ISSUES AND CHALLENGES IN BUSINESS INTELLIGENCE CASE STUDIES

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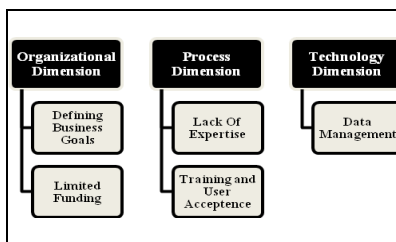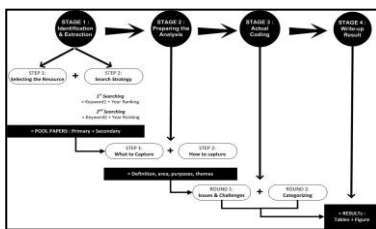
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Graphical abstract

Abstract

Business Intelligence (BI) has embarked on decision-making setting. This has influenced many organizations from different industries that are located in diverse regions to implement BI. Critical Successful Factors (CSF) becomes the guideline for the implementer to adopt BI successfully. However, lack of BI knowledge and weak consideration of BI CSF led to the failure of BI implementation project. Several issues and challenges have been identified during the BI implementation. In addition, other researchers rarely discussed this subject. Thus, the objective of this paper is to recognize the issues and challenges on BI implementation. Through qualitative method, BI practices systematically described the purpose of BI execution on selected organizations, industries and regions. It has given the path towards the issues and challenges of BI implementation. The identified issues and challenges are defining the business goal, data management, limited funding, training and user acceptance as well as the lack of expertise issues. The findings categorized the issues and challenges into three dimensions of CSF for BI implementation, which are Organization, Process and Technology dimension. Limitation in this study requires future researchers to study in details of these issues and challenges including the solutions and the impact of BI implementation.

Keywords: Business Intelligence Implementation, BI Issues, BI Challenges, BI Adoption

Abstrak

Perisikan Perniagaan (BI) telah membuka era baru dalam prosos membuat keputusan. Ini telah mempengaruhi banyak organisasi daripada industri yang berbeza dari pelbagai kawasan untuk melaksanakan BI. Faktor Kejayaan Kritikal (CSF) menjadi garis panduan kepada pelaksana untuk menerima pakai BI dengan jayanya. Walaubagaimanapun, pengetahuan tentang BI yang terhad dan kurang mempertimbangkan CSF BI telah membawa kepada kegagalan projek pelaksanaan BI. Beberapa isu dan cabaran telah dikenalpasti dalam pelaksanaan BI. Di samping itu, penyelidik lain juga, jarang membincangkan perkara ini. Oleh yang demikian, objektif kajian ini adalah untuk mengenal pasti isu-isu dan cabaran dalam pelaksanaan BI. Melalui kaedah kualitatif, perlaksanaan BI diterangkan secara sistematik yang mengenalpasti tujuan pelaksanaan BI terhadap organisasi, industri dan wilayah yang dipilih. Ia telah memberi tunjuk arah kepada isu-isu dan cabaran dalam pelaksanaan BI. Isu-isu dan cabaran yang telah dikenal pasti adalah menentukan matlamat perniagaan, pengurusan data, dana yang terhad, latihan dan penerimaan pengguna dan juga kekurangan isu-isu kepakaran. Hasil kajian mengkategorikan isu dan cabaran kepada tiga dimensi CSF bagi pelaksanaan BI, iaitu dimensi Organisasi, Proses dan Teknologi. Kekangan dalam kajian ini memerlukan pengkaji seterusnya mengkaji secara terperinci isu-isu dan cabaran termasuk penyelesaiannya serta kesan pelaksanaan BI.

Kata kunci: Perisikan Perniagaan, Permasalah BI, Cabaran BI, Perlaksanaan BI

1.0 INTRODUCTION

Many areas such as Education, Hospitality and Healthcare have seen the potential of Business Intelligence (BI) to accelerate the business process as to meet the objectives of organizations. Small Medium Enterprises (SME) is the most organizations that implemented BI [1] where they require support in decision-making. Apart from that, insurance companies, hospitality, healthcares, education and recognize industries benefitted from the use of BI too. The definition of BI itself has created the competitive advantages for an organization to deploy it Ziemba and Olszak [2]. In the context of supporting decision making, BI can be defined as *"An architecture and a collection of integrated operational as well as decision-support applications and databases that provide the business community easy access to business data"*[3]. To support the success of BI implementation, the Critical Success Factors (CSF) of BI has become the drivers of adoption strategies [4]. In addition, BI capabilities that cover both organizational and technological perspectives have extended the CSF elements to ensure the BI is successfully implemented [5]. According to Thamir and Poulis [6], BI capabilities should emphasize in four main points that become BI implementation strategies to facilitate both perspectives. The first point is, each level of management must be involved in technology and business perspective of BI implementation and the second point is the business must determine which dashboard or report will pinpoint to the business needs by improving the data quality from both perspectives. The third point is, the comprehension and understanding of stakeholders on BI uses within the organization to create impact to the organization's culture is vital, and the last point is, an effective use of BI in both perspectives will direct the successful of BI implementation. BI success also can be achieved when BI capabilities support the setting of decision making which covers internal and external environments [7].

The CSF of BI implementations have been discussed in previous literature. Appropriate CSF elements guide top management to prepare strategies in advance such as specific regulations or policies to manage and monitor the BI implementations [8]. Essentially BI implementations are influenced by several factors. According to Yeoh, et al. [4], Yeoh and Koronios [9], in order to ensure the success of BI implementations, three dimensions of CSF are suggested to be focused by the implementers. They are Organizational, Process and Technology dimensions. In Organizational dimension, it holds elements such as the commitment of management support and sponsorship, including senior management responsibility and decision maker commitments. In addition, the clear vision and how well the business strategies are established are also considered in BI implementations. The Business-centric championship and balanced team composition are elements that influence BI success in the Process dimension. Another element in this dimension is business-driven and iterative development approach as well as user-oriented change management. For the Technology dimension, the business-driven, scalable and flexible technical frameworks of BI system are the elements that may accommodate each other. The sustainable data quality and integrity becomes another element of this dimension for BI CSF.

However, the issues and challenges in BI implementations are hardly discussed. The in-depth study of CFS for SME done by Ziemba and Olszak [2], mentioned that many BI projects (in SME) fails and some of them are not undertaken at all due to the low level of BI knowledge and weak CSF consideration. Thus, it proved that the implementation issues and the challenges of BI are rarely discussed. This leads to the idea to investigate the issues and challenges that are faced by organizations while implementing BI systems. Therefore, this study identifies issues and challenges of BI implementations. Understanding the BI implementation in a specific industry, regions and organizations, provides better insight on the problems and obstacle faced by the BI adopters.

The remainder of this paper is structured as follows. In the next section, the research method used is presented that discusses on how this study is conducted. Then, the result of analysis is presented in the Analysis and Findings section. Finally, the paper concludes with the discussion of findings and recommendations for future research.

2.0 RESEARCH METHODS

The aim of this paper is to recognize the issues and challenges of BI implementation. For the review process, the authors use the qualitative approach that refers to the principles of a systematic review by Bandara, et al. [10]. In this principle, it contains four stages where the first stage is an identification and extraction of articles. The second stage is preparing the analysis and the third stage is actual coding for the manuscript. The final stage is finding of analysis and write-up of the result.

For the first stage, it involves selecting the source and search strategy step. A research was constructed which comprises the research question of interest and the keywords. The main aim of this paper is to determine the issues and challenges of BI implementation. Therefore, the research question is outlined as "What are the issues and challenge in implementing the BI? Throughout the university's library, several online databases were selected as the literature sources such as Ebscohost, Science Direct, Elsevier, Springer-Link, IEEE, Sage Journal, ProQuest and Taylor Francis Online. Next, for the search strategy step, the keyword "Business Intelligence implementation" AND "issues" OR "challenge" is used. The goal is to identify any

industries, regions or organizations that have experience in implementing BI. The search was limited to English-language studies that were published between the year 2010 and 2015. Initial search yield 22 related articles and journals that match with the research question. The related articles are scanned from the top of the page including the body text in order to find "issues" or "challenges". As a result, only 3 out of 22 collected papers are directly match with the research aim. However, since the studies on BI implementations issues and challenges are very limited, the authors have broadened the published year of literature up to the year 2000. In this second searching step strategy, the keyword "Business Intelligence adoption" is practiced. Thus, it collects 48 pool papers that related to the research aim. As a result, nine papers are chosen as a primary source that reported the implementations of BI in various industries, regions and organizations. The rest of papers become a secondary source for supporting this study.

The second stage is preparing the analysis that involves two steps, which are *what to capture* and *how to capture*. The authors captured BI definition and related information for BI implementation such as BI success, BI capabilities and CSF for successful BI implementation. A part from that, the authors denote the area of BI implementation and its purposes. The authors extract from the Abstract until the body content of papers to identify the related information as to make the analysis. As a result, the authors find out, the nine reported papers discussed the implementation of BI in the different organizations, industries and regions and various purposes.

In the third stage, the actual coding that is involving the analysis step takes multiples round. In the first round of analysis, the abstract and content of the text is comprehended and digested thoroughly. Thus, it interprets the issues and challenges in a form of CSF. It creates the "themes" according to the three dimensions of CSF. Five issues were found in the reported papers and each of the issues and challenges is justified to get real attention of the review. The second round of analysis is categorizing the issues and challenges into three dimensions of CSF, which are Organizational dimension, Process dimension and Technology dimension.

For the final stage, the authors present the finding of analysis. The results of analysis on the purposes of BI are explained in a descriptive manner and then summarised in a table (See Table 1). For the issues and challenges, the information is organized in the table including the sources (See Table 2). Then, the descriptions on issues and challenges are reviewed in the following paragraph. The authors then, categorize the issues and challenges according to the related CSF dimension (See Figure 2).
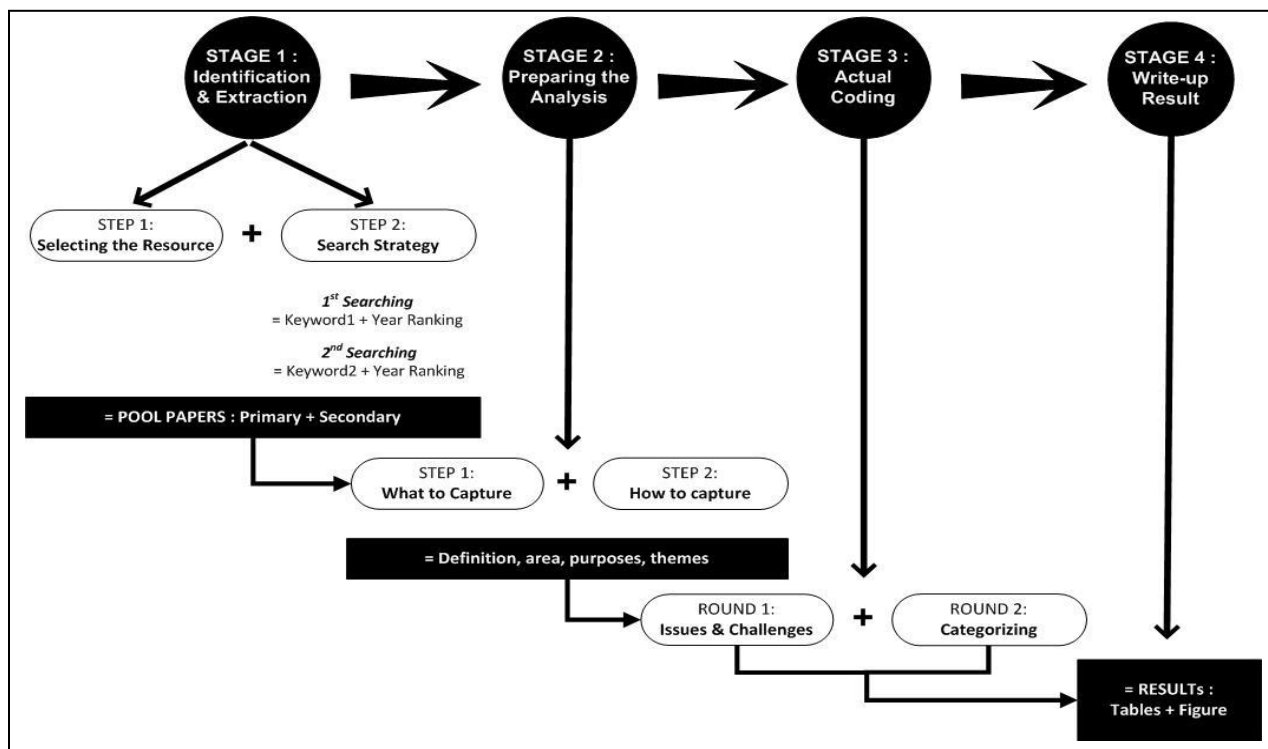

Figure 1 Summary of methodology approach for this review *(adapted from [10])*

3.0 ANALYSIS AND FINDINGS

The selected papers that reported on issues and challenges clearly described that BI applications require all those three dimensions that become CSF for successful BI implementation [8]. Thus, in order to determine BI issues and challenges in various industries, regions and organizations, the purposes and environments of BI implementations should be explored. This is presented in the following discussion.

3.1 BI in Practices

BI in Pakistan: The globalization of BI becomes the main factor for organizations in Pakistan adopting BI [11]. Banks and the telecommunications industry are among the highest adopters of BI in Pakistan. For example, Telenor Company is a Europe Telco Company that runs a business in Pakistan and has strong strategies of BI [12]. Telenor may integrate the scattered data from all regions where Telenor conducts business. Through automation of reporting activities from central data warehouse, they are able to generate the critical business information for better decision making. As a result, the company like Telenor have taken the opportunity to create great revenue.

BI in India: According to Ranjan [13] research, around 57 percent of enterprises in India considered BI as business strategies initiative for the year 2004. The interactive and network computing in India has encouraged enterprises to implement BI system. They have invested a lot in IT to produce effective decision-making as well as to gain the competitive advantages. India has been seeing the opportunities in adopting BI such as transforming the data to intelligent decision making by analyzing the customers and trends for future forecast. A part from that, integrations of business information, improve the transparency of data and speed up the decision making have worth for BI in India. Moreover, BI also has given the India Insurance companies to detect money laundering criminal activities.

BI in Poland: SMEs are among enterprises that support the implementations of BI. It is proved from the study conducted by Ziemba and Olszak [2] through in-depth interview with 20 managers of Upper Silesian SME. The results found that BI are used for the purpose of market demand assessment, quick decision making and easy reporting where this led to competitive advantages.

BI in Hospitality Industry: The major support of BI in the hospitality industry is booking optimization as to able the consistent booking activities for travelers. BI has helped hotels to understand their customers and how they spend money and time. This becomes the main value for the hotel in preparing better services and performs the future forecast. According to Korte, et al. [14] in their study Marriot Hotel desires the BI implementations to manage huge customers and staffs data from multiple branches. As a result, through BI implementation, Marriot Hotel has improved their customer services by providing Marriot Rewards Program. The program was able to identify the member's status, the inventory availabilities and possible pricing models. Furthermore, the preference of hotels by the customer can also be recognized through proper BI system implementations. Besides that, the quality of communication concerning on reporting activities happen more efficiently.

BI in Academic Administration: For the purpose of academic administration, many of the researchers focus their study on universities or Higher Education Institutions (HEIs). Generally, these institutions hold huge data that includes at all levels of management and operations as well as students details and profiles. University requires reporting the institution's performance due the government's obligation that helps in terms of funding and accreditations [15]. For instance, the Arab International University (AIU), Syria, utilize BI solution in order for university's top management to have a better insight of the students' and instructors' performances [16]. Enhancing the GPA of students becomes the strategic goal for AIU to maintain and improve teaching performance.

BI in NHS Wales: National Health Service (NHS) Wales is a public organization in healthcare industry that is located in Wales, United Kingdom. In the literature review done by Shadi and Mustafee [17], they mentioned that NHS Wales has adopted BI, However, due to outdated application which is unparalleled with the organization objective's, this situation influenced them to re-adopt BI with upgraded functionalities. According to them, NH Wales used to manage their customers or patients' details. It is important, as they need to improve the service and hospital's infrastructure for their patients. Silos systems caused them to integrate currently available systems to ensure smooth reporting activities.

BI in Government: The Swedish Municipality Contact Center has become the center point for citizens in Järfälla Kommun. The citizens may make the inquiries, gain information on local issues, lodge any complaints and related activities within the municipality area. BI implementations in this context is to determine whether this municipality contact centre could provide raw data that turn out to be figure and reports that were mapped to trends and support the decision making by municipality for the safety of citizens [18]. BI concept is used to analyze data in order to get a better insight of their security, for example through determining the different scenarios of communities' activities, the Contact Center can understand the trends of residents and outsiders that could cause the insecure surroundings.

Church Management: In a study by Felder [19] a church which is a non-profit organization used IT application to manage their visitors' and members' details. Twenty pastors from Small Medium Churches (SMCs) in Los Angeles, California participated in the study. The study identified how BI adoption helped the churches management in decision-making. By understanding the member's profiles such occupations, income and family members, they can organize better activities, get funding and plan for preaching according to church's religious belief. Apart from that, centralized access to the database helps the church to manage and disseminate among themselves any necessary data and information.

BI in Insurance Company: Insurance companies in Poland have grown since 1991 until 2004. However, in the late 2004 the number of insurance companies has dropped since the consolidation of companies in 2005. One of the reasons that caused the fall is the lack of awareness in IT solutions that actually helped promote competitive advantage for the insurance markets [20]. In the early stage of IT applications implementation, most of insurance companies such AIG Universal Retirement Association (AIG PTE), Allianz Elementar Versicherungs AG, AXA Insurance and Samsung Insurance have used Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) applications. These medium have helped them in managing the insurance business process and customer profiles and details. The applications of BI in CRM and ERP further improved their performance in decision-making. Through data mining of customer profiles, insurance agents, compensations and policies are among important raw data gained and use by insurance companies in making decisions. This enables effective and efficient decision making that helps measure products line profitability as well as customers and distribution channels, the total cost of main processes and activities and ROI for investment portfolio that are needed by the top management.

From the BI practices section above, the organizations, industries and regions determine the potential and benefits of BI for their business values. Table 1 presents the summary of BI implementations intention on selected organizations, industries and regions.

Table 1 Summary of BI implementations objectives according to Organizations / Industries.

Organizations / Industries [Sources]	Objectives / Purposes of BI Implementations
Multinational companies [11, 13]	To sustain the competitive advantage locally and globally. To improve the effectiveness in reporting activities.
SMEs [2]	To hasten in, assessing current market trends and demands with quick decision-making

including the forecast of future markets. Reporting on business performance is vital.

Organizations / Industries [Sources]	Objectives / Purposes of BI Implementations
Insurance companies [20]	To make quick decisions on certain areas such as human resource management, insurance claims management, for actuarial analysis, risk evaluation and policy management, distribution channel management, financial management and customer relationship management. These areas are interrelated to each other.
Hospitality / Hotels [14]	To maintain and improve customer services through the collection of customer's details and information. To recognize hotel trends as to accelerate the sales and profits. To improve communication performance among branches.
Government [18]	To make quick decisions for secure environments within the municipality areas. To prepare and provide detailed data concerning non-violent activities.
Church's or Non-Profit Organization [19]	To manages the identifications of Church members and visitors. To be effective in reporting activities and to make quick decisions on church activities, financial and management issues.
Higher Education Institution [15, 16]	To report instructor and student performance as required by the Government.
Healthcare / Hospitals [17]	To integrate the silo systems from different units those hold patients' information for improving the services and infrastructures for their patients.

3.2 Issues and Challenges

Besides identifying the purpose of BI, the analysis also identified the issues and challenges faced by implementers. The issues and challenges are categorized into themes as shown in Table 2.

Table 2 Issues and challenges descriptions

Issues / Challenges(Themes)	Descriptions
Defining Business Goals	Aligning the organizational goal with BI goal that affect decision makers and organization.
Data Management	Responsible person has to ensure the cleanliness, authentication and authorization of data are complementary to use as input and output for BI project implementation.

Lack of Expertise	Lack of people with knowledge and ability in IT and BI technical area.
Limited Funding	Amount of investment required to cover the whole BI project implementation is limited.
Training and User Acceptance	The acceptance and readiness for BI implementation activities.

Defining Business Goals: Generally, the objective of BI is to support management in making strategic decisions. However, some top management personnel are not clear enough on the aim of BI used in their organizations. As a result, adoption of BI with ambiguous objective and goal of the BI project led to failure. In other words, BI system can be used effectively once the top management better understand the decision making process [2]. Meanwhile, Shah [11] in his study claimed that it is important for people (users) in the organization to have well understanding of the objective of the management to have BI solution. Hence, this creates the supportive environment towards the execution procedures.

Data Management: Based on the analysis, researchers agreed that data is a major issue that rises during implementation. The big bulk of data has caused the difficulties for the implementer to manage the information. A part from that, the users of BI also found it is unreliable to interpret information from incomplete data, especially the unclean data [20]. In addition, some data used in BI are not verified properly by the data owner and may cause false and unclear results [2]. Authorization of data is another issue that needs to be considered during BI implementations. Unclear or lack of policy on authorization of data will jeopardize the confidentiality of the organizational data. According to Ranjan [13], Indian companies face the problems on preprocessing data because the original data is inaccurate and irrelevant.

Lack of Expertise: This issue arises when handling the technical and hardware problems. A study by Ziemba and Olszak [2] highlighted that the expert in BI is crucial since he or she is the person who is responsible for explaining and solving any technical problems. The organization is very much depending on the expert, for example, to integrate BI with other system such as ERP. The expert needs to be familiar with any technical difficulties for both systems that occur during BI implementation. The competency of IS personnel to utilize BI capabilities is very important, for instance, the analytical skills are required to ensure the understanding of BI could be advantageous to business value [21]. Ranjan [13] and Shah [11] in their studies also shared similar point of view where the BI implementation requires high technical infrastructures that work well with BI requirements.

Limited Funding: Whether the BI implementation is successful or not, the cost of projects always becomes the center point of discussion. According to Ranjan [13], India companies demand for cheap, fast and easy applications. Thus, costly BI projects usually were implemented partially due to limited budget. The funding issue is more critical for non-profit organizations even though they realize enormous benefits offered by BI [19]. Meanwhile Korte, et al. [14]stated that hotel industry has increased their budget on upgrading the IT facilities and infrastructure as to fit the BI requirements. The budget should consider the BI infrastructure and also the wage of experts [17]. In academic administration, private institutions are less likely to adopt BI compared to public institutions. The reason is, public institutions are supported by government while private institution relies on individuals or privates funding [15].

Training and User Acceptance: This issue is frequently discussed by previous researchers when discussing BI implementation. Since BI is still in the know-how, the acceptance of new technology becomes a major barrier in the adoption process. It happens when the management is lacking in providing the training and support for BI solutions. The acceptance may occur when they can use the system easily and appreciate the usefulness of BI applications [22]. Therefore, user training and support must be performed regularly to ensure that they are able to use BI without difficulties.

Table 3 shows the number of occurrences of issues and challenges which arise from BI practices according to the themes from the nine papers being reviewed. The Training and User Acceptance themes hold 7 discussions from the 9 papers and the Limited Funding theme holds 6 discussions.

Table 3 Issues and challenges identified

BI In Practices (Sources)	Defining Business Goals	Data Management	Lack of Expertise	Limited Funding	Training and User Acceptance
BI in Pakistan [11]	√		√		√
BI in India [13]		√	√	√	√
BI in Poland [2]	√	√	√	√	√
BI in Hospitality Industry [14]				√	
BI in Academic Administration [15]				√	
BI in NHS Wales				√	√

[17]		
BI in Government		√
[20]		
Church Management	√	√
[19]		
BI in Insurance Company	√	√
[20]		

On the other hand, the theme Defining Business Goals have been discussed by 2 papers, while Data Management and Lack of Expertise challenge are discussed by3 papers.BI in Poland has discussed all the issues and challenges and proven that these issues and challenges were major barriers that hinder them to be successful in BI implementation. However, in the hospitality and academic administration context, only the Limited Funding issue becomes their obstacle in practicing BI. BI in India and Pakistan implementer has faced 3 issues and challenges in BI accomplishment. For the Government, the only issue arise is Training and User Acceptance.

In summary, this study has recognized five issues and challenges that are continuously discussed by former researchers. From the analysis, previous studies have identified several issues and challenges in BI implementations that should be addressed by implementers. Figure 2 illustrates the key issues and challenges that are mapped with BI implementation factors from CSF according to Yeoh and Koronios [9].
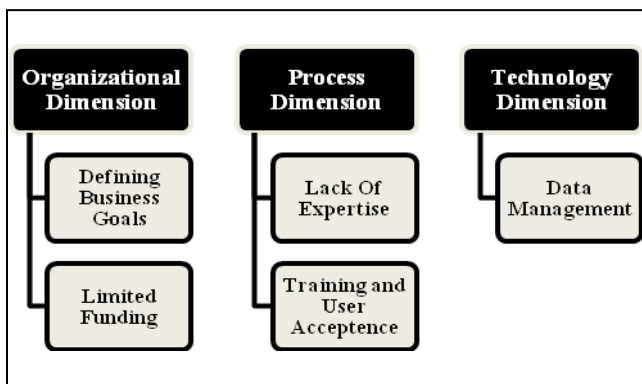

Figure 2 The key issues and challenges of BI implementation.

4.0 DISCUSSION

The analysis shows there are various purposes in implementing BI. It may be utilized in various contexts such in healthcare or hospitals, academic and education industry, service and insurance industry, multinational companies, government and non-profit organization (as shown in Table 1). The purpose of BI also has given the benefit not only to the organizations or to industries but also to the customers as an external entity, that supports the growth of business for example in the hospitality industry.

However, this paper also discovers problems that become challenges for the implementer to be successful in BI executions. As been reviewed previously, in order to achieve successful BI implementations, the implementer must focus on three dimensions that worked well for an organizations or industries [23]. Three dimensions are Organization dimension that concerns on organizational direction that produces the business value through BI, Process dimension which concern on management activities and requirements as to supports BI executions and finally the Technology dimension, which involves the practical fundamentals of BI. Each dimension contains elements that need to run successfully. However, some of the elements may turn to be problems during BI implementations. Thus, issues and challenges are identified from the analysis are categorized according to the CSF point of view.

For the Organization dimension, limitation of funding had become a major challenge among BI adopters. Six out of nine researchers in the different setting have discussed this issue as a major challenge. The reason is BI implementation requires a high cost in setting the BI infrastructure and hiring BI experts. Thus, the cost automatically increases, as BI is large and is a continuous project. Furthermore, difficulties in defining the business goals that requires the usage of BI have become a further challenge in this dimension. It has been discussed by two researchers which covers BI implementation in two regions (Poland and Pakistan) from different industries.

On the other hand, training and user acceptance becomes the main barrier in the Process Dimension. Seven out of nine studies show that this issue appears in all types of organizations and industries.BI users must have good reflection and must be prepared in the changing of behavior in getting the BI requirements. Moreover, BI requires high technical and BI infrastructure knowledge as to complete the requirements. From Table 3, three researchers that study BI in three regions have recognized the Lack of Expertise issue. According to them, the expert is necessary for an organization in order to handle any BI technical and hardware matter arise for the BI implementations.

Technology dimension relates with data management issue that is frequently discussed by practitioners and academics. Authorization and authentication issues become a center point in data management concerns. In this dimension, support from top management is highly required since the approvals and validations of data or information may help to produce genuine results.

Among the five issues and challenges, Training and User acceptance should be given more focus by implementers. The reason is, training for newbie's is important where they as users are required to understand BI functions and are accountable in providing high quality information [24]. Apart from that, the resistance to change to new technology in

organization may lead to the weak of acceptance and readiness of BI [25]. In order to do that, the continuity of training that involves the experts and high budget are needed as well as the management support.

5.0 CONCLUSION

In conclusion, the Organization dimension holds two major issues and challenges of BI implementations. The reason is, organizations involve the people who are responsible for managing and monitoring BI projects. Furthermore, two issues and challenges are recognized in Process dimension and one issue in the Technology dimension. These five key issues and challenges have confronted by implementer during the BI execution from the different settings. Nevertheless, there is limitation to the findings of this study, which is, no in-depth case study that presents the real picture of BI implementation. In addition, the study also does not focus on specific industry or region due to limited number of case studies in the same industry and region. Further investigation on impacts of BI implementations is suggested in order to understand BI effectiveness in decision-making.

Acknowledgement

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