

MEASUREMENT METRICS FOR MEASURING SUCCESS OF BUSINESS
INTELLIGENCE SYSTEM

AMIN BABAZADEH SANGAR

A thesis submitted in fulfilment of the
requirements for the award of the degree of
Doctor of Philosophy (Information Systems)

Faculty of Computing
Universiti Teknologi Malaysia

JUNE 2014

Compassionate Allah, Thank you for the chance you give to me to find my way in my life. Thank you for showing the way, I promise to do all my best for applying my knowledge in making beautiful world.

My parents, Thank you for your unconditional support with my studies. I am honored to have you as my parents. Thank you for giving me a chance to prove and improve myself through all my walks of life. Please do not ever change. I love you forever (Khalil Babazadeh Sangar and Farideh Noroozpour Hesari).

My Supervisors, Thank you for supervising me during this research. I am so proud of you. Thank you for the time that you gave me in guiding during this study.

My sisters, Thank you for believing in me; for supporting me to further my studies. Please do not ever doubt my dedication and love for both of you (Arezu and Pouneh Babazadeh Sangar)

Dear Prof. Dr. Iraj Mirzaee, Thank you for motivating me to continue my study in PhD, I wish all the best for you and your family.

My Friends, Thank you for supporting me by your kind calls and e-mails from thousands of miles (Pouya Afagh, Hojjat Abbaspour and Meysam Zomorodi)

ACKNOWLEDGEMENTS

A profound depth of gratitude is own to my dearest supervisor, Dr. Noorminshah Binti A.Lahad and my dear co-supervisor Dr. Noorfa Haszlinna Binti Mustaffa. Their unwavering belief in me has been great resource of my strength.

Furthermore, I would like to give very special thanks to Assoc. Prof. Dr. Maghsoud Solimanpur, Assoc. Prof. Dr. Michael Sutton and Assoc. Prof. Dr. Behrouz Masoumi for their continuous support during this study.

Additionally, I would like to appreciate Iran Khodro Company (IKCO), especially IKCO deputy of engineering and systems, which gave me the opportunity of collecting data.

I acknowledge, with gratitude, to School of Postgraduate Studies (SPS) UTM for award of International Doctoral Fellowship (IDF) for five semesters.

Last but not least, my special thanks to my family, especially my parents for their continuous support and patience and all my friends for their love and support over the last few years at UTM.

ABSTRACT

Currently, Business Intelligence Systems (BIS) have been widely utilized in organizations. Although BIS have been well accepted as value creator by organizations, justification of BIS value is not always been clear in order to justify BIS investment. Therefore, to understand BIS value, organizations need to measure their BIS. In addition, reviewing other researches shows that BIS measurement was used for managing BIS process as well as understanding BIS value. Prior researchers applied objective and subjective methods for BIS measurement which are suitable for Competitive Intelligence System (CIS) but not for BIS. Literatures also suggested that Information Systems (IS) success measurement models could be used for BIS success measurement in order to understand BIS value and manage BIS process. Therefore, this research applied DeLone & McLean (D&M) updated IS success model to identify BIS success dimensions. Furthermore, based on the model, previous researches focused more on user satisfaction, system use and net benefits dimensions of BIS success rather than BIS service, system, and information quality dimensions which this research aimed to address. To do so, the interpretive paradigm was chosen. Qualitative data collection methods, which include interviews, focus group and organizational document review were applied for collecting data in the largest car manufacturing company of Middle-East as a case study. During this study, 25 participants include senior and technical level managers were selected as interviewees and focused group members. Collected data was analyzed using qualitative data analysis methods, and the findings were validated by 10 BIS experts. In addition, researcher performed a Walk-Through test on BIS in Case Study Company. The main contribution of this research is the measurement metrics for BIS quality and the BIS success measurement model, which are applicable to understand success of BIS in organizations.

ABSTRAK

Pada masa kini, Sistem Perniagaan Pintar (BIS) telah digunakan secara meluas oleh organisasi. Walaupun BIS telah diterima sebagai sesuatu yang boleh membawa nilai kepada organisasi, justifikasi terhadap nilai BIS sering kali tidak jelas untuk pelaburan BIS. Oleh itu, untuk memahami nilai BIS, organisasi perlu mengukur BIS masing-masing. Tambahan pula, tinjauan kajian sebelum ini menunjukkan pengukuran BIS telah digunakan untuk mengurus proses BIS dan juga untuk memahami nilai BIS. Kajian terdahulu menggunakan kaedah objektif dan subjektif untuk pengukuran kejayaan BIS dan di dapati sesuai untuk Sistem Pintar Bersaingan (CIS) tetapi tidak untuk BIS. Kajian literatur turut menunjukkan pengukuran kejayaan Sistem Maklumat (IS) boleh digunakan untuk mengukur kejayaan BIS bagi memahami nilai dan menguruskan proses BIS. Kajian ini menggunakan Model Kejayaan Sistem Maklumat DeLone & McLean (D&M) yang terkini bagi mengenal pasti dimensi kejayaan BIS. Tambahan lagi, berdasarkan kepada model, kajian terdahulu lebih fokus kepada kepuasan pengguna, penggunaan sistem dan dimensi pulangan bersih BIS berbanding dengan mengukur kejayaan BIS menggunakan dimensi Perkhidmatan BIS, dimensi sistem dan dimensi kualiti maklumat yang merupakan sasaran kajian ini. Kajian ini menggunakan paradigma interpretif. Kaedah pengumpulan data kualitatif termasuk menemu ramah, kumpulan kelompok, dan semakan dokumen organisasi, telah dijalankan untuk mengumpul data di sebuah syarikat pembuatan kereta terbesar di Timur Tengah yang digunakan sebagai kajian kes. Data yang telah dikumpul, dianalisis melalui kaedah data kualitatif dan hasil kajian telah disahkan oleh 10 pakar BIS. Tambahan lagi, pengkaji telah menjalankan ujian Semakan-Lalu pada BIS Organisasi kajian kes tersebut. Sumbangan utama kajian ini adalah matriks pengukuran kualiti dan model pengukur kejayaan BIS yang dipercayai dapat membantu untuk memahami kejayaan BIS di dalam organisasi.

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LIST OF ABBREVIATIONS

BIS	-	Business Intelligence Systems
IT	-	Information Technology
ROI	-	Return on Investment
CIMM	-	Competitive Intelligence Measurement Model
CIS	-	Competitive Intelligence System
BSC	-	Balance Score Card
BI	-	Business Intelligence
CI	-	Competitive Intelligence
TEC	-	Technology Evaluation Centre
SME	-	Small and Medium Enterprise
ERP	-	Enterprise Resource Planning
HRM	-	Human Resource Management
TCO	-	Total Cost of Ownership
NPV	-	Net Present Value
PPM	-	Payback Period Method
ROCII	-	Return on Competitive Intelligence Investment
BPM	-	Balanced Performance Measurement
NIST	-	National Institute of Standards and Technology
TAM	-	Technology Acceptance Model

TRA	-	Theory of Reasoned Action
DMS	-	Data Management System
CFs	-	Critical Factors
EIS	-	Enterprise Information Systems
OLAP	-	Online Analytic Processing
JIT	-	Just In Time
IKCO	-	Iran Khodro Car Manufacturing Company
CAQDAS	-	Computer Assisted Qualitative Data Analysis
SAPCO	-	Auto parts Supplying, Engineering & Designing
SIAMCO	-	Syria Samand
ISACO	-	IKCO spare parts & after sales services
ISEIKCO	-	Industrial Service Engineering of Iran Khodro Co.
IAPCO	-	Iran Auto Parts Industrial Group
UTM	-	Universiti Teknologi Malaysia

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Business Intelligence Systems (BIS) is an Information Technology (IT)-based system, which has been widely utilized in organizations. Although statistics reveals the growths of using BIS in organizations, some concerns still remain for organizations. These concerns are firstly, proving that the BIS investment is worth to concern and secondly, managing BIS process efficiently produce valuable intelligence for the specific needs of the users.

Measuring of BIS success helps organizations to prove the value of BIS investment and manage the BIS processes. Therefore, this research aims to explore and propose measurement metrics in order to help organizations in measuring their BIS success. In order to achieve research purposes, this chapter discusses the background of study, statement of the problem, research questions and objectives. It also covers the scope and significance of the study, which are briefly shown in Figure 1.1.

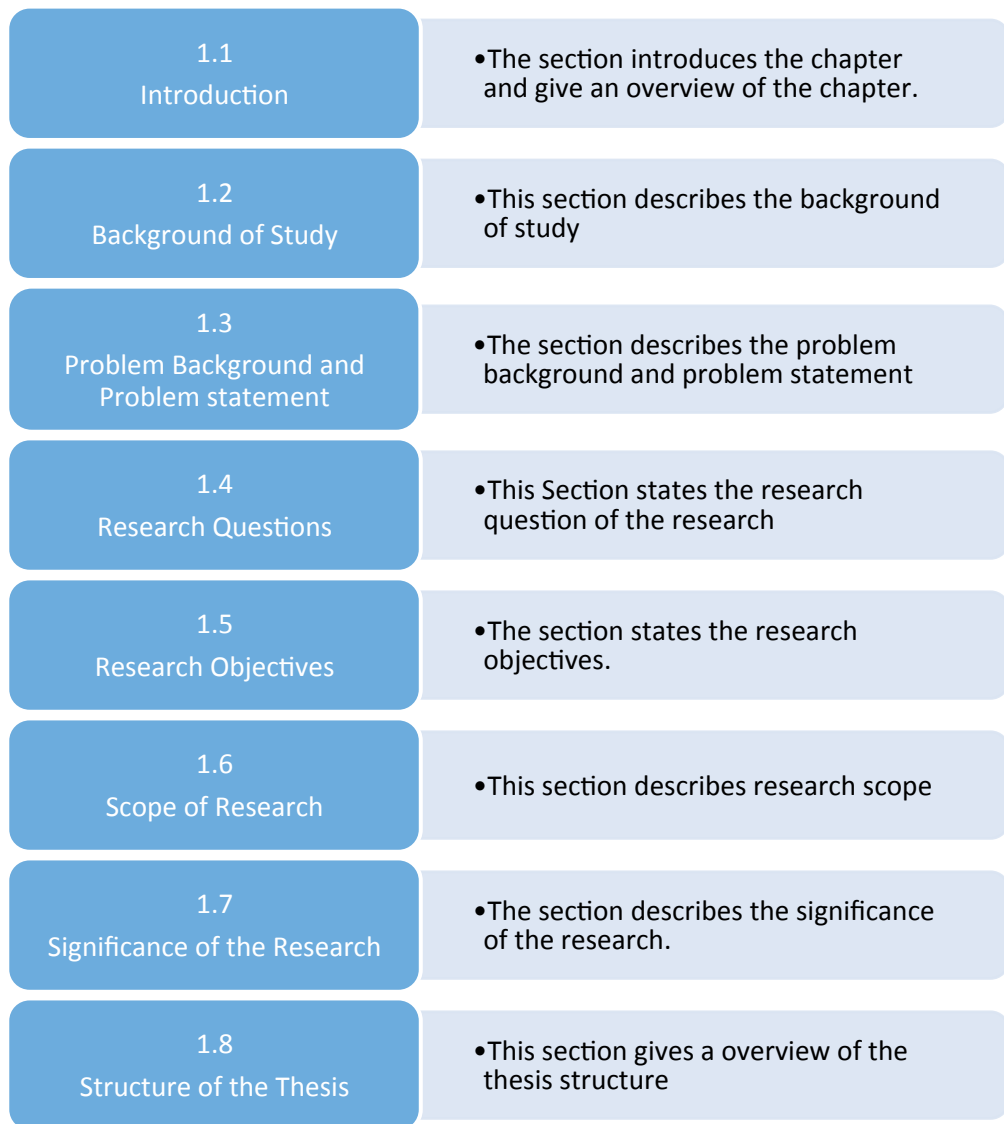


Figure 1.1: Organization of Chapter 1

1.2 Background of research

In most organizations of today's competitive world, IT is playing main role as underlying infrastructure to perform various activities such as, goods ordering and shipping, interactions with customers and conducting business functions. By applying IT-based systems, organizations want to fulfill their supply chain's processes both effectively and efficiently to remain competitive in marketplace. IT-based systems change organizations outputs, the way of processes performing, and organizations' ability to create links between interior and exterior processes.

Moreover, IT became organizational backbone and transformed the nature of production, processes of companies and even competition in the market place (Porter, 1985).

Over the past decades, the majority of IT investment has been contributed for controlling day-to-day operations and generating voluminous reports (Williams, 2004b; Williams and Williams, 2007). There is little debate that IT-based systems are necessary to operate many modern enterprises (Davenport and Short, 2003; Dewett and Jones, 2001; Li and Ye, 1999; Williams and Williams, 2007), but the scientific researchers propose that organizations are quiet rich in data and poor in information after applying these systems (Forslund, 2007; Gibson et al., 2004; Williams, 2004b; Williams and Williams, 2007). In another word, organization still encounter the lack of actionable information and they require analytical tools to improve performance and consequent the profits (A. Popovič, Turk, & Jaklič, 2010). Therefore, to gain a better perception on the environmental forces and to improve organization's performance; they has been moved toward applying BIS.

BIS is an IT-based system, which statistics reveals growth in its utilization in the organizations over last decades (Jorge García, 2012; Jorge García, 2011). Organizations rely on BIS in order to create current information for covering operational and strategic business decision-making (A. Popovič et al., 2010). Implementing and utilizing BIS in organizations is expensive, complex and risky. Therefore, after implementing BIS, it is important for organizations to capture true benefits of BIS investments. Organizations, which fail to take ride of BIS advantages, run the risk of falling behind other competitors that adopt BIS in their business (Chamoni, 2004; A. Popovič et al., 2010).

1.3 Problem Background and statement

A major agenda of both practitioners and researchers within the area of IT management is determining the value of BIS investments (Buchda, 2007; A. Popovič et al., 2010). BIS have been well accepted as value creator by organizations and

especially from managerial levels point of view (Lonnqvist & Pirttimäki, 2006; A. Popovič et al., 2010). Nevertheless, justification of BIS value is not always clear. Therefore, organization has started to measure the BIS value to understand it (Hannula, 2003; Lonnqvist & Pirttimäki, 2006; A. Popovič et al., 2010). Measuring BIS is not only for understanding value of BIS; literature review shows that organization aims to measure their BIS in order to serve two purposes. One of these purposes is to understand BIS value and the other is to manage BIS process. In other word, organizations aim to measure BIS, firstly for understanding the value of BIS and secondly, managing BIS process (Hannula, 2003; Lonnqvist & Pirttimäki, 2006; A. Popovič et al., 2010). Understanding BIS value helps organizations to prove their investment on BIS and in addition help them in managing BIS process efficiently (Hannula, 2003; Lonnqvist & Pirttimäki, 2006; A. Popovič et al., 2010).

Organizations believe BIS produces valuable intelligence for the specific needs of the users and for efficiently producing valuable intelligence, organization should manage BIS process (Hannula, 2003; Lonnqvist & Pirttimäki, 2006; A. Popovič et al., 2010). However, reports show that 88 percent of businesses do not know what they want from their BIS (Cooter, 2009) and this caused 60 percent of BIS projects to fail. Therefore, it is important to prove BIS investment (Computerworlduk, 2012).

Prior researchers applied different Subjective methods and Objective methods for measuring BIS value and measuring for managing BIS (Lonnqvist & Pirttimäki, 2006; A. T. Popovič, T. Jaklič, J., 2010). Review of literatures illustrated that the majority of current methods mainly focuses on proving the value of BIS however, prior researchers proposed these methods for managing BIS processes. However, according to prior researchers, these methods are mostly suitable for CIS, which is not really BIS (Lonnqvist & Pirttimäki, 2006; Pirttimäki, 2006; A. Popovič et al., 2010).

Objective methods aimed to show financial values of BIS. The value is created as a result of utilizing BIS (Lonnqvist & Pirttimäki, 2006; Pirttimäki, 2006). Objective methods for measuring BIS are typically used in assessing monetary value

of any investment. For example one of the objective methods is the Return on Investment (ROI) method, which is widely used in assessing any type of investments. The main problem of these methods for measuring BIS is related to BIS output. BIS output is intelligence; intelligence is kind of processed information and it is extraordinarily difficult to quantify information and measure the value of BIS accurately (Buchda, 2007; Kilmetz, 1999; Lonnqvist & Pirttimaki, 2006; A. Popovič et al., 2010). Additionally, Lonnqvist and Pirttimaki (2006) showed that applying a purely financial measurement causes other aspects of BIS (e.g. customers and employees) to be forgotten.

Subjective measurements methods aimed to figure out how effectively the users evaluate the intelligence products. Subjective methods more focused on system use and user (Customer) satisfaction rather than BIS itself (Buchda, 2007; Lonnqvist & Pirttimaki, 2006; A. Popovič et al., 2010). For example, Davison in 2001 proposed a method that called Competitive Intelligence Measurement Model (CIMM) for BIS. CIMM was for individual Competitive Intelligence System (CIS) projects and aimed to calculate the CIS ROI from a subjective point of view. The critic of the method is occurred base on difference between BIS and CIS.

BIS is considered as a broad concept, rather than CIS and other intelligence-related terms. There are many similarities between these two systems but both terms differ in the source of data used for analysis. BIS explicitly involves the use of pure IT-based tools in comparing with CIS. In addition, after defining the CIMM formula, Davison stated: “the value of some variables in the formula are impossible to evaluate”. Therefore, the result of the calculation in the CIMM can be unreliable. CIMM was used for both measuring value and managing BIS process, however, it was not reliable method (Buchda, 2007; Lonnqvist & Pirttimaki, 2006; A. Popovič et al., 2010). As another example, Herring (1996) has defined 4 measures for measuring the success of CIS but he did not clarify “how these effects can be measured” (Lonnqvist & Pirttimaki, 2006). Also, the Balance Score Card (BSC) method that used for BIS used predefined measures of CIS (Buchda, 2007; Lonnqvist & Pirttimaki, 2006; A. Popovič et al., 2010).

Current literatures on BIS measurement show that the measuring of BIS is critical for organizations. However, in practice BIS measurement is not carried out yet and currently there is no suitable measurement method for measuring BIS (Hannula, 2003; Lonqvist & Pirttimaki, 2006; A. Popovič et al., 2010).

Through studying IS and BIS measurement literatures, researcher found that prior researchers used IS success models to understand value of IS and efficiency of IS management actions (David Kurian, 2000; Davis, 1989; DeLone, 1992; Mclean, 2003; Sebastian Dorr, 2013; Urbach, 2009). Öykü Işık (2010) defined concept of BIS success and proposed “IS success measurement models could be applied for measuring BIS success to understand BIS value and manage BIS process”. This is also supported by other researchers, they stated: “aims of BIS measurement endeavors to serve two main purposes: First, is to prove that BIS investment is worth. Second, is to help managing the BIS process (Herring, 1996; Keil, 2011; Lonqvist & Pirttimaki, 2006; A. Popovič et al., 2010). Therefore, in main research question of this study, measuring of BIS success has considered and the main research question is: **“How can Business Intelligence System’s success be measured?”**

Before measuring BIS success, it is important to understand the concept of BIS success. According to different researches on IS Success, prior researcher used different IS success models to conduct their researches (DeLone, 1992; Mclean, 2003; Sebastian Dorr, 2013). BIS is type of IS, thus, it is obvious that in studying BIS success, a proper IS success model is adopted for understanding the concept of BIS success. In addition, identifying different criteria that effect on BIS success is another step that should be carried out. Moreover, it is obvious that exploring appropriate metrics are necessary for measuring BIS success.

1.4 Research Questions

In this study, research questions are divided into two levels. First level is includes three research questions. Second level questions are sub question of second

research question in first level. Therefore, in this study, research questions are listed as follow:

1. What are the BIS success Dimensions?
2. What are the BIS success measurement metrics?
 - 2.1. What are the BIS Service Quality Metrics?
 - 2.2. What are the BIS System Quality Metrics?
 - 2.3. What are the BIS Information Quality Metrics?

1.5 Research Objectives

According to research questions, researcher aims to achieve research objectives. In this study, research objectives are divided to two levels. These two levels follow research questions levels hierarchy. Research objectives of the study are listed as follow:

1. To identify BIS success measurement dimensions
2. To propose BIS success measurement metrics
 - 2.1. To identify BIS Service quality measurement metrics
 - 2.2. To identify BIS System quality measurement metrics
 - 2.3. To identify BIS Information quality measurement metrics

1.6 Scope of the Research

This research considers Iranian Car Manufacturing Companies as the target organizations. Car manufactures are data rich; developing information systems that helps them to increase pure information and knowledge improves their ability in making decision and gaining competitive advantages. Nowadays, BIS can undertake

their needs of a powerful information system in helping them for making decisions. But the important question is “How can they understand the success of their BIS?” So measuring BIS success can help them in understanding value of BIS and improving their ability in maximizing their usage and managing.

In addition the research considers Senior Managers and Technical Managers as target group includes. Main users of BIS are organization’s top-level managers. Therefore, target groups of this research are senior managers and technical managers of Car manufactures.

1.7 Significance of Research

The most important users of intelligence that produced by BIS are organizations top managers. Literature review illustrate that a “basic reason for measuring BIS by organizations is that the managers want to prove the organization’s investment on BIS (understanding the value of BIS investment)” (Lonnqvist & Pirttimaki, 2006; A. Popovič et al., 2010; Sawka, 2000).

In addition, Peter Drucker (a famous management guru) once stated, “If you cannot measure it, you cannot manage it”. This sentence shows the importance of measuring in management perspective. IT is playing an essential role in the organization. This role is part of strategy, competitive advantage and profitability of the organization. So, IT become like other parts of organization, it is important to be aware of its performance and its contribution to the organization’s success and opportunities. Without managing BIS process, producing intelligence for needs of the users is not efficient and valuable. Then, it is hard for organizations to capture true benefits and value of BIS.

With BIS success measurement metrics, organizations can easily measure success of BIS. Understanding BIS success helps organization in justifying and proving the investment and help organization to efficiently produce valuable intelligence for the specific needs of the users.

1.8 Structure of the Thesis

The thesis is organized in ten chapters, as shown in Figure 1.2. The thesis illustrates research development in a structured and coherent manner. There is interrelation between different chapters. Sections of each chapter are clearly related and show research development step by step.

Chapter 1 Introduction	•The chapter introduces the research area of concern.
Chapter 2 Litrature Review	•The chapter describes the litrature related to the IS success, BIS and BIS measurment.
Chapter 3 Research Methodology	•The chapter describes the research methodology of this study.
Chapter 4 Case study and data collection	•Chapter explains the selected case study organization and process of data collection.
Chapter5 Data Analysis	•Chapter 5 describes the data analysis of the research in order to achive the research objectives.
Chapter 6 BIS service quality Metrics	•The chapter describes the services that should be supported by BIS and the quality metrics of the BIS services.
Chapter 7 BIS System quality metrics	•This chapter explains factors that effect on BIS system quality and quality metrics of them.
Chapter 8 BIS information quality metrics	•The chapter explains specification of data managment systems of BIS and shows the quality metrics for measuring information quality.
Chapter 9 Discussions and BIS success measuring metrics	•This chapter discusses on research and findings.
Chapter 10 Conclusion	•The chapter concludes the research and explore recommendations of the research.

Figure 1.2: Structure of thesis

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APPENDIX A

CASE STUDY PROTOCOL: Measurement Metrics for Business Intelligence System Success

A.1 Outline

Appendix A explains case study protocols of the research. This Appendix includes following information:

- Description of the Research
- Methodology of the Research
- Objectives of the Case Study
- Methodology of the Case Study
- Procedures
- Protocol of Questions

A.2 Description of the research

This section highlights the researcher background, problem background, research objective and scope of the research.

A.2.1 Background of the Researcher

The researcher is a lecturer in the IT Department at the Faculty of Information Technology and Computer Science at Urmia University of Technology.

In addition, he is BIS professional who play role as BIS developer in IRANIAN IT companies. He has six years of experience in developing BIS. His research interest in BIS, human-IT interaction, IT and organizations lead him to conduct research on explore the measurement metrics for BIS success which has become his PhD research topic.

A.2.2 Background of the problem

Researcher found that the proving BIS value and managing BIS process are important for organizations. Moreover, he found organization for understanding the value of BIS and managing BIS process started to measure BIS. However, there was not any reliable method for measuring BIS.

A.2.3 Research Objective

The overall objective of this study is to identify the measurement metrics for BIS success. The specific objectives are:

1. To understand the concept of BIS success
2. To identify BIS success measurement criteria
3. To propose BIS success measurement metrics

A.2.4 Scope of the research

The research focuses on IRANIAN context of BIS, specifically on car manufacturing companies. Interpretive qualitative case studies conducted for data collection for the research. Target group was managerial level and technological level of the organization.

A.3 METHODOLOGY OF THE RESEARCH

This research aimed to analytically review various works on BIS measurement, extract the gaps, find the criteria of BIS success, perform studding on the case study organization and finally propose BIS success measurement metrics. The methodology of the research is as follows:

- Literature review on BIS, BIS measurement, BIS implementation, IS success and BIS in car manufacturing companies.
- Develop instruments for data collection
- Conduct case study to gather data from the organizations.
- Conduct data analysis using specific software tools
- Produce the results and conclude the findings

A.4 OBJECTIVES OF THE CASE STUDY

- To understand the IS in general and specifically BIS utilization status in organization
- To explore the motivation factors for managers to implement BIS
- To understand different perspectives and expectations of the organizations on BIS services and service quality
- To identify critical success factors that effect on BIS system quality
- To discover organizational needs of BIS provided information and information quality

A.5 METHODOLOGY OF THE CASE STUDY

- Conduct focus groups with managerial and technological levels personnel
- Transcribe focus group as resource for conducting research

- Conduct interviews with management level and Technological level personnel
- Transcribe focus group as resource for conducting research
- Transcribe the interviews
- Conduct organization document review

A.6 PROCEDURES

Gaining access to the organizations information to conduct the case study across following steps:

- Send letter to the director of the chosen organizations describing the nature of the research and soliciting participation for case study
- Start the case study
- Upon agreement of the organizations to participate in the case study, get the general information of the organization BIS

A.7 PROTOCOL of QUESTIONS

A.7.1 Management level

- History of the organization
- Self-assessment of the organization and the applications
- Expectation towards IS in general and specifically BIS
- Responsibilities towards the BIS utilization and measurement
- Organizational problems when the organization starts to use BIS
- Organizational changes which occur during/after implementation
- Their evaluation of BIS
- Organizational imagination of BIS

A.7.1 Technical personnel

- Background of the IS and BIS implementation in the organization
- Self-assessment of the department and the applications
- Responsibilities towards the BIS utilization and measurement
- Technical information about BIS, problems when the organization starts utilizing BIS, changes which occur during/after implementation

APPENDIX B

FOCUS GROUPS QUESTIONS

B.1. Questions of Managerial focus groups

B.1.1. Questions for understanding BIS services and service quality

1. Why do organizations moving toward Business Intelligence system? And which functionalities are considered in buying BIS?
2. Please describe briefly on the background of this organization and how it started to use Information Systems and How long have your organizations been using the BIS?
3. Did your organization ever rejected/stopped any kind of IS or BIS because of its services and functionality? What was the weakness?
4. Your organization have some other IS, such as ERP, e-SCM, CRM and ... what is the advantage of BIS compare to them? I mean, what is the benefits of using BIS compare to other IS?
5. How it is possible to evaluate BIS, especially BIS provided services? And how do you understand a service is useable?

B.1.2. Questions for understanding BIS system and system quality

1. How was the organization management level involvement in implementing BIS?
2. In your organization, usually who are the decisions makers about buying enterprise information system? (Organization wide, department level) what

do they consider when buying IS / BIS? And which considerations are important to develop/implement BIS?

3. Who are the parties that are currently responsible in developing/maintaining/implementing the BIS in the organization? (Internal technical staffs, outsource, vendor. If different parties at different level describe)
4. How BIS system quality is measurable?

B.1.3. Questions for understanding criteria of BIS information quality

1. Do you believe BIS effect on organizational information? What is the effect of using BIS on information?
2. What is the different between BIS provided information and other IS?
3. What are the important features for BIS DMS?
4. Which services should be provide by BIS DMS to perform on information?
5. How do you evaluate the information quality and usefulness of BIS information?

B.2. Questions of Technological focus group

B.2.1. Questions for understanding BIS services and service quality

1. Did your organization ever rejected/stopped any kind of IS or BIS because of its services and functionality? What was the weakness?
2. How BIS provided services do effect on organization technological level personnel job?

B.2.2. Questions for understanding BIS system and system quality

1. What are important consideration for organization in selecting, implementing and using BIS?
2. What are the organizational/technical/personal advantages/disadvantages while utilizing BIS?
3. How the organization evaluate hardware for continuing/stopping/rejecting its use?
4. How the organization evaluate software for continuing/stopping/rejecting its use?
5. Is there any difference between the hardware that used for BIS and other information systems hardware?
6. How do maintenance processes taking place?
7. Is there any measure of matrices? How do you test the hardware?
8. What is different between BIS and other Information systems such as ERP software? I heard that you buy BIS from SAP so what did your software developing group in developing BIS? Did you apply any changes in order to improving BIS applications?
9. How did software technical personnel cooperate with hardware technicians?
10. Do you have any method to evaluate and test software?

B.2.3. Questions for understanding criteria of BIS information quality

1. Did your organization ever rejected/stopped any kind of IS or BIS because of its information quality and DMS functionality? What was the weakness?
2. How BIS provided DMS functions on information do effect on organization technological level personnel job?
3. How does BIS information quality be evaluated?

APPENDIX C

INTERVIEW QUESTIONS

C.1. Question for identifying the IS in general and specifically BIS utilization status in organization:

1. Please describe briefly about your responsibilities in this organization.
2. What are your responsibilities related to IS and BIS selecting in your organization?
3. Have you known about BIS before its implementation in the organization?
What did you know about it?

C.2. Questions for understanding BIS quality and quality metrics

These questions helps researcher to understand managerial and technical levels points of views about BIS quality. These questions are divided to three groups as follow:

C.2.1. Question for discover BIS services and service quality

C.2.1.1. Managerial level

1. Personally, how do you perceive BIS (initial perception, general perception)?
What do you understand about BIS?
2. Would you please explain about your own expectations of BIS in your job and management?
3. What is the functionality or functionalities of BIS for the organization?
4. What is the meaning of “BIS effects on organization profitability”? What is the meaning of profitability?
5. How do the BIS effect on organization processes?
6. Have you seen BIS being use differently than its intended usage in the organization?
7. Do you think BIS functions and services have improved your work? If yes then How and which services? If no then why?
8. How do you judge about an ability of BIS? Means how do you understand a function or service have proper quality?

C.2.1.2. Technological level

1. Which specification of BIS is motivating you to suggest BIS for organization?
2. Has your organization ever rejected any kind of IS or BIS because of its services and functionality? How and why?
3. Do you think BIS functions and services have improved your work? How?
4. How do you judge about an ability of BIS? Means how do you understand a function or service have acceptable quality?

C.2.3. Question for discover BIS system specification and system quality

C.2.2.1. Managerial level

1. What things/factor that the organization would consider when buying/implementing new software/information systems (the one not included in the policy, i.e user acceptance, organization needs etc.) or (What was important before implementing BIS for your organization?)
2. What are the important factors for choosing a vendor? (What is your mean of vendor reliability?)
3. What is your mean by saying clear visions and missions and goals?
4. To choose a project managers which factors is important for you?
5. What makes you use the BIS? How do find using the BIS? (easy, easy after quite some time, hard)
6. What/who influence on the implementing/utilizing BIS? (Staff's recommendation, organizations need, vendors recommendation, government recommendation – if possible be precise and refer to documentation if any i.e. Proposal, contract etc.) Do governments or other BIS initiatives influence your BIS implementation and utilizing?
7. Is there any resistant in the usage of the applications and BIS? (Which level: top management, technical personnel, and normal staffs)? If yes, what are the reasons of their resistant?
8. How many vendors do you rely on when buying a new system for your organization?
9. Who provide the training and support for the BIS? (internal/vendor)
10. In your opinion what is important for implementing a BIS?

C.2.2.2. Technological level

1. Is the compatibility of current system and BIS important for you?
2. What are the organizational/technical/personal advantages/disadvantages that you have identified while utilizing BIS?

3. Has your organization ever rejected/stopped any kind of hardware? Why?
4. Has your organization ever stopped/rejected using any kind of software? Why?
5. Are there any positive/negative changes in the organizational/technical environment after the implementation and utilizing BIS?
6. How do implementation and maintenance processes taking place? Why?
7. Is there any difference between the hardware that used for BIS and other information systems hardware? Did the organization apply new networking systems and equipment?
8. Which factors are important in selecting hardware?
9. How can the organization realize the hardware is proper and useful? Is there any measure of matrices? How do you test the hardware?
10. What do you do if you found a problem of failure in test results?
11. Would you please explain what is different between BIS other Information systems software?
12. I heard that you buy BIS from SAP so what did your software developing group in developing BIS? Did you apply any changes in order to improving BIS applications?
13. How did you cooperate with hardware technicians?
14. Do you have any method to evaluate and test software?
15. In your opinion what is important for implementing a BIS?

F.2.3. Question for discover BIS information specification and information quality

F.2.3.1. Managerial level

1. Has your organization ever rejected/stopped any kind of IS or BIS because of its information quality?
2. What do the organizations want from BIS data management system?
3. What is the BIS provided information and data management system specifications?
4. Which services should be provide by BIS DMS to perform on information?

5. How do you evaluate the information quality and usefulness?

F.2.3.2. Technological level

1. What is the best architecture for BIS DMS?
2. What is the technical functionality and specification of BIS DMS?
3. Which technical functionality should be support by BIS DMS?
4. Is there any individual specification of hardware that used for BIS DMS?
5. How is it possible to evaluate BIS DMS functionality?
6. How it is possible to evaluate BIS DMS generated information?