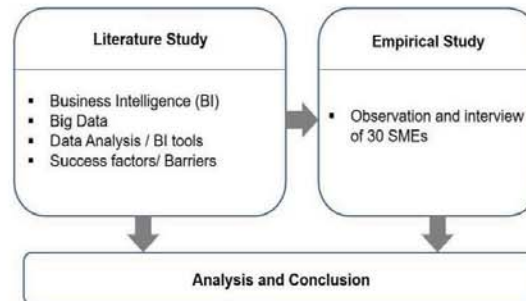


Figure 1: Research Process

4. Research Results and Discussion

This section presents results of the observation and interview of 30 SMEs on data analysis. From the observation of 30 SMEs, most SMEs are aware of using data analysis tools. Due to a highly competitive market, information is needed to provide business strategies and plan within the organization. The manufacturing sector focuses on cost and production aspects while service sector focuses on sales. The results of the observation and interview are described in Table 2.

Table 2: Results of the observation and interview

Category	Results
Technology	90% of sample SMEs' Infrastructures are not ready. - Most of the sample SMEs are not paying attention to IT investments. 95% of sample SMEs pay attention to applying data for decision making in corporate management and operations. - Most sample SMEs have tried to apply technology for strategic planning in the organization. 90% of sample SMEs agree that the data analysis and visualization tools are easy to use. 95% of sample SMEs agree that the data analysis and visualization tools are beneficial to the organization.
Data	Most sample SMEs do not have a suitable data management. Since 80% of companies do not have their own IT system, there is no organized centralized storage. Most of the information is

Category	Results
	separated in the storage of each department. As a result, the data is overlapping. While 20% of SMEs have their own IT system but do not have some knowledge of database design. Therefore, when exporting data for analysis, the company needs to clean data, and this cleaning process is time consuming. 90% of the SMEs have at least one database. Most of these databases are from accounting software such as CD Organizer or Express program, etc. 10% of the data is not stored in the database system; instead, it is kept in a document format. - The data cannot be used for real time analysis, since most of the data is in the form of reports and incomplete database fields. The data must be cleaned before importing to BI or data analysis tools. - Since database systems in the organizations are not designed to be integrated, most data needs to be customized before importing to BI or data analysis tools. 90% of SMEs do not have data security, data protection, and data Privacy.
Human	80% of staff in the SMEs have computer skills at a moderate level. They can understand and apply various software for their work. 15% of SMEs have good computer skills. They can use high-level software. 5% of SMEs have a low level of computer literacy; most of these staff are in older generation or non-IT staff. - Most of those people who view data analysis report are senior executives or company owners. The operating level staff has less analytical skill, and they make a report according to executive's orders. - Approximate 40% of enterprises with medium and large organizations provide training for employees regarding the organizations' KPI. In addition, 60% of SMEs which are small enterprises do not providing training to improve employee's skills. 90% of SMEs have analytical ability; most of them are corporate executives. 10% of SMEs do not have enough capability to analyze data. - From the observation, 5% of SMEs are not willing to adopt the data analysis tools.
Organization	- The organizations routinely make, display, and view report only. They do not pay attention to other analysis. 70% of the executives supported data visualization and analytic tools. 30% of SMEs has a perception that the company is small, and there is no need for data analysis. - If top management supports change management, the implementation of data analysis system would be successful.

According to the observation, interview, and analysis, the main barriers for SMEs to adopt data analysis and visualization tools are:

4.1 Data

Many SMEs do not have electronic data for analysis. The data is still kept in a paper form. Moreover, most of SMEs do not have any ideas of how to analyze this data. Data format can be one of the most important barriers since when exporting data from the current system (mostly the accounting system), the data cannot be directly imported into tools for further analysis. Adjusting the format takes a lot of time, and some users do not have fluent

skills for data cleaning.

4.2 Organization: Top-Management's mindset and knowledge

Some top managements of the organizations have a perception that their company is too small to apply data analysis tools, and do not believe that it is necessary for data to be analyzed. Some top-managements in SMEs lack knowledge, skill, and understanding of BI and data analysis. Most executives think that this data analysis tool is an accounting program, and they do not know how BI can support their businesses. In addition, some executives concern about the security of data that has to be stored on the cloud. Therefore, they have to avoid data analysis tools that analyze information on the cloud.

The approach to overcome the barriers is to start with top-management in the organization by providing top-management some knowledge and understanding of benefits of data analysis. If data is stored on the cloud, the enterprise should acquire the tools that provide high security standards for cloud computing so that the executive do not have any worries about data security. When top management realizes the benefits of BI/data analysis, policy to analyze and present information within the organization should be issued for using analytical tools in various perspectives according to the company mission. Furthermore, capacity and investment plan for information technology system to support data storage in a standard format should be provided to promote the implementation of data analysis system.

5. Conclusions and Recommendations

The purpose of this research is to study Barriers to the Adoption of Data Analysis and visualization tools for SMEs focusing on service and production sector. BI and data analysis are considered as one of the key drivers for SMEs' business growth that helps the company increase flexibility, productivity, responsiveness, anticipation and ability to meet customer need and make better decisions. In this research, an empirical study is conducted by observing and interviewing 30 SMEs in Thailand.

According to the observation, interview and analysis, Barriers to the Adoption of Data Analysis and visualization tools comprises technology, data, human, and organization. The main barriers for SMEs to adopt data analysis and visualization tools are data and organization barriers. Many of SMEs do not have electronic data for analysis, and data format is not suitable for importing to the tools. Therefore, it takes time for data cleansing. As for organization barriers, Top-Management's mindset and knowledge are the major concerns. Some top managements of SMEs have a perception that their company is too small to apply data analysis tools. Some top-managements in SMEs lack knowledge, skill, and understanding of BI and data analysis.

The guideline to overcome the barriers is to start with top-management in the organization by providing top-management some knowledge and understanding of data analysis. Data analysis policy should be issued according to company mission. Moreover, capacity and investment plan for infrastructure should be provided to support the implementation of data analysis system.

The future research is to consider this framework regarding Barriers to the Adoption of Data Analysis and visualization tools focusing on SMEs in other sectors. Moreover, the quantitative research could be conducted to confirm these barriers. The results of this research can be applied as a part of the preparation of Digital Thailand or digital economy plan in other countries.

6. References

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