ORGANIZATIONAL AND TECHNICAL FACTORS FOR IMPLEMENTING BUSINESS INTELLIGENCE

Vahid FARROKHI[1] and Laszlo POKORADI[2]

[1]Doctoral School of Informatics, University of Debrecen, Debrecen, Hungary, vahid.farrokhi@inf.unideb.hu
[2]Doctoral School of Informatics, University of Debrecen, Debrecen, Hungary, pokoradi@.eng.unideb.hu

Abstract—For both academics and practitioners concerned with Business Intelligence (BI) systems, one of important issues is to identify the factors which are vital for successful implementation of BI projects. Hence, this paper offers a broad summary of the most common and impact factors which can be influenced in implementing BI projects. We believe it is valuable to determine these factors, particularly for managers of those companies are involved in implementing BI projects and they face to evaluate readiness of their organizations before launching the project in pre-implementation stage.

The objective of this paper is to provide a better understanding of the important and critical success factors and it is to conduct a survey and comprehensive study of the critical factors in evaluation phase of the readiness by classifying the factors into two main categories; organizational and technical. It is obvious that each category has its own characteristics and a brief description of each factor is discussed.

Keywords—Business Intelligence, Critical Success Factors, Readiness Evaluation.

I. INTRODUCTION

IN today's rapid technological and dynamic and unpredictable business environment, BI solutions can be assisted the managers in decision making process. The interest in this subject has increased significantly when the opinions began to appear indicating that BI systems are an important component of a modern enterprise's information infrastructure, as they contribute to its success and competitiveness [1]. A successful implementation of BI project enables experts and managers of companies make and take better decisions. But according to Farrokhi and Pokoràdi [2], risk of failure is high in implementing BI projects.

To success in implementing a BI project and gain the associated benefits, we need to identify the factors which contribute to the success. These factors must be received careful attention by top managers and BI project managers of those companies are evaluating the readiness of their organizations. These prerequisites can be grouped in organizational factors and technical factors for better understanding and concentrating. Most of authors are often named these factors as Critical Success Factors (CSF). Every BI project includes multiple stages and each stage has its characteristic with specific activities.

The main aim of this study is to find and categorized CSFs in setting-up stage of implementing a BI project by related literature review. In this way, the authors with assisting of an experienced BI project manager provided their best judgments based on their studies and experiences in determining and categorizing CSFs.

This paper is organized as follows: In the next section, we show an overview of a BI project and its components in the form of a high-level architecture of BI. In the Section 3, we express some reasons in importance and necessity for implementing BI projects in companies. The critical organizational and technical factors are depicted in the Section 4. Finally, the Section 5 presents the conclusions and future works of the authors.

II. BUSINESS INTELLIGENCE PROJECTS

In 1989, Howard Drenser of the Gartner Group introduced BI to describe a set of concepts and methods for improving business decision making by using fact-based, computerized support systems [3]. The goal of BI systems [4] is to capture (data, information, knowledge) and respond to business events and needs better, more informed, and faster, as decisions. One of the best ways for the information in BI and its components to be understandable is to describe it in form of architecture. Hence, we have tried to express components of the new-generation architecture which is introduced by W. Eckerson [5]. This BI architecture is more analytical, giving power users greater options to access and mix corporate data with their own data via various types of analytical sandboxes. It also brings unstructured and semi-structured data fully into the mix using Hadoop and nonrelational databases. This architecture is illustrated in Fig. 1.
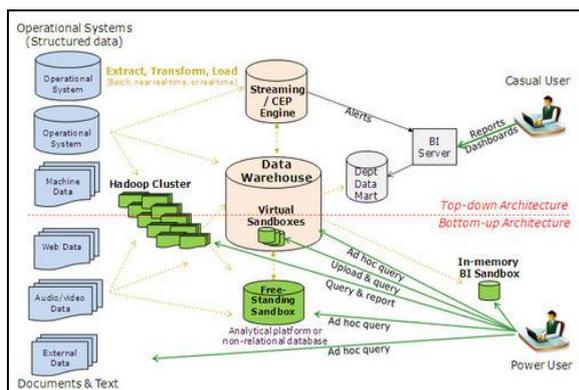
Fig. 1. The new-generation BI architecture (Source: [5])

The top half of the figure indicates to classic top-down architecture which data warehousing delivers interactive reports and dashboards to casual users and the bottom half represents a bottom-up analytical architecture with analytical sandboxes and new type of data sources. Of course, from the business (organizational) perspective, BI systems mean specific philosophy and methodology that refer to working with information and knowledge, open communication, and knowledge sharing along with the holistic and analytic approach to business processes in organizations [6].

III. IMPORTANCE OF IMPLEMENTATION OF BI PROJECTS IN COMPANIES

In recent years, implementing BI projects have been rated as one of the highest priorities of information systems and a significant portion of companies' IT budgets are spent on BI and related technology. A BI system can correspond to the needs of users in different levels of organizations, specially managers, with supporting key processes and business decisions. It utilizes a substantial amount of collected data during the daily operational processes, and transforms the data into information and knowledge to avoid the supposition and ignorance of the enterprises [7]. A successful implemented BI project plays an important role in understanding business status, measuring organization performance, improving relationship with stakeholders and making profitable opportunities. The demands for a range of capabilities to satisfy a diverse set of user needs have enforced BI software companies to develop better and more suitable BI applications. This concept is shown in Fig. 2.

Based on the levels of ambitions of the various stakeholders, a BI system can improve efficiency by on time saving in developing reports and validating data, reduced number of toolsets and maintenance/integration costs, time saving in managing report security, etc. Also, it can be make business more effective by increasing conversion rate in marketing, cross-sell opportunities in the call center, fraud detection, a better matching of available human resources and internal job opportunities,

etc. BI initiatives can also be transformational by enabling new business models, using a new pricing model, providing BI to the customers and offering relevant information as part of the service. Efficiency is the starting point and it is hard to create a sustainable business case aimed at effectiveness or transformation, if there is no basic level of efficiency [8].

Fig. 2. The capabilities of BI applications (Source: [9])

IV. THE CRITICAL ORGANIZATIONAL AND TECHNICAL FACTORS

The study of critical organizational and technical factors helps us to extract the core activities that are essential for successful implementing a BI project. These critical success factors as Rockart [10] defined are "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization". In fact, they are the few key areas where "things must go right" for the company to success in implementing its BI project. In our literature review, as we mentioned previously, we categorized these factors as organizational and technical factors for better understanding and concentrating. Of course, nature of these factors is also led us to this categorization. For applying a BI system, an organization needs to have capability in both organizational and technical factors.

Based on related studies in the literature [11]–[25], the organizational factors which influence in a BI project success are management support, decision-making structure, management style, managerial IT knowledge, goal alignment, and resources allocation, user participation, balanced and skilled project team, and agile project management. The related and critical technical factors are system quality, information quality, reliable back-end system, metadata management, technical framework, and agile methodology. Table 1 provides a summary of these factors. Of course, the names of factors are selected based on their similarities in concepts and definitions.

TABLE I
CRITICAL ORGANIZATIONAL AND TECHNICAL FACTORS FOR SUCCESSFUL
BI IMPLEMENTATION

Critical Success Factor	Description
Management support (Organizational)	The managers of organization involve and participate in the activities of BI project.
Organizational culture (Organizational)	A corporate culture which emphasizes on the value of sharing common goals over individual pursuits and the value of trust between partners, employees, managers and corporations.
Decision-making structure (Organizational)	The type of control or delegation of decision-making authority throughout the organization and the extent of participation by organizational members in decision-making pertaining to BI.
Goal alignment (Organizational)	The linking together of the business goals and the BI goals.
Managerial IT knowledge(Organizational)	Knowledge and experience of senior management about IT.
Management style (Organizational)	The way in which management tends to influence, coordinate, and direct people's activities towards a group's objectives.
Resource allocation (Organizational)	Allocating adequate resources of money, people, and time.
User participation (Organizational)	Involving and participating user in BI development process.
Balanced and skilled project team (Organizational)	The composition and skills of a BI team have a major influence on the success of the systems implementation.
Agile project management (Organizational)	Managing team members work together in the most effective manner possible.
System quality (Technical)	The performance characteristics of the BI system itself, which includes ease-of-use, functionality, reliability, flexibility, integration, and response time.
Information quality (Technical)	It refers to accuracy, timeliness, completeness, relevance, consistency, and usefulness of information generated by the system.
Reliable back-end system (Technical)	It is critical to ensure that the updating of data works well for the extraction, transformation and loading (ETL).
Metadata management (Technical)	It is an end-to-end process for creating, enhancing and maintain meta-data repository and associated processes.
Technical framework (Technical)	It must be business-driven, scalable and flexible framework.
Agile methodology (Technical)	The purpose of agile BI is to get the development done faster, and react more quickly to changing business requirements.

Similarity of implementing BI projects with other infrastructural projects like Enterprise Resource Planning (ERP) projects implementation shows that this kind of projects need to consider many aspects of the project before deployment. Implementing a BI system is not a simple activity entailing merely the purchase of a combination of software and hardware; rather, it is a complex undertaking requiring appropriate infrastructure and resources over a lengthy period [22], [26]. Good performance of the CSFs requires that their elements (or constituents) be known so that management can formulate appropriate policies and strategies to ensure that the elements are constantly and carefully being managed and monitored [27].

It is generally believed that the organizational factors are more important than the technical factors, and identifying these factors can help us to find the organizational strength and weakness of the company with regard to implementation of BI. Burton et al. [28] pointed out that organizational dynamics are the most significant challenge to the success of business intelligence initiatives and implementations. The results from the recent survey show clearly that non-technical factors were the hardest to solve and indicate that these CSFs play a dominant role in BI initiatives' success in large enterprises [29]. In the organizational factors, management support has been widely acknowledged as the most important factor in implementing a BI project. The managers must consider the BI project as a top priority and fund it and take an active role in leading the change by involving in every step of the BI implementation.

In spite of having second role of technical factors, they must completely be concerned. Because without these elements, implementing a BI project is impossible and lack of each element can be lead to fail of the project. It is assumed that the main tasks to be faced by BI systems include intelligent exploration, integration, aggregation, and a multidimensional analysis of data originating from various information resources [30]. System and information quality are the most important factors in the technical factors because each BI system needs to integrate right data and information from various source systems. Hence, having a system approach for BI project managers is a necessity and they should make a balance in considering between organizational and technical factors.

V. CONCLUSIONS AND FUTURE WORKS

An important step in pre-implementation stage of a BI project is to identify critical factors which influence in the project success. First, in this paper an attempt has been made to depict an overview of BI from architectural perspective. Then, the necessities for implementing BI project for companies were described and finally, based on the literature survey, vital and critical factors in both of organizational and technical aspects which impact on

the success were determined. We believe that both the organizational and technical dimensions are important and they should be concerned together and interact with each other for leading to BI success. It can be useable for assisting managers who are decision makers in implementing BI projects by optimizing their scarce resources on these CSFs and concentrate their commitment to monitor, control and support only these factors. Of course, ranking of these CSFs with the use of a formal method like the analytic hierarchy process (AHP) can be proposed for future work for those scholars and practitioners who want to concentrate more attention on the CSFs. Also, these CSFs will be applied in building a model to assess readiness of organizations before launching BI projects by the authors.

REFERENCES

[1] T. H. Davenport, Harris, J.G., & Morison, R., Analytics at works: Smarter decisions, better results. Boston: Harvard Business Press, 2010.

[2] V. Farrokhi, and Pokorádi, L., "The necessities for building a model to evaluate Business Intelligence projects- Literature Review," International Journal of Computer Science & Engineering Survey (IJCSES), vol. 3, pp. 1-10, 2012.

[3] A. Nylund, "Tracing the BI family tree," Knowledge Management, 1999.

[4] M. Guran, Mehanna, A., Hussein, B., "Real Time On-Line Analytical Processing for Business Intelligence," U.P.B. Sci. Bull., Series C, vol. 7, 2009.

[5] W. Eckerson. (2012). A Practical Guide to Advanced Analytics [Pdf]. Available: http://www.bileader.com/A_Practical_Guide_to_Analytics_E-book.pdf

[6] C. M. Olszak, Ziemba, E., "Critical Success Factors for implementing Business Intelligence Systems in Small and Medium Enterprises on the example of Upper Silesia, Poland," Interdisciplinary Journal of Information, Knowledge, and Management, vol. 7, pp. 130-150, 2012.

[7] Z. Wang. (2005) Business intelligence. Taiwan: DrMater Culture Limited Company.

[8] F. Buytendijk, Landry, D., "BI Optimization: Building A Better Business Case for Business Intelligence," ed. 500 Oracle Parkway, Redwood Shores, CA 94065, U.S.A.: Oracle Corporation, 2009.

[9] MicroStrategy. (2013). Architecture for Enterprise Business Intelligence. Available: www.microstrategy.com

[10] J. Rockart. (1979) Chief executives define their own information needs. Harvard Business Review. 81-92.

[11] R. Hussein, Abdul Karim, N., Mohamed, N., Ahlan, A., "The Iinfluence of Organizational Factors on Information Ssystems Success in E-Government Agencies in Malaysia" EJISDC, vol. 29, pp. 1-17, 2007.

[12] J. Farley, "Keeping the Data Warehouse of the Rocks" Measuring Business Excellence, vol. 2, pp. 14-15, 1998.

[13] H. J. Watson, Haley, B. J. (1998) Managerial considerations. Communications of the ACM. 32-37.

[14] L. D. Chen, Khalid S. Soliman, K. S., Mao, E., Frolick, M. N., "Measuring user satisfaction with data warehouses: an exploratory study," Information & Management, vol. 37, pp. 103-110, 2000.

[15] D. Sammon, Finnegan, P., "The ten commandments of data warehousing," ACM SIGMIS Database, vol. 31, pp. 82-91, 2000.

[16] R. G. Little, Gibson, M. L., "Perceived influences on implementing data warehousing," IEEE Transactions on Software Engineering, vol. 29, pp. 290-296, 2003.

[17] D. Mukherjee, D'Souza, D., "Think phased implementation for successful data warehousing," Information Systems Management, vol. 20, pp. 82-90, 2003.

[18] A. Rudra, Yeo, E., "Issues in User Perceptions of Data Quality and Satisfaction in using a Data Warehouse - An Australian Experience," in 33rd Annual Hawaii International Conference on System Sciences (HICSS), Hawaii, 2000.

[19] K. Joshi, Curtis, M., "Issues in building a successful data warehouse," Information Strategy, vol. 15, pp. 28-36, 1999.

[20] B. H. Wixom, Watson, H. J., "An Empirical Investigation of the Factors Affecting Data Warehousing Success," MIS Quarterly, vol. 25, pp. 17-41, 2001.

[21] T. Chenoweth, Corral, K., Demirkan, H. (2006) Seven key interventions for data warehouse success. Communications of the ACM. 114-119.

[22] W. Yeoh, Koronios, A., "Critical Success Factors for Business Intelligence Systems," Journal of Computer Information Systems, pp. 23-32, 2010.

[23] J. Terry, Standing, C., "The Value of User Participation in E-Commerce Systems Development," Informing Science Journal, vol. 7, pp. 31-45, 2004.

[24] C. Stefanou, "Supply chain management (SCM) and organizational key factors for successful implementation of enterprise resource planning (ERP) systems," in AMCIS 1999, Milwaukee, WI, 1999.

[25] Execution-MiH. (2013). Metadata Management definition - What is metadata? Available: http://www.executionmih.com/metadata/definition-concept.php

[26] L. T. Moss, Atre, S., Business intelligence roadmap. The complete lifecycle for decision-support applications. Boston: Addison-Wesley, 2003.

[27] W. Yeoh, Koronios, A., Gao, J., "Managing the Implementation of Business Intelligence Systems: A Critical Success Factors Framework," International Journal of Enterprise Information Systems, pp. 79-94, 2008.

[28] B. Burton, Geishecker, L., Hostmann, B., "Organizational structure: Business intelligence and information management," Gartner Research, 2006.

[29] S. Adamala, Cidrin, L., "Key Success Factors in Business Intelligence," Journal of Intelligence Studies in Business, vol. 1, pp. 107-127, 2011.

[30] V. L. Sauter, Decision support systems for business intelligence. New Jersey: Wiley, 2010.