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Organizational Readiness Toward Business Intelligence Implementation Case Study: Ministry of Education & Higher Education – Gaza

مدى جاهزية المؤسسة لتطبيق نظام ذكاء الأعمال دراسة حالة: وزارة التربية والتعليم العالي –بغزة

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أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

Organizational Readiness Toward Business Intelligence Implementation
Case Study: Ministry of Education & Higher Education – Gaza

مدى جاهزية المؤسسة لتطبيق نظام ذكاء الأعمال
دراسة حالة: وزارة التربية والتعليم العالي –بغزة

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بناءً على موافقة شئون البحث العلمي والدراسات العليا بالجامعة الإسلامية بغزة على تشكيل لجنة الحكم على أطروحة الباحث/ **بدر أحمد عبدالرحمن بدر** لنيل درجة الماجستير في كلية *التجارة*/ قسم إدارة الأعمال وموضوعها:

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Organizational Readiness Toward Business Intelligence Implementation Case Study: Ministry of Education & Higher Education - Gaza

وبعد المناقشة التي تمت اليوم الأربعاء 23 جمادى الثانية 1438 هـ، الموافق 2017/03/22م الساعة الواحدة مساءً، في قاعة مؤتمرات مبنى القدس، اجتمعت لجنة الحكم على الأطروحة والمكونة من:

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وبعد المداولة أوصت اللجنة بمنح الباحث درجة الماجستير في كلية *التجارة*/ قسم إدارة الأعمال.

واللجنة إذ تمنحه هذه الدرجة فإنها توصيه بتقوى الله ولزوم طاعته وأن يسخر علمه في خدمة دينه ووطنه.

والله ولي التوفيق ،،،

نائب الرئيس لشئون البحث العلمي والدراسات العليا

أ.د. عبدالرؤوف على المناعمة

Abstract

Business Intelligence (BI) is becoming one of the fastest growing systems in the Information Management (IM) field. Due to the complexity of the implementation process of BI, Many BI investments face serious challenges leading to under expected benefit returns and most probably system failure. Thus, performing a readiness assessment toward BI becomes essential for avoiding loss and reducing implementation's risks. This study aims to develop a readiness assessment framework based on the critical success factors (CSFs) of BI in Gaza Strip environment. To achieve this objective, this study followed a three-phase exploratory mixed-methodology: Firstly, a relevant literature review was carried out to consolidate and extract the CSFs that significantly affect the BI system during the pre-implementation phase. A comprehensive list of fourteen CSFs, categorized into three domains: *Organization, Process, and Technology*, has been derived. In the second phase, a CSFs readiness framework has been developed by ranking and weighting the factors using AHP method and developing contextual terms for each factor. Results showed that *Organization* domain was the most important domain with importance weight of 62.1% followed by *Process* domain and *Technology* domain with 25.1% and 12.8% respectively. In addition, study results exposed that the top seven factors were *Top Management Support*, *Vision & Planning*, *Available Data Quality*, *Resource Allocation*, *Appropriate Team Skills*, *IT Governance*, and *Continuous Improvement Culture* with 20.0%, 12.7%, 9.9%, 8.1%, 7.1%, 6.3% and 6.0% respectively. Finally, the proposed framework was then applied at Ministry of Education & Higher Education (MoEHE) by conducting a quantitative survey to measure the readiness level of the top seven factors. The assessment of MoEHE illustrated that the overall readiness of the ministry was 71.4%. The study found that *Appropriate Team Skills, Available Data Quality, and Top Management Support* factors were adequate and suitable for BI adoption. While, *Vision & Planning, Resource Allocation, Continuous Improvement Culture and IT Governance* factors were insufficient and needed more attention to be improved. Organizations in Gaza are strongly recommended to use the proposed readiness framework before starting BI implementation process. Future empirical studies are recommended to validate the proposed readiness framework by checking the relationship between the proposed CSFs and BI success.

الملخص

أضحت برامج ذكاء الأعمال واحدة من أهم البرامج وأكثرها انتشارا في مجال إدارة المعلومات. وانطلاقا من أن عملية تبني وتطبيق برامج ذكاء الأعمال تعد عملية صعبة ومعقدة، فإن العديد من الاستثمارات في هذا المجال لا تحقق الفوائد المرجوة منها مما يؤدي إلى فشل الاستثمار في هذه البرنامج. ولهذا، فإن من الضروري أن تقوم المؤسسات بتقييم مدى استعدادها لتبني برامج ذكاء الأعمال لتقليل الخسائر والحد من مخاطر التطبيق. تهدف هذه الدراسة إلى تصميم نموذج لقياس مدى جاهزية مؤسسات قطاع غزة لتطبيق برامج ذكاء الأعمال. وقد استخدمت الدراسة منهج البحث الاستكشافي وقسمت العمل إلى ثلاث مراحل. في المرحلة الأولى، عمل الباحثون على مراجعة الدراسات السابقة ذات العلاقة لاستخراج عوامل النجاح الحرجة المؤثرة على تطبيق برامج ذكاء الاعمال خلال فترة ما قبل التنفيذ. نتج عن المرحلة الأولى قائمة شاملة مكونة من أربعة عشر عاملا صنفوا إلى عوامل تنظيمية وعوامل تطبيقية وعوامل تكنولوجية. في المرحلة الثانية من الدراسة انتقل الباحثون إلى تصميم نموذج لقياس جاهزية المؤسسات من خلال ترتيب وحساب الأهمية النسبية للعوامل الحرجة باستخدام أسلوب التحليل الهرمي AHP. حيث اظهرت النتائج هيمنة العوامل التنظيمية بنسبة أهمية بلغت 62.1% تليها العوامل التطبيقية بنسبة 25.1% بينما حصلت العوامل التكنولوجية على نسبة 12.8%. كما وأظهرت النتائج أن العوامل التالية: *دعم الإدارة العليا، رؤية المؤسسة وتخطيطها، جودة البيانات، القدرة على تخصيص الموارد، مهارة فريق التطوير، حوكمة تكنولوجيا المعلومات، وثقافة التحسين المستمر* هي أعلى سبع عوامل من ناحية الأهمية النسبية والتأثير على تطبيق برامج ذكاء الأعمال بنسب 20.0%، 12.7%، 9.9%، 8.1%، 7.1%، 6.3%، 6.0% على التوالي. وفي المرحلة الثالثة من الدراسة، قام الباحثون بتطبيق نموذج قياس الجاهزية للمؤسسة على وزارة التربية والتعليم العالي من خلال استخدام استبيان كمي لقياس مدى جاهزية العوامل الحرجة داخل الوزارة لتطبيق برامج ذكاء الأعمال. وقد بينت النتائج أن الوزارة جاهزة بنسبة 71.4%. كما وأظهرت النتائج أن *دعم الإدارة العليا ومهارة فريق التطوير وجودة البيانات* جاهزة ومناسبة لدعم عملية التطبيق، بينما أوضحت أن الوزارة لديها ضعف في الجوانب التالي: *رؤية المؤسسة وتخطيطها والقدرة على تخصيص الموارد وحوكمة تكنولوجيا المعلومات وثقافة التحسين المستمر* والتي تحتاج إلى المزيد من الاهتمام والتطوير لإنجاح تبني وتطبيق برامج ذكاء الأعمال. وفي النهاية أوصي الباحثون الوزارات والمؤسسات المحلية باستخدام النموذج المقترح من قبل الدراسة لقياس مدى جاهزيتهم قبل الشروع في تطبيق برامج ذكاء الأعمال. كما ويدعو الباحثون إلى عقد بحوث مستقبلية للتحقق من صحة ودقة النموذج المقترح من خلال فحص العلاقات بين عوامل الحرجة ونجاح تطبيق برامج ذكاء الأعمال.

Dedication

Especially dedicated

To my dear parents, mother and father,

To my beloved family, Abeer, Ahmed and Mohammed,

To my dear brothers, sisters and their beloved families,

To my dear friends and MOEHE colleagues,

To those who sacrifice their lives so that we might live in dignity, The Martyrs

To those who was robbed of their freedom so that we might live in freedom, The Prisoners

To Palestine, All Palestine

To all of you I dedicate this work.

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List of Abbreviations

ADQ : Available Data Quality
AHP : Analytical Hierarchy Process
AR : Resource Allocation
ATS : Appropriate Team Skills
BI : Business Intelligence
BIS : Business Intelligence System
CEO : Chief Executive Officer
CI : Consistency Index
CIC : Continuous Improvement Culture
CIO : Chief information officer
CM : Change Management
CR : Consistency Ratio
CRM : Customer Relationship Management
CSFs : Critical Success factors
DSS : Decision Support System
DW : Data Warehouse
ERP : Enterprise Resource Planning System
ETL : Extract, Transform and Load
IM : Information Management
IS : Information System
IT : Information Technology
ITC : User IT & Analytical Culture
ITG : IT Governance
ITI : IT Infrastructure
KPI : Key Performance Indicator
MCDM : Multi Criteria Decision Making
MIS : Management Information System
MoEHE : Ministry of Education & Higher Education
NPV : Net Present Value
OCC : Cross-Organization Collaboration Culture
OLAP : Online Analytical Processing
OLTP : Online Transactional Processing
PC : Presence Of Champion
PIP : Project Implementation Profile
PMM : Project Management & Methodology
ROI : Return Of Investment
TMS : Top Management Support
UI : User Involvement
VP : Vision & Planning

Chapter one
Introduction

Chapter One: Introduction

1.1 Introduction

Information plays a vital role in the most management processes and functions including planning, organizing, controlling, and decision-making. Hence, it is a widely held view that information is the power that nothing moves without it. In addition, organizations that cannot properly utilize their information assets risk serious failure. As a result to the rapid changes in the organizations' internal and external environments, organizations are working hard to lever the benefits from information through adopting a new concept called Information Management (IM).

Information management is acquisition of information from all available sources and distribution of that information to those who need it. Information management is a superset of many functions and systems, including data quality, master data management, data warehousing, business intelligence, etc. Many organizations began adopting Data Warehouse (DW), which is a central repository of integrated current and historical data from one or more disparate sources. Soon, many organizations recognized that a data warehouse is just the first step toward building an information infrastructure that supports a complete range of analytical activities and applications. This led to the emergence of a new conception called Business intelligence (BI), which has come to take advantage of the data warehouse by turning data into knowledge and knowledge into action for business gain. According to a survey released by Gartner Group (2008), BI has become one of the most important strategic tools and is considered highly demanded system (Anjariny, Zeki, & Hussin, 2012).

Although, the successful implementation of BI can achieve 400% ROI (Adamala & Cidrin, 2011), BI implementation is such a complex and comprehensive process which is affected by many technical and nontechnical factors, so many of BI investments failed to reach the expected and desired outcomes (Olszak & Ziemba, 2012; Yeoh & Koronios, 2010; Yeoh, Koronios, & Gao, 2008). Recently , many researchers investigated the Critical Success Factors (CSFs) of BI to increase the chance of a successful BI implementation (Adamala & Cidrin, 2011; Anjariny et al., 2012; Dawson & Van Belle, 2013; Naderinejad, Tarokh, & Poorebrahimi, 2014; Olbrich et al., 2012; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010).

The high failure rate of BI initiatives lead to the fact that many researchers consider the readiness assessment as one of the key success factors for BI systems and essential for reducing implementation's risk (Anjariny et al., 2012; Consulting, 2008; S. Williams & Williams, 2004, 2010). Organizational readiness of BI refers to the degree of preparation and the existence of the essential prerequisites necessary to capture the full business value of BI (Reinschmidt & Francoise, 2000). Theoretically, organizations with a high level of readiness have a lower level of risk and able to leverage the success ratio for new BI system.

The current study addresses the organizational readiness assessment of BI systems. This research uses a three-phase exploratory methodology: In the first phase, an investigation of previous studies has been used to analyze, consolidate and extract the critical success factors (CSFs) of BI systems. In the second phase, a CSFs readiness assessment framework for BI has been developed by ranking and weighting the factors using AHP method and developing contextual terms for each factor. Finally, a case study has been conducted to thoroughly analyze the proposed framework. The readiness assessment framework has been applied to Ministry of Education & Higher Education (MoEHE) as one of the biggest and most important ministries in Palestine.

1.2 Problem Statement

To get adapted to the rapid changes in business environment, organizations are working hard to leverage the benefits from information through adopting the new conception of Information Management (IM). The top demanded system in this field is Business Intelligence (BI). BI is a set of integrated tools that gather, store and analyze the available data to generate a useful information for the decision-making process. BI supports users to access the right data in the right time to take the right decision.

In 2008, Palestinian Authority has taken a decision to invest in information systems' tools to increase and improve work and deliver its services and facilities in an effective and efficiency way. This decision became a strategic objective for many Palestinian Authority ministries including the ministry of education & higher education (MoEHE), which implemented the Enterprise Resource Planning (ERP)

supported by UNICEF. Furthermore, depending on the interviews conducted with experts from different fields (governmental, private, and high educational fields), the experts mentioned that many organizations in Gaza decided to invest in information systems to improve work and to deliver services effectively and efficiently. The adoption of Information Systems generates huge data over years. Thus, some organizations in Gaza are looking forward to utilizing the existing data to support decision-making process in the light of business intelligence. The IT director general and the project manager of MoEHE declared that after a successful implementation of ERP, BI adoption has become a strategic goal for the ministry and it is one of the scheduled projects that will be sponsored by UNICEF in 2017 (M. Khateeb, IT director general, June 15, 2016).

Unfortunately, BI is a complex system that has a high failure rate. 50-80% of BI initiatives were under expectation and failed to achieve their objectives (Adamala & Cidrin, 2011; Jamaludin & Mansor, 2011; Yeoh & Koronios, 2010). Such failure costs organizations huge monetary, time, and man efforts. This is why MoEHE and other organizations need to deeply evaluate their readiness for change before investing in BI. Hence, this study introduces a readiness assessment framework based on the critical success factors of BI. Then, the last phase of this study aims to fulfill the MoEHE need by applying the proposed framework to the ministry as a case study to assess to what extent the ministry is ready to accept BI system and to provide a suitable recommendation for BI implementation.

1.3 Research Questions

The study come to answer the following research questions:

1- What is the most important Critical Success Factors (CSFs) of Business Intelligence (BI) implementation in Gaza strip?

2- What is the impact weight for each Critical Success Factor (CSF) on Business Intelligence (BI) success implementation based on Gaza context?

3- Is there a suitable readiness assessment framework to assess the organizational readiness of BI adoption in Gaza?
4- What are the contextual terms of each Critical Success Factors (CSFs) of Business Intelligence (BI) in Gaza?
5- What is the overall readiness ratio of implementing Business Intelligence (BI) in Ministry of Education & Higher Education (MoEHE) - Gaza?
6- What are the weaknesses that the Ministry of Education & Higher Education - Gaza should focus on to maximize BI benefits?

1.4 Research Objectives

Based on the above introduction and problem statement, the study has the following specific objectives:

1- To investigate and determine BI critical success factors and their associated contextual elements that influence implementation of BI systems.
2- To identify the most important factors by ranking and weighting the BI critical success factors according to relevance, controllable, and variability dimensions.
3- To develop a framework for evaluating the organizational readiness of BI adoption.
4- To deeply investigate the proposed framework by applying it to the Ministry of Education & Higher Education (MoEHE) as a case study.
5- To determine the weaknesses that the Ministry of Education & Higher Education - Gaza should focus on to maximize BI benefits.

1.5 Research Variables

The current research contains fourteen variables, *Critical Success Factors*, that may affect the success of BI implementation in Gaza, these factors are briefly descripted as follows:

1- ***Vision & Planning (VP):*** Organization should have a clear vision about the needs, reasons, and benefits that must be achieved by BI investment. Therefore the organization must align BI to organization vision, business needs and strategies (Yeoh & Koronios, 2010).

2- ***Top Management Support (TMS):*** BI should be business driven with widespread management support. The commitment and involvement of senior management are imperative since this will help in overcoming resistance and manage the change process (Yeoh & Koronios, 2010).

3- ***Resource Allocation (RA):*** There should be adequate funding, hardware, software and human resources (Hawking, 2013).

4- ***Continuous Improvement Culture (CIC):*** adopting continuous improvement culture and empowering all members within an organization to continuously seek opportunities for improvement is considered a significant factor for success of BI implementation (S. Williams & Williams, 2004).

5- ***User IT & Analytical Culture (UIT):*** Organizations that are accustomed to the use of information, IT technologies and analytical frameworks do better to lever benefits of BI (Hidayanto, Kristianto, & Shihab, 2012).

6- ***Cross-Organization Collaboration Culture (CC):*** To succeed at BI, an enterprise must nurture a cross-organizational collaborative culture in which everyone grasps and works toward the strategic vision (Hidayanto et al., 2012).

7- ***IT Governance (ITG):*** it consists of organizational structures, mechanisms, and processes that guide the management to leverage the organization's IT outcome and ensure that the organization's IT extends organization's strategies and objectives (Gheorghe, 2010).

8- ***Appropriate Team Skills (ATS):*** Staff in the client organization and external consultants should have the appropriate knowledge, skills, and experience (Yeoh & Koronios, 2010).

9- ***Presence of Champion (PC):*** a business-centric champion would view the BI system primarily in strategic and organizational perspectives, as opposed to one who might over-focus on the technical issues. It is always important since he will be able to foresee the organizational challenges (Yeoh & Koronios, 2010).

10- ***Project Management & Methodology (PMM):*** The BI system should be a business-driven process and recommend to be developed iteratively with a quick turnaround between requirements analysis and delivery of outcomes (Reinschmidt & Francoise, 2000).
11- ***User Involvement (UI):*** Better user participation in the process of change can lead to better communication of their needs, which in turn can help ensure the successful introduction of the system (Yeoh & Koronios, 2010).
12- ***Change Management (CM):*** successful dealing with changes in business environment and reduced user resistance leads to better user acceptance for adopting the new system (Yeoh & Koronios, 2010).
13- ***Available Data Quality (ADQ):*** Operational data sources should be available. *Extract, Transform and Load* (ETL) tools should ensure data currency, consistency, and accuracy (Reinschmidt & Francoise, 2000).
14- ***IT Infrastructure (ITI):*** ITI should be of high degree of organizational fit with the BI hardware and software, and be flexible to adapt the emerging and ever-changing business requirements (Negash, 2004).

1.6 Significance of this study

Importance for researcher, the researcher has a bachelor degree in computer engineering with professional IT background, and he works in the Ministry of Education & Higher Education (MoEHE) as an IT team manager responsible for developing, evaluating and supporting the ministry's ERP system. The researcher aims to better understand the BI system capabilities and needs and to identify its critical success factors to prepare his team and the ministry for BI adoption, which is considered a strategic tool for MoEHE. In addition, this study is a mandatory requirement in the Master of Business Administration (MBA) program and is conducted by the researcher to fulfill the requirement of MBA degree.

From a theoretical perspective, business intelligence system is a relatively new concept. Most of the existing studies have focused on the implementation aspects. They have determined the critical success factors of BI by applying a qualitative methodology on the organizations that already implemented the system. Whereas this study extends existing research by targeting organizations that are contemplating to

implement a BI system. This study explore the critical factors during the pre-implementation phase and extends current research by developing a readiness assessment framework with contextual terms for each factor.

From a practical perspective, BI is becoming one of the fastest growing systems in the for-profit, non-profit, government and academic organizations. With a big data generated over years, many organizations find themselves in need to sift through terabytes of data sets and statistics. The importance of this study emerges from the fact that such systems are still new in Gaza and need to be studied in order to figure out whether organizations have adequate level of readiness to invest in this field. In addition, developing a readiness assessment framework helps organizations, in Gaza, to evaluate their readiness toward BI and determine their weaknesses. It provides some guidelines to managers to manage implementation risks and increase the chances of the BI success.

Finally, this study comes to bridge the theoretical and practical gap of BI implementation by deeply reviewing previous research and identifying the critical success factors of BI, then conducting an investigation with experts who have professional background in practical implementation of BI. Finally, a practical test was conducted by applying the proposed framework to MoEHE as one of the biggest ministries in Gaza. This study provides a holistic picture of business intelligence implementation.

1.7 Research Limitations

As with most research of this nature, time available to investigate the research problem is limited. This limitation led to conduct an interview with just fifteen experts in the information system field. However, this number of experts is considered suitable to conduct this study and gain acceptable outcomes.

Although this study addresses many relevant studies and collects a good amount of data from conducting interviews with experts and applying questionnaires, it is hard to say that this study has determined every issue related to BI project implementation. There might be new studies that may not have been addressed. However, this is

common in studies that deal with a new field, and it has not affected the core findings of the study.

Furthermore, this research concentrates on issues of BI implementation based on mix methodology. The study followed a qualitative method to identify the CSFs and their contextual terms, and then it used a quantitative method to rank and weight these factors according to their impact on BI success. Finally, the developed framework was tested by a quantitative survey on MoEHE as a case study. In spite of that, a generalization of the outcomes of this research is considered a major limitation, the outcomes can be used in Gaza, but may not be immediately applicable to other countries without applying future empirical studies to validate and adapt the proposed results.

1.8 Structure of the Thesis

The study consists of six chapters. Chapter 1 contains a general introduction that includes the problem statement, research questions, research objectives, research variables, research importance, and structure of the thesis. Next, Chapter 2 contains the literature review, and it includes a brief discussion of the concept of BI in terms of definition, benefits, architecture, critical success factors, and readiness assessment. Then, Chapter 3 presents relevant studies and research papers, which are related to the CSFs of BI and BI readiness assessment. Chapter 4 contains research design and methodology, which includes study phases, factors selection process, experts selection, AHP implementation, and applying the proposed framework to a case study. Chapter 5 contains the data analysis and results, and it includes descriptive analysis and answering research questions, and data analysis to determine the factors' weights. Finally, Chapter 6 includes the conclusions and the recommendations of the study.

1.9 Chapter Summery

In this chapter, the researchers introduced the problem under study, elaborated on the study objectives, questions, and explained the various variables handled throughout the study. He also pointed out the importance of the research to the different

parties encompassing the researchers themselves, other researchers, and organizations in Gaza Strip. Study boundaries and limitations were also briefed.

Chapter Two
Literature Review

Chapter Two: Literature Review

This chapter introduces the concept of BI in terms of definition, implementation benefits, Architecture and the critical success factors. It discusses the organizational readiness for BI adoption. This chapter deeply explains the critical success factors (CSFs) of BI implementation and the impact of these factors on BI success during the pre-implementation phase.

2.1 Business Intelligence

This section presents the information related to BI systems, focusing on BI definition, features, benefits, and architecture.

2.1.1 Defining Business Intelligence

Researchers understand and define business intelligence (BI) differently and from different perspectives. For instance, Vitt, Misner, and Luckevich (2002) defined BI as an approach of management that enables organizations to define and identify the useful and relevant information for corporate decision making. C Howson (2007) described BI as a tool that allows employees at all levels of an organization to access, interact with, and analyze data to make intelligent decisions, improve performance, discover opportunities, and operate efficiently. In addition, BI was defined as a new approach that help managers to make tough decisions as shortly as possible through understanding their organizations in better manner (Naderinejad et al., 2014). From IT perspective, Golfarelli, Rizzi, and Cella (2004) defined BI as an information system which processes data into information and then into knowledge to facilitate decision making. Negash (2004) supported Golfarelli definition in more details when he described BI as a collection of integrated tools for gathering, storing and analyzing data then manage the resulting knowledge to present complex and useful information to decision makers. Carlo (2009) defined BI as a mathematical and analysis models that use data from various resources to produce useful knowledge and improve decision-making. Anjariny et al. (2012) and Dawson & Van Belle (2013) also defined BI as the ability of a user to access the right data at the right time to take a right decision.

As we see above, all BI definitions have a common theme affiliated with the fact that BI is an integrated combination of processes and technologies to support decision-making. The proposed definition for BI, which supports the purpose of this research, is that BI is a set of integrated tools to collect, store, analysis and manage data to support decision makers in all employee levels to take a right decision at the right time.

2.1.2 Values and Benefits of Business Intelligence

Gartner (2016) indicated that the revenue of BI market reached to $16.9 billion in 2016 showing an increase of 5.2% from 2015 and an increase of 60.7% from 2010. This trend reflects the level of BI impact on a company's performance. In addition, Gartner (2012) conducted a survey of Chief Information Officers (CIOs) who found that BI system is considered to be the most demanded and adopted software, as well as owning the highest priority in technology software in 2012.

The main objective of BI system is to improve decision making process by providing a useful and right information to the right people at the right time (Bălăceanu, 2007). A survey on 3000 participant from more than 100 countries was conducted by LaValle, Lesser, Shockley, Hopkins, and Kruschwitz (2011) and concluded that top companies rely on BI to support their decision making wherever possible, while lower performing companies use human intuition for decision making. Also, BI focuses on reducing decision latency - amount of time taken to access the required information - by standardizing and integrating data from different functional areas ,transforming and storing the result information in a centralized repository which facilitate quick access and analysis (Eckerson, 2005).

Hočevar & Jaklič (2008) and Nofal & Yusof (2013) argued that BI systems can bring multiple benefits via dynamic enterprise data search, analysis, explanation of the needed data, faster and easier access to information which facilitate decision making and leading to achieve new competitive advantages. The top companies depend on BI to understand the capabilities available in the firm, customer's trends, market future directions, the actions of competitors and the implications of these actions (Negash, 2004).

BI adoptions provide tangible and intangible benefits (Negash, 2004). From the economic perspective, each adopted software project is considered as an investment, so the value of BI as an investment is measured by Return Of Investment (ROI) (Sullivan, Chalasani, Jha, & Sazawal, 1999). For example, 1 million BI investment must result an incremental cash flow of at least 1 million to cover investment cost and save the organization from a reduction in assets. Therefore, organizations must focus on improving management processes (like planning, controlling, measuring and monitoring) or improving operational processes (like fraud detection, sales campaign execution, customer order processing and purchasing) that lead to a significant influence in increased revenues or reduced costs or both (S. Williams & Williams, 2003).

IDC (1996) proved that a successful BI initiatives achieve a magnificent ROI by a survey on 62 companies found an average ROI of 401% over a three-year time period with an average payback equal to 2.3 years, this study excluded failed projects as well as exceptional performers (both good and bad). As well as, Morris (2003) analyzed the ROI associated with BI adoption in 43 North America and Europe. He found that 20 companies achieved a ROI less than 100%, 15 achieved an ROI between 101% and 1000% and 8 achieved a magnificent ROI greater than 1000%.On the other hand, a survey of 540 IT professionals found that the intangible benefits were equal or more important than the tangible benefits (Gibson, Arnott, Jagielska, & Melbourne, 2004) . Hannula & Pirttimaki (2003) found by survey on 50 that most companies do not consider the tangible benefits as primary benefit when investing in BI systems , hoping that the intangible benefits will lead to a big bang ROI at some time in the future.

Computerworld (2007) conducted a survey on 227 IT international respondents to measure the benefits of BI adoptions. Computerworld identified the key benefits expected to be derived from BI adoption as shown in Figure (2.1). The survey showed that the highest rate benefits are intangible such as quality and relevance of decisions made, single and unified view of enterprise-wide information, better aligning resources with strategies, speeding up the decision-making process and responding to user needs for availability of data on a timely basis.

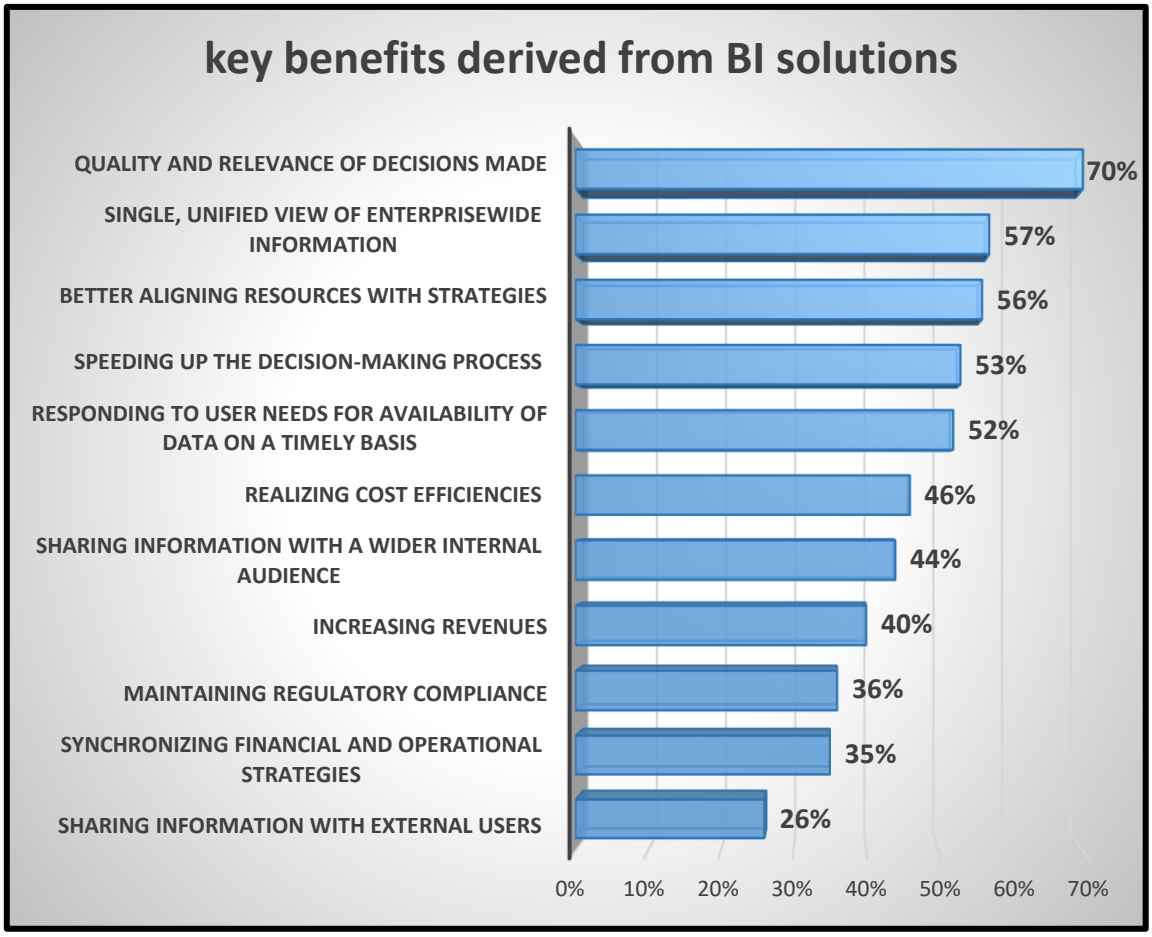

Figure (2.1): Key benefits derived from BI solutions

Source: Computerworld (2007)

S. Williams and Williams (2003) described useful methods to up-front business value analysis aiming to get an estimated value of BI initiatives:

1. ***BI Opportunity Analysis***: A comprehensive assessment of how BI can be used to identified and prioritize the company opportunities based on what amounts to a risk/reward tradeoff (S. Williams & Williams, 2010). In addition, how BI enable critical strategies and support key business processes to improve revenue and reduce costs.
2. ***BI Readiness Assessment***: An assessments process is used to determine the degree to which a given organization is prepared to make the necessary changes to capture the business value of BI as much as it can (Anjariny et al., 2012). The assessment applied by examining the correlated CSFs to exploit BI for improved profits

(private sector) or improved productivity and service (public sector) (S. Williams & Williams, 2004). This assessment is the subject of the current research.

3. ***Process Engineering***: Determines and specifies exactly how BI applications will be used in the context of management processes to plan, control, measure, and manage. It provides a map of what processes must change and how they must be changed in order to create business value with BI applications (S. Williams & Williams, 2010).
4. ***ROI Analysis***: It is a performance measure used to evaluate the efficiency of an investment, it measures a number of benefits returned from the investment relative to the investment's cost. This analysis is used to measure the tangible benefits of BI.
5. ***Change Analysis***: This analysis estimates the current situation of the organization and the degree of change required in business processes, organizational culture, individual's skills, and training requirement for various types of users.

2.1.3 Architecture of Business Intelligence

It's very important to understand BI architecture to increase organization's knowledge of how BI works, this knowledge guides organizations to make better decisions during BI development and implementation (Ong, Siew, & Wong, 2011). The objective of BI architecture is to comprise BI main elements, relations among them, functions and properties of both elements and relations(Shariat & Hightower, 2007). Negash (2004) identified the key functions for BI system which center on a data warehouse, these functions are: data collection and acquisition, data cleanup and integration, data storage, data analysis and knowledge delivery, each function can be presented in a separate layer in BI architecture.

Ong et al. (2011) proposed a five-layer framework of BI architecture as shown in Figure (2.2).These five layers are vital to ensure high data quality and smooth information flow in a BI system.

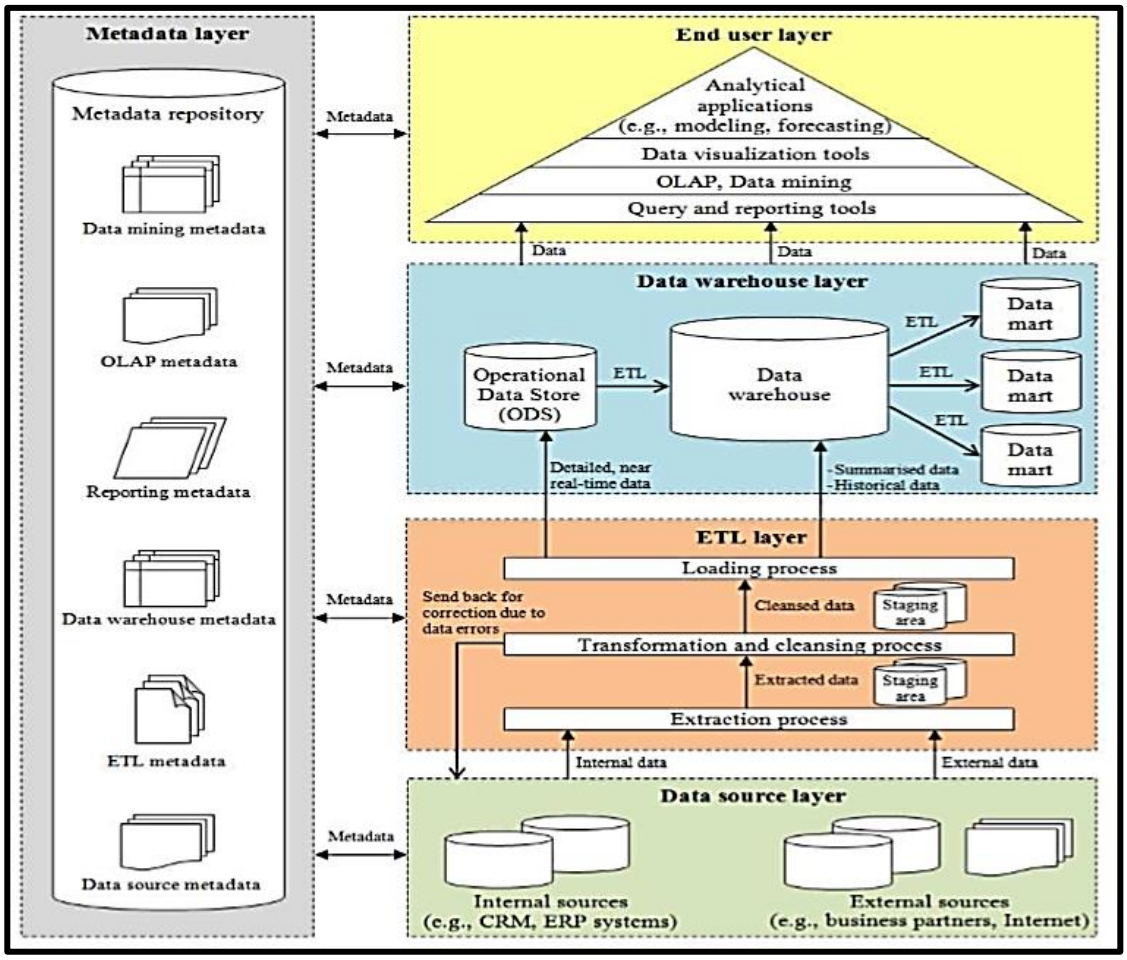

Figure (2.2): Five-layered framework of Business Intelligence architecture

Source: Ong, Siew & Wong (2011)

1- ***Data Source layer*:** BI depends on gathering all needed data from different sources to deliver useful information for decision makers, these sources are divided into two types: internal sources(day by day transactional systems like OLTP and ERP) and external sources (data from organization's environment like CRM, internet and government websites & reports) (Negash, 2004). Also, BI deals with both structured data (like data warehouses, ERP, CRM, and databases) and semi-structured data (like Business processes, Charts, Emails and Graphics) (Negash, 2004). The extracted raw data - output from this layer- is passed to next layer.

2- ***Extract, Transform and Load (ETL) layer*:** ETL is a set of processes by which raw data is extracted from dispersed data sources, then transformed to appropriate standard by data cleansing, aggregation, summarization and integration. The standard data are then loaded into a target storage (operational data store, data mart

or data warehouse) (Bălăceanu, 2007). Every organization has its own way of doing business, so the first step of ETL process is understanding the business needs and the nature of data sources according to data currency, data quality and the level of detail in the data (Negash, 2004). Different sources with varying data quality and inconsistent representations, codes and formats make ETL process a challenge for BI implementation (Jamaludin & Mansor, 2011). The integrated and standardized data, output from this layer, is loaded onto data repository for next layer.

3- ***Data Warehouse (DW) layer*:** Data Warehouse is considered as the core component of BI (Jamaludin & Mansor, 2011; Shariat & Hightower, 2007).Bălăceanu (2007) defined DW as a central repository of multi-dimensional integrated data which store current and historical data for creating analytical reports needed for performance management. The data stored in DW is subject-oriented, time-variant, non-volatile and integrated consistently so that all the data elements relating to the same real-world object are linked together consistently (Bălăceanu, 2007).

4- ***End User Layer*:** End user layer is a set of analytical tools presented as a pyramid to show how BI tools deliver different information to different user groups (based on management levels) in different comprehensive degrees (Shariat & Hightower, 2007):

- Executive managers use tools called Dashboard to monitor the contribution of the various departments in their organization, also, they use analytical applications for modeling and forecasting reasons.
- Middle managers focus on *On-Line Analytical Processing* (OLAP) and ad hoc query for limitless report viewing, complex analytical calculations, and predictive "what if" scenario planning.
- Lower managers and workers use preformatted report generators for operational management.

5- ***Metadata Layer*:** Metadata is a set of data that describe and give information about other data. It has considered as the DNA of BI because it plays an essential role by specifying source, values, usage and features of DW data and defined how data can be changed and processed at every architecture layer.

2.2 Organizational Readiness Assessment

Business Intelligence (BI) is a comprehensive and complex system that has a high failure rate, 50-80% of BI initiatives were under expectation and failed to achieve their objectives (Adamala & Cidrin, 2011; Jamaludin & Mansor, 2011; Yeoh & Koronios, 2010). Implementing a BI system requires major changes to the decision-making process, culture, and business processes within the organization. Thus, organizations should not invest in BI before evaluating its change readiness deeply (Anjariny et al., 2012; Consulting, 2008; Hidayanto et al., 2012). Reinschmidt and Francoise (2000) motioned that one of the first steps in any BI system is assessing the organization readiness. Organizational readiness toword BI refers to the degree of preparation and the existence of the essential prerequisites to make the changes that are necessary to capture the full business value of BI (Reinschmidt & Francoise, 2000). Concisely, BI readiness is the level of fit between the new BI system and the current state of the organization (Armenakis & Harris, 2002). Theoretically, organizations with a high level of readiness have a lower level of risk and able to leverage the success ratio of the new BI system.

According to the high failure rate of BI initiatives, many researchers consider the readiness assessment as one of the key success factors for BI systems and essential for reducing risk (Anjariny et al., 2012; Consulting, 2008; S. Williams & Williams, 2004, 2010). It is common for organizations to obtaining a wide range of capabilities, from strong to weak. The strong capability acts as lever for success. In contrast, weak capability reflects risks that require the management attention (S. Williams & Williams, 2010). With the readiness assessment, the organization can find out its strengths and weaknesses. The major purpose of using readiness assessment is to extract gap areas where the organization is not ready for BI processing. Therefore, the organization can save time and resources by building a roadmap that focusing on filling these gap areas before or during implementation process (Farrokhi & Pokoradi, 2012; S. Williams & Williams, 2010). By using readiness assessment, organizations can overcome their limitations and develop a sufficient combination of *Organization*, *Process* and *Technical* factors to reach a successful implementation (S. Williams & Williams, 2010). In addition, other benefits can be obtained from BI readiness assessment including:

1- Clarify the organization's vision, goals, and scope of a BI system.

2- Strengthening the support for your BI initiative from key stakeholders by increasing the awareness about it.

3- Outlining business, data and information requirements.

4- Identify current risks, constraints, and deficiencies and prepare a suitable roadmap for filling gaps.

5- Identify potential data quality issues in existing OLTP systems.

6- Develop an effective and consistent methodology for the BI implementation.

7- Identify and develop needed policies, strategies, and processes necessary to sustain the organization's BI system for a long term.

Ultimately, BI readiness assessment about ensures the existence of three abilities: the ability of the organization to govern a BI system and align it to its strategies, the ability of the organization to change in order to leverage BI benefits, and the technical ability to implement the system. The absence of any of these abilities rises deficiencies that lead to increased probability of implementation failure. To measure the existence degree of these abilities, a series of tasks are used to measure the degree of existence of these abilities' factors across an organization and how these factors affect the preparation of the entire organization. This evaluation ensures successful implementation over the short term and sustains the system maturity over the long term (Farrokhi & Pokoradi, 2012). Because of the interrelatedness of the BI critical factors, the existence of a single unready factor could block the implementation process from being effective even though other factors are ready (Yeoh & Koronios, 2010).

To assess BI readiness in organizations, we need to:

- Investigate and determine BI Critical Success Factors (CSFs) and their associated contextual elements that influence implementation of BI systems in organizations.
- Select the most important factors by ranking and weighting the BI critical success factors according to relevance (how much the factor impact the BI

success), variability (how fast the factor can change) and controllability (how much the BI team is able to control this factor and effects on it) dimensions.

- ❖ Developing a framework for the evaluation of BI readiness in organizations.

2.3 Business Intelligence Critical Success Factors (CSFs)

Due to the fact that identifying and investigating the Critical Success Factors (CSFs) of BI is an essential step in readiness assessment, this section focuses on these critical factors that need to be met to ensure the successful adoption of business intelligence. This section lists and elaborates on CSFs related to BI implementation derived from various literature.

2.3.1 Critical Success Factors (CSFs)

The concept of the critical success factors (CSFs) was firstly noted by Daniel (1961), then it was refined by Rockart (1979). Rockart (1979) outlined how to identify the set of CSFs and their performance measures by conducting interviews with CEOs of highly ranked companies. He defined CSFs as limited number of areas in which satisfactory results will ensure successful performance of the organization. Rockart (1979) described that CSFs should drive computer based information system to success by highlighting key areas that require constant and careful attention. Other studies like Leidecker & Bruno (1987) defined CSFs as a set of conditions or variables that can significantly impact on the success of a firm given that these variables or conditions are well sustained, maintained and managed. Whereas, Boynton and Zmud (1984) defined CSFs as a few things that must go well to ensure the success and they must receive continuous attention to get high performance. J. Williams and Ramaprasad (1996) said that CSFs are the necessary and sufficient conditions for project success. Hartono, Santhanam, and Holsapple (2007) defined CSFs as key factors that can be managed, so the information system deliver a desired results. Also, Yeoh, Koronios, et al. (2008) mentioned that CSFs are all factors that ensure and indicate the implementation success, absent of one will significantly participate in leading the project to a fail status.

A mere ensuring of good management of CSFs may not guarantee the success of a project implementation, this can be attributed to the fact that CSFs fundamentally different from the set of interlinked detailed tasks, which must be accompanied to ensure a project's completion. But surely the CSFs help in reducing time and resources and give a prolonged run to the project (Dobbins, 2000). Therefore, Businesses must perform the activities associated with CSFs at the highest possible level in order to achieve their intended objectives and achieve competitive advantages.

It is noted that there is a confusion between organizational goals, Critical Success Factors (CSFs) and Key Performance Indicators (KPIs). Goals are organizational targets that are established to achieve the organization's mission; on the other hand, CSFs are the antecedents to realize the goal. Yet, KPIs are defined as a set of measures of progress towards achieving goals. So, there is substantial relationship between them, and identifying the relevant CSFs and KPIs is crucial to achieve a specific goal (Cooper, 2006).

In conclusion, we emphasize the fact that deep investigation, identification, definition and evaluation of Critical Success Factors (CSFs) are necessary for examining readiness and capturing organization strengths and weaknesses (Dawson & Van Belle, 2013; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010). In addition, Identifying CSFs can provide business teams insight into which tasks are truly important and set clear paths for successful implementation of the desired information systems (Rockart, 1979).

2.3.2 CSFs Associated With Information Systems

To discover BI success factors we need first to look at the factors of IS success in general. Slevin and Pinto (1986) deeply studied and refined the concept of CSFs during project implementation process, including information systems projects, by developing the Project Implementation Profile (PIP) which used 10 CSFs that addressed the areas of: *Project Mission, Top Management Support, Project Schedule/Plan, Client Consultation, Personnel, Client Acceptance, Technical Tasks, Monitoring & Feedback, Communication and Troubleshooting*.

The previous 10 CSFs were classified into strategic or tactical factors by (Schultz, Slevin, & Pinto, 1987). These two groups of factors affect IS project performance at different phases of implementation. The strategic phase focuses on the planning aspects of the project and CSFs associated with this phase have greater emphasis at the beginning of the project. On other hands, the tactical phase of the project involves the performance of project activities. Accordingly, the tactical critical success factors are important throughout the project. The strategic phase includes factors such as project mission, top management support and project scheduling whereas the tactical phase consists of factors such as client consultation, personnel selection and training and technical tasks.

Delone and McLean (2003) proposed an excellent framework which has been widely cited, validated or extended in hundreds of articles. The original framework proposed by DeLone and McLean (1992) has been updated and expanded in 2003 by addressing and investigating all empirical studies which validated, updated or supported their original model. The Delone and McLean (2003) model defined IS success in terms of *System Use*, *User Satisfaction* and *Net Benefits* whereas the independent factors leading to the success are *Information Quality*, *System Quality* and *Service Quality*, as shown in Figure (2.3).

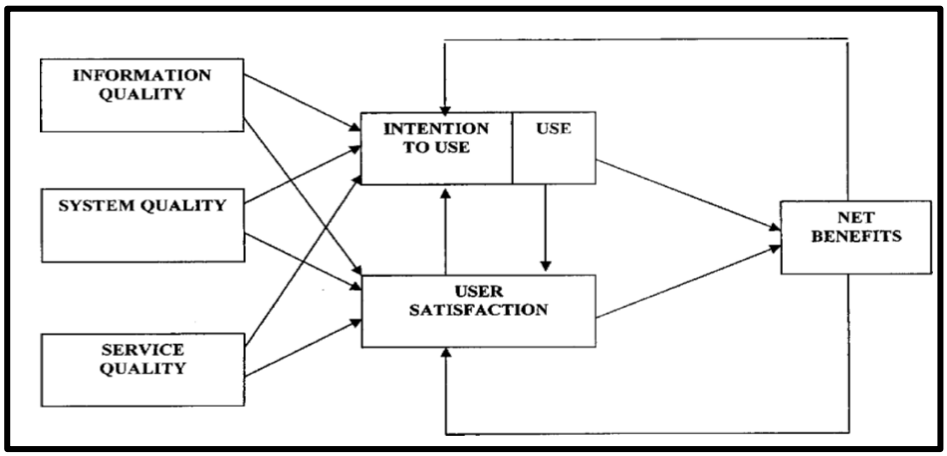

Figure 2.3): Information System success model

Source: Delone & McLean (2003)

This model considered as a general model for measuring IS success. In each implementation, the model dimensions and measures should be contingent on the

objectives and context of the empirical IS implementation. One major drawback of this framework is the concentration on technology. Success of BI implementations depend on some management factors more than technological factors (Yeoh & Koronios, 2010), so some researchers believe that the framework of Delone & McLean (2003) need modification and improvement to be applicable for Business Intelligence systems.

Some literature focus on the non-technical factors which affect the IS success. Hartono et al. (2007) and Santhanam, Guimaraes, & George (2000) identified perceived user-friendliness of the system and level of user experience & training as critical factors for IS. Lapointe and Rivard (2006) found that the attitude of the project's stakeholders and users' resistance play a critical role in IS success. Other studies like Bajwa, Garcia, and Mooney (2004) emphasize on developers' skills and the degree of project difficulty. Hartono et al. (2007) indicated that there is no single key success factors list uniform across all IS types for achieving implementation success. Instead, Hartono et al. (2007) illustrated that organizations must carefully identify what benefits they need most out of the system and then select the corresponding success factors accordingly.

2.3.3 CSFs Associated With Business Intelligence

As other types of information systems, the successful implementation of BI can face a range of barriers considering the special needs for BI adoption, BI has a set of CSFs that differs from those of others IS types (Baker & Chasalow, 2015; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010). Many of BI initiatives failed in achieving the expected ROI (Adamala & Cidrin, 2011; Arnott, 2008; Olszak & Ziemba, 2012; Yeoh, Koronios, et al., 2008), which means that a significant number of companies often fail to achieve the expected benefits of BI. Most of these failures could be due to the fact that companies treat BI projects as just another IT project. BI is neither a product nor a system. It is, rather, a constantly evolving strategy, vision, and architecture that continuously seek to align an organization’s operations and direction with its strategic business goals (Jamaludin & Mansor, 2011). It is highly recognized that Business Intelligence is an important area of practice and research, yet not many studies were

conducted to assess BI practices and its related CSFs (Adamala & Cidrin, 2011; Bargshady, Alipanah, Abdulrazzaq, & Chukwunonso, 2014; Naderinejad et al., 2014; Nasab, Selamat, & Masrom, 2015; Olbrich et al., 2012; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010).

Firstly, researchers investigate the CSFs related to Data Warehouse (DW) that is the core component of BI. Sammon and Finnegan (2000) identified the organizational prerequisites for successful DW implementation as business driven approach, management support, adequate resources, data quality, strategy for automated data, and integration of data warehouse with existing systems. Wixom & Watson (2001) develop a DW success model, which is considered as one of the most famous DW implementation model. Their model attempted to demonstrate the interrelationship between the implementation factors and their impact on implementation success and system success as shown in Figure (2.4).

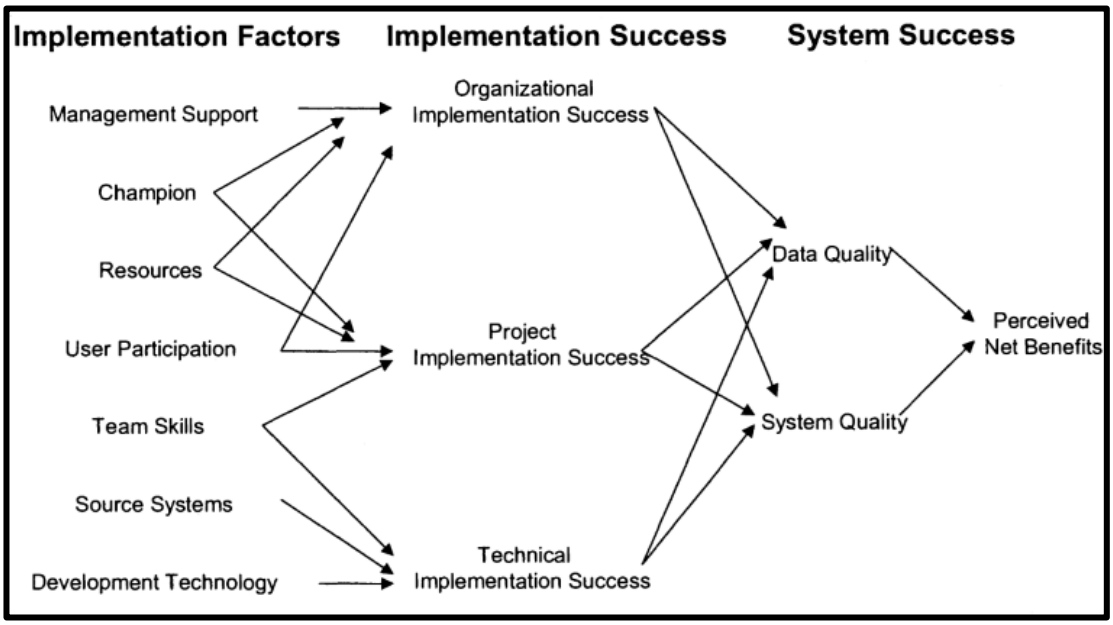

Figure (2.4): Data Warehouse success model

Source: Wixom & Watson (2001)

The model implementation factors include *Management Support, Champion, Resources, User Participation, Team Skills, Source Systems and Development Technology*. The researchers proved a strong relationship between implementation factors and DW success. However, this model has a limitation by missing the strategic

factors (*Clear Business Needs - BI Alignment – Business/IT Partnership*), which are considered as very important factors in many other literature (Dawson & Van Belle, 2013; Kimpel & Morris, 2013; Naderinejad et al., 2014; Nasab et al., 2015; Olszak & Ziemba, 2012; Xu & Hwang, 2005; Yeoh & Koronios, 2010). On the other hand, Kimpel & Morris (2013) and Xu & Hwang (2005) conducted an empirical study to identify and investigate CSFs related to DW, they found that *Clear Need Definition* and *Available Data Quality* are the most important factors affect the DW implementation success.

Recently, several studies have investigated the outcomes of BI projects by using the CSF approach (Adamala & Cidrin, 2011; Anjariny et al., 2012; Baker & Chasalow, 2015; Bargshady et al., 2014; Hidayanto et al., 2012; Naderinejad et al., 2014; Nasab et al., 2015; Olbrich et al., 2012; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010; Yeoh, Koronios, et al., 2008). One of the most referred to research in this domain is Yeoh and Koronios (2010). Yeoh, Koronios, et al. (2008) investigated the CSFs that significantly affect the success implementation of BI. Yeoh and Koronios (2010) continued their investigation in 2010 by using the Delphi Method with 15 BI experts to identify and address CSFs. They proposed a CSFs framework that encapsulate the top seven factors into three categories: **Organization** (*Vision, Business Case & Planning, and Top Management Support*), **Process** (*Team & Presence of Champion, Project Management & Business Driven Methodology, and Change Management & User Involvement*) and **Technology** (*Data, Infrastructure*) as shown in Figure (2.5).

Yeoh & Koronios (2010) empirically examined their model and proved its applicability in five case studies. This model was also proved by other researchers and most of the seven CSFs were marked as critical factors in other BI research which made the model of Yeoh & Koronios (2010) strong and reliable (Adamala & Cidrin, 2011; Naderinejad et al., 2014; Olbrich et al., 2012). Yeoh & Koronios (2010) mentioned that infrastructure and IT factors are less affected, easier to manage and more controllable compared to organization and process factors which are out of team control and more time consuming (Adamala & Cidrin, 2011; Egbeniyoko, 2014; Farrokhi & Pokoradi, 2013; Hawking, 2013; Naderinejad et al., 2014; Olbrich et al., 2012; Yeoh & Koronios, 2010). The model reveals that CSFs should be addressed from a business orientation methodology to achieve better results. In addition, BI

implementation should address a clear vision and business needs and take different user needs into account to gain superior usage and return value (Adamala & Cidrin, 2011; Naderinejad et al., 2014; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010).

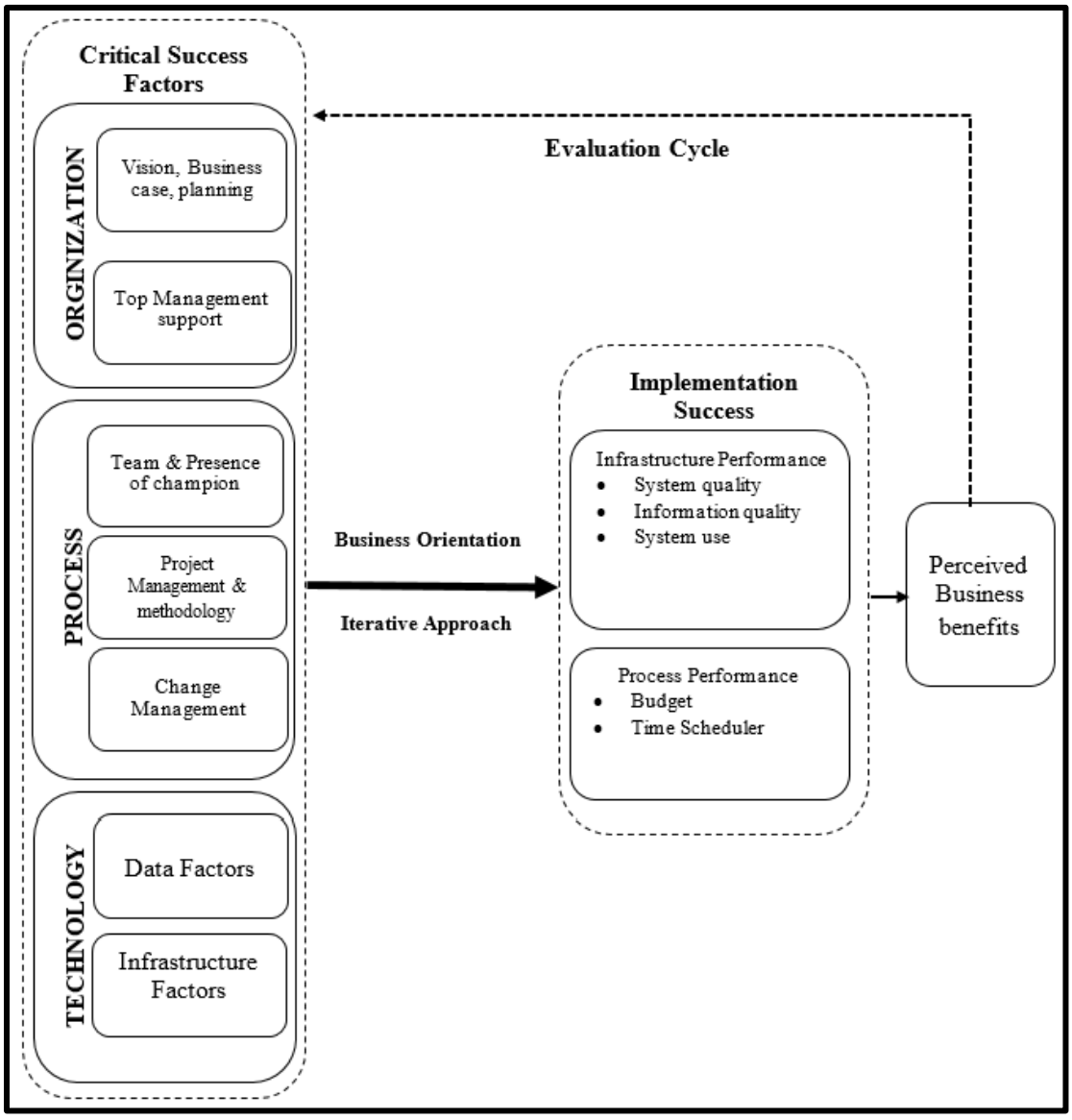

Figure (2.5): Business Intelligence success framework

Source: Yeoh & Koronios (2010)

There is a concern that the Yeoh & Koronios (2010) study did not propose specific BI success measurement criteria, and therefore it could be subjective. In addition, the study missed organizational culture factors like *Continuous Improvement Culture and Collaboration Culture* , which are considered significant incentive factors

to gain the potential benefits from the system (Egbeniyoko, 2014; Nasab et al., 2015; S. Williams & Williams, 2004).

Some research such as Dawson & Van Belle (2013), Mungree, Rudra, & Morien (2013), Naderinejad et al. (2014), Nasab et al. (2015), and Phiriyayotha & Rotchanakitumnuai (2013) focused only on investigating and addressing the CSFs for BI. While, other research focused on addressing the relationship between implementation factors and success factors for BI. Delone & McLean (2003), Wixom & Watson (2001) and Yeoh & Koronios (2010) mentioned that BI successful implementation can be noted by measuring the *Net Present Value* (*NPV*). Yeoh & Koronios (2010) used two-key criteria to measure the implementation success of BI; the first key criterion was Infrastructure Performance (IP) (the quality level of the system and the standardization of output). Infrastructure Performance (IP) can be measured in terms of system quality (how much the system is stable, available and flexible), information quality (how much the information is accurate, comprehensive and in time), and system use (how much the recipient use the output of the system). The second key criterion is Process Performance (PP), which relates to how much the process implementation fits its budget and time schedule. This research focuses on measuring the level of organization readiness towards implementing BI system, so researchers are not going to focus on these criteria factors. However, still it is important to keep these two keys in mind during implementation and evaluation stages, as they need to be measured after BI implementation and usage. This evaluation is a valuable feedback to keep the existing system optimized and continuously improved (Adamala & Cidrin, 2011; Yeoh & Koronios, 2010).

2.3.4 Categorization of CSFs Associated With Business Intelligence

Some researchers broadly classify CSFs of BI, based on different perspectives, affiliated with factor domains into 3 categories, namely, *Organizational, Process* and *Technical* factors (Egbeniyoko, 2014; Naderinejad et al., 2014; Olbrich et al., 2012; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010). Organizational factors describe the organization management, culture, environment and planning. In the other hand, process factors are those factors relate to the process of BI system implementation

including using methodology, team skills & ability and user participation. Technical factors focus on data, IT equipment and technical issues, including data quality and IT infrastructure. This classification is adopt in this research. Table (2.1) demonstrates this categorization of CSFs.

Table (2.1): Categorization of CSFs

Organization Perspective	Process Perspective	Technology Perspective
1. Vision & Planning	8. Team Skills	13. Available Data Quality
2. Top Management Support	9. Presence Of Champion	14. IT Infrastructure
3. Resource Allocation	10. Project Management & Methodology	
4. Continuous Improvement Culture	11. User Involvement	
5. User IT & Analytical Culture	12. Change Management	
6. Collaboration Culture		
7. IT Governance		

Another classification was presented by Dawson & Van Belle (2013) and Olbrich et al. (2012) who used Delphi method to rank and cluster the CSFs of BI from three perspectives: relevance (how much the factor impact the BI success), variability (how fast the factor can change) and controllability (how much the BI team is able to control this factor and effects on it). After conducting a cluster analysis, researchers grouped these factors into six clusters as shown in Figure (2.6). Each cluster aggregates similar attributes. This lets BI managers deal with all factors in the same cluster in the same way.

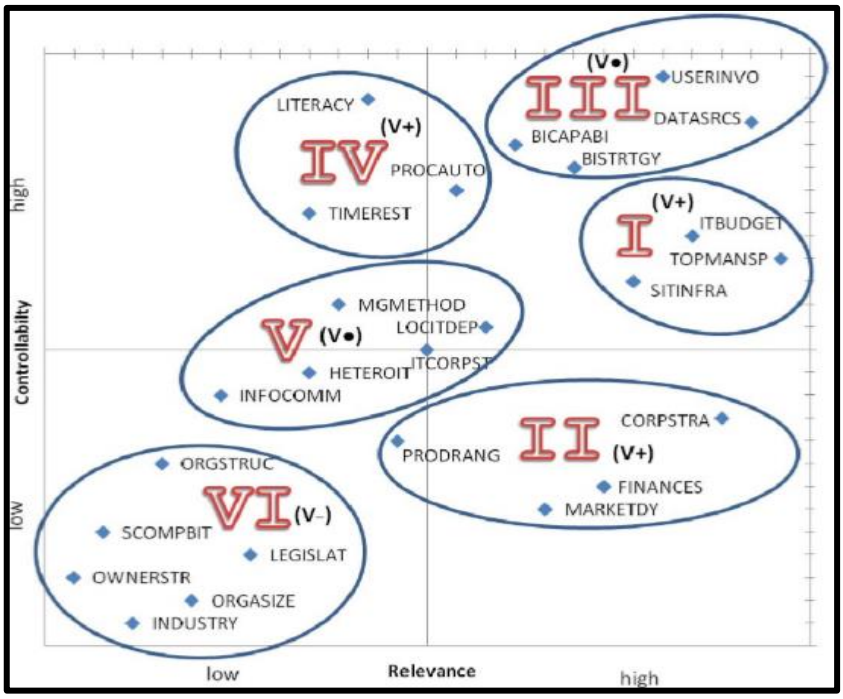

Figure 2.6): Critical success factors clusters

Source: (Olbrich, Poppelbuß, & Niehaves, 2012)

Hawking & Sellitto (2010) and Sangar & Iahad (2013) found that the level of relevance of CSFs varies based on BI system implementation phase, thus they advised managers consider BI implementation phase while dealing with these factors. Sangar and Iahad (2013) proposed a model for BI project life cycle as shown in Figure (2.7). At the pre-implementation stage, the organization should evaluate its readiness for the change by giving a serious consideration to: clear vision and mission, organizational culture, committed management support, suitable software and hardware, Team skills and suitability of hardware and software. At the implementation stage, the organization should seriously consider change management, top management support, data accuracy & integrity, and a suitable & flexible technical infrastructure. At the post-implementation stage, the organization should seriously consider user training and education, and encourage the perceived usefulness of a BI.

This research focuses on pre-implementation and some of the implementation factors to measure the organizational level of readiness for BI system.

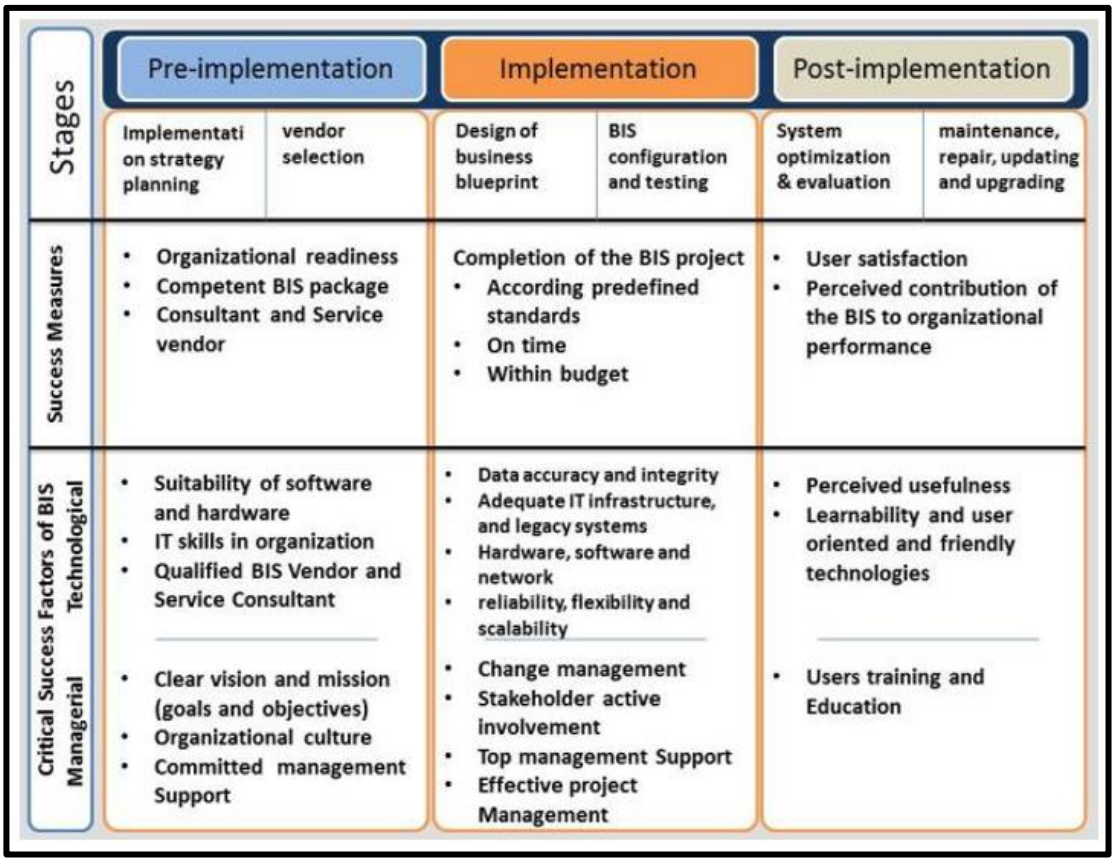

Figure (2.7): Business Intelligence project life cycle

Source: (Sangar & Iahad, 2013)

2.3.5 List of Proposed CSFs Associated With Business Intelligence

This section is a brief theoretical exposition of the 14 CSFs of BI used in the research conceptual framework, each of these 14 factors is further described below.

Organizational Factors:

This part focuses on the factors relevant to organization vision, culture, policies, resources, business and management processes that affect the success and the level of readiness for BI implementation.

1- Vision And Planning (VP)

One of the most important and highest ranking factors for BI implementation are the clear vision and long-term strategies linked to BI (Adamala & Cidrin, 2011; Olbrich et al., 2012; Yeoh & Koronios, 2010). Clark, Jones & Armstrong (2007) and Hartono et al. (2007) found that misalignment between the business objectives and the information system is one of the major reasons for IS failures. Therefore, before taking a BI investment decision, organizations should have a clear vision about the needs, reasons and benefits that must be achieved with BI investment.

BI implementation is a complex process that has a lot of related factors and tasks. A planning process is necessary to prioritize the organization's goals and needs from the system and to draw the roadmap for BI implementation process in order to manage resources and time and to apply iterative methodology in a proper way (Dawson & Van Belle, 2013; Yeoh & Koronios, 2010). 90% of success comes from clear vision, good planning, realistic expectation, and optimal estimation of time and budget (Yeoh & Koronios, 2010). In addition, a clear vision and business needs increase the chances of winning top management support and keeping focus on the core objectives of the business (Adamala & Cidrin, 2011).

BI is a business-oriented system, consequently, to take BI investment seriously, the organization should align BI to its vision, business needs, and strategies (Yeoh & Koronios, 2010). Therefore, there must be consistency among business strategy, IT strategy, IT infrastructure, and IT organization and processes. In addition, BI must be directed to business processes that have the greatest impact on profits (private sector) or productivity and service (public sector) (S. Williams & Williams, 2004). Finally, we can say that BI derives its success from the business case and the organization’s problems which it comes to solve (Naderinejad et al., 2014; Yeoh & Koronios, 2010).

2- Top Management Support (TMS)

Widely known and acknowledged by researchers that any IT system must be supported by top management to facilitate implementation success and achieve organization goals (Arnott, 2008; Olbrich et al., 2012; Olszak & Ziemba, 2012; Poon & Wagner, 2001; Wixom & Watson, 2001; Xu & Hwang, 2005; Yeoh & Koronios,

2010). Slevin and Pinto (1986), declared that at the early stages of any project, no factor can predict project success as much as top management support.

BI is a comprehensive system that cuts across many areas and supports multi-business levels by informing managers and employees to take the right decisions (C Howson, 2007; Naderinejad et al., 2014; Vitt et al., 2002; Yeoh, Koronios, et al., 2008). Therefore, to gain the expected benefits, BI should be positioned under senior management authority rather than under specific departments, and senior management must be aware of BI capabilities (Egbeniyoko, 2014). The existence of the *Top Management Support* is focal for fulfilling a specific business purpose (Olbrich et al., 2012; Olszak & Ziemba, 2012). According to a inclusiveness feature of BI, BI need to have policies and strategies which enforce system acceptance and allocate all needed resources (budget, qualified human resources, IT skills, experts and consultants) to facilitate system implementation and encourage employees take BI seriously (Adamala & Cidrin, 2011; Yeoh, Koronios, et al., 2008).

Finally, senior management is focal for reducing resistance, managing the change process and overcoming continual organizational problems in each phase of the BI implementation (Adamala & Cidrin, 2011; Olszak & Ziemba, 2012).

3- Resource Allocation (RA)

The resource allocation readiness is the level of organization's ability to support the proposed technology through its life cycle. Management support and resource allocation play important roles to overcome organizational problems that arise during BI implementations (Egbeniyoko, 2014; Olbrich et al., 2012; Wixom & Watson, 2001; Yeoh, Koronios, et al., 2008). Project timeline is influenced by the amount of time, resources and the people assigned to do the work, the allocation of resources needed for BI helps project teams meet their project milestones and increase the likelihood that BI project will finish on time, within budget and with the right functionality, (Jamaludin & Mansor, 2011; Wixom & Watson, 2001).

BI projects tend to be time-consuming, human resource exhaustive and grow over time, hence can become very costly (Reinschmidt & Francoise, 2000). The needed resources include money, skilled people, machines, tools and time (Hawking,

2013). Egbeniyoko (2014) noted that BI involves a huge upfront financial expense for hardware, software, staff training and external consultancy costs, in addition to on-going costs for annual licensing renewals, system security and administration. Also, the organization may need to prepare or extend its IT infrastructure to support the new system needs such as centralized warehouse, high-performance servers, and high bandwidth networks.

Furthermore, BI initiatives require many different skills that may not be available within the company and have to be brought in from outside such as consultants and technical specialists (Reinschmidt & Francoise, 2000).

4- Continuous Improvement Culture (CIC)

Organizational culture defines the shared attitudes, beliefs, customs, and written and unwritten rules that have been developed over time that govern the way in which individuals behave in an organization, which forms a strong corporate identity. The Organization culture is critical to accept and facilitate new innovations (S. Williams & Williams, 2004). Lapointe and Rivard (2006) mentioned that the ability of the organization to respond to resistance or antagonistic behavior plays a critical role in IS implementation success.

The main objective of BI is to support decision making by informing managers and end users at all organization levels, leading to generate a significant change in decision process and business processes by redistributing authorities and responsibilities (Egbeniyoko, 2014; Hidayanto et al., 2012; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010). BI is useless if people resist using it or do not know how. If users do not accept the new system or do not change business processes to lever BI, the investment in BI will not return the expected value (Hidayanto et al., 2012). Organizations that have created successful continuous improvement cultures and have high level of openness to change would be more capable of adapting to the change process and be more accepting and facilitating new innovations. This has a critical impact on prepares these organizations to lever BI effectively (S. Williams & Williams, 2004). The organization that has a continuous improvement culture is more

capable to identify and manage the needed changes to fully leverage the new BI application (Hidayanto et al., 2012).

S. Williams and Williams (2010) discussed a manufacturing company in which continuous improvement was not part of the culture of its employees. Employees were not accustomed to change and innovation, and thus they had trouble getting adjusted to change from static reports to highly-powered, flexible business analysis capabilities even though they had been involved throughout the design, development, and training design processes.

5- User IT & Analytical Culture (UIT)

Decision making depends on a number of factors including data, personal experience, external consultants and analytical applications (Fisher, Chengalur-Smith, & Ballou, 2003). Researchers found a significant variation in the degree to which organizations rely on data and analytical applications in making decisions, this variation lead to different conceptions when it comes to levering BI benefits (Cindi Howson, 2006). Organizations that embrace the use of information and analytical applications to improve profits or quality of services are better able to lever investments in BI compared to organizations that suffer lack of information and their decisions are usually driven by force of personality (Hidayanto et al., 2012; S. Williams & Williams, 2004).

The level of dependence on information and analytical application is part of organizational culture and is influenced by the environment in which the organization operates. Some organizations' industries are more naturally inclined to use analytical applications. Therefore the more BI users are capable of using information and analytical applications the more they have the ability to harness and exploit the BI system and in turn maximizing BI benefits (Egbeniyoko, 2014).

If such a culture is considered a corporate weakness, the organization needs to improve it. One of the most proper solutions for such IT cultural problem is to identify business “power users” who can embrace new BI applications and demonstrate how these applications can be used to measure and manage business performance (S. Williams & Williams, 2004).

6- Cross-Organizational Collaboration Culture (CC)

Rosen (2007) defines collaboration as working together as a team to create value, the collaboration power comes from the interaction of smart people, thinking through the problem as a group with a comprehensive view and feedback leading to increases the total value (Rud, 2009). Collaboration and cross-organization commitment make an important contribution to the success of BI initiatives (Baker & Chasalow, 2015). The conflicting needs and unmatched priorities between BI team and the departments' managers reduce effective collaboration. Departments' managers have their own goals to focus on and may be reluctant to release key staff for external projects. To create effective teamwork across an organization, senior managers need to break down any departmental barriers to collaboration so that they can draw on the best people (Rud, 2009).

BI is an evolution toward cross-organizational integration of information for decision-support (Mungree et al., 2013; Negash, 2004; Yeoh & Koronios, 2010). Therefore, even if only a specific business subject area is covered by the project, business definitions and business rules must be standardized, clear and valid at any enterprise level to ensure consistency and facilitate information reuse (Reinschmidt & Francoise, 2000). Therefore, senior managers need to set clear objectives, define working relationships and provide tools that support efficient collaboration and information distribution (Rud, 2009). In addition, collaboration is not limited to departments within the organization; BI requires integration of knowledge about customers, competition, market conditions, vendors, partners, products and employees at all levels (Atre, 2003).

Conclusion, cross-organization collaboration culture has a positive impact on BI dynamic capability, better adoption and more acceptance for the new BI system (Atre, 2003; Hawking, 2013; Yeoh & Koronios, 2010).

7- IT Governance (ITG)

Aligning with the rapid development in IT realm, many organizations adopted IT to facilitate achieving its strategic goals and increasing profit by raising its performances and gaining competitive advantages (Bowen, Cheung, & Rohde, 2007).

Organizations faced several challenges in managing investments in IT and to cope with these challenges organizations introduced the new conception of IT governance (Gheorghe, 2010). IT governance is an essential part of enterprise governance that consists of organizational structures, mechanisms, and processes that guide the management to raise organization's IT outcome and to ensure that the organization's IT extends the organization strategies and objectives (Gheorghe, 2010). Many researchers identify *IT Governance* as a critical factor for BI success (Eckerson, 2005; Egbeniyoko, 2014; Hawking, 2013; Watson, Fuller, & Ariyachandra, 2004; Wixom & Watson, 2001; Yeoh, Koronios, et al., 2008).

IT Governance should cover five principal domains: firstly, IT Governance must accomplish an effective Business/IT Partnership by mapping the organization's IT to support the strategic goals of the organization. Secondly, managing IT resources for best investment opportunities. In addition, it should decrease IT risks through a continuous scanning of threats and weaknesses of the system and ensure that appropriate security and privacy controls are in place. Also, IT Governance should measure IT performance in achieving the expected outcomes. Finally, it should deliver competitive advantages by increasing organizational performance, increasing profit, improving business process quality or reducing costs (Bowen et al., 2007; Gheorghe, 2010; Watson et al., 2004).

Because IT is linked with other key enterprise assets, *IT Governance* decisions should not be made by IT managers in isolation of others business managers. So, IT governance must be steered by a committee composed of managers from all major areas of the organization (Bowen et al., 2007; S. Williams & Williams, 2010). This steering committee should actively participate in the organization decision-making process by developing flexible IT strategies and rules to meet the changing and future needs of the organization (Bowen et al., 2007).

Conclusion, organizations with clearly documented information usage policies, information retention, and capacity planning to deliver a sustainable business case are capable of making wise decisions and avoid expensive future problems during the entire BI system life cycle (Hawking, 2013; S. Williams & Williams, 2010).

Process Factors:

In this part, the study addresses the factors related to the ability of the organization to manage the process of BI system implementation; these factors are implementation methodology, team skills and ability and user participation, presence of champion and change management. All these factors affect the success and the level of readiness for BI implementation.

8- Appropriate Team Skills (ATS)

One of the key success factors of any project is the skills of the people involved in the implementation (Nasab et al., 2015; Wixom & Watson, 2001; Yeoh, Koronios, et al., 2008). The project team should be balanced, cross-functional, and consist of both internal staff and external consultants (Reinschmidt & Francoise, 2000). Olszak & Ziemba (2012), Watson et al. (2004) and Yeoh, Koronios, et al. (2008) emphasized the importance of technical skills and expertise for the success of any BI project. These skills may need to be sourced externally through consultants if not available within the firm (Xu & Hwang, 2007; Yeoh & Koronios, 2010).

Additionally, BI implementation should be a business driven project rather than a technology driven one (Farrokhi & Pokoradi, 2013; Sammon & Finnegan, 2000; Yeoh & Koronios, 2010). Consequently, the project team should be composed of personnel with strong business background and knowledge complimented by those with relevant technical experience in addition to business members who must be including in all system implementation stages to ensure business orientation. BI is a comprehensive project that collect data from all available internal or external sources, so the project team should contain members from different business areas to ensure data and ideas sharing and to increase the potential for standardization (Egbeniyoko, 2014; Naderinejad et al., 2014; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010).

Adamala and Cidrin (2011) found that the appropriate skills needed for such a team can easily be achieved by training or acquisition, and it’s not a key factor for success. This factor has been classified as less variability and more controllability by (Olbrich et al., 2012).

9- Presence of Champion (PC)

The majority of researchers acknowledged that having a good champion from the business side is critical for implementation success and gaining an optimal BI values (Egbeniyoko, 2014; Naderinejad et al., 2014; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010). The champion is an employee with a high business level and plays significant role in the company (Hawking, 2013). He has a deep understanding of the needs for BI initiative and has the responsibility to support, promote and drive the adoption of BI from the beginning to the end (Egbeniyoko, 2014; Hawking, 2013; Yeoh & Koronios, 2010). Presence of a champion increases the ability for reducing the level of users' resistance and manage the change process. In addition, he focuses on aligning BI to the core business processes for gaining a maximum impact and benefits.

The champion should have business and technology background to integrate all business needs and transform them to suitable BI functions (Egbeniyoko, 2014; Naderinejad et al., 2014; Yeoh & Koronios, 2010). Watson et al. (2004) and Yeoh, Koronios, et al. (2008) supported the idea that when BI champion nominated from business side rather than IT side , he is much more capable of predicting organizational challenges and can drive the project to a success rather than focusing on technical issues.

10- Project Management and Methodology (PMM)

Adamala & Cidrin (2011), Anjariny et al. (2012) and Olszak & Ziemba (2012) concentrated on the conception that BI implementation must be a business-driven process. Nowadays, business leaders seek to become more data-driven in decision making and operational management, so the traditional business/IT relationship has changed (Egbeniyoko, 2014). Business-driven projects focus on answering questions that are presented as challenges within a company. BI systems come to fulfill business gap and solve a specific needed business, therefore, most of the experts focus on business oriented implementation to lever benefits and achieve success (Nasab et al., 2015; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010).

The requirements for a BI project are often extendable and developed over time, many additional requirements may be raised in the system development life cycle (Hawking, 2013). Therefore, researchers recommend that BI projects should be iterative in nature with a quick turnaround between requirements analysis and delivery of outcomes (Reinschmidt & Francoise, 2000; Yeoh, Koronios, et al., 2008). Iterative development is a way of breaking down the BI system into smaller modules; each module targets a single business subject area. In each iterative, the development team identifies the module scope and analyzes the system functionality within a reasonable time frame (Egbeniyoko, 2014). The iterative approach leads to continuously enhance the solution, deliver business value to the users throughout the project, and align the solution as close as possible to the business (Egbeniyoko, 2014; Reinschmidt & Francoise, 2000; Sammon & Finnegan, 2000). In addition, the iterative approach gives the organization more ability to monitor and evaluate the implementation and reduce risks, it also increases the system usability and acceptance by gradually introducing the system to end users (Olszak & Ziemba, 2012; Yeoh, Koronios, et al., 2008). Starting with small change and work in incremental approach help the project team to focus on specific issues in each iteration and avoid being trapped in unnecessary works, given that, each iteration should add a value to stakeholders and the organization (Greer & Ruhe, 2004).

11- User Involvement (UI)

How can the technical team provide a successful and efficient system that meets all different end users requirements without getting them involved in the development process? This makes user involvement essential for successful adoption of BI system (Mungree et al., 2013; Naderinejad et al., 2014; Nasab et al., 2015; Wixom & Watson, 2001; Yeoh, Koronios, et al., 2008). Users from different functional levels or different fields have different skills, require different tools, leading to special needs and expectations from BI system (Olszak & Ziemba, 2012; Reinschmidt & Francoise, 2000). There are many types of expectations impeded into BI systems such as availability, functionality, reliability, maintainability, etc. (Reinschmidt & Francoise, 2000). Consequently, User participation ensures that user requirements and

expectations are clearly captured by the project team. Wixom and Watson (2001) found that user expectations management and user involvement are essential for BI success especially in the initial phase, where requirements and expectations are unclear.

In addition, user training is essential for any new IS adoption. Hartono et al. (2007) found that lack of appropriate training is responsible for the negative results and software adoption and implementation failure. Developing an adequate training program taking into account the variation in users' types and needs assists users to understand the new BI system, its benefits, and its limitations (Egbeniyoko, 2014; Hawking, 2013; Nasab et al., 2015).

BI success depends on integrating the BI system with the daily work to enhances business processes, increase performance, and services quality (S. Williams & Williams, 2003). When users participate in system implementation and receive proper and adequate training, they gain better understanding and recognition of the BI capabilities and limitations. This in turn leads to greater user acceptance and satisfaction with the BI solution and encourages users for effective use of BI to enhance business processes (Hidayanto et al., 2012; Naderinejad et al., 2014; Yeoh & Koronios, 2010).

12- Change Management (CM)

Many experts in information system implementation demonstrated that the end users always decide and say the last word that leads IS adoption to success or failure (Reinschmidt & Francoise, 2000). New IS implementation often causes changes in the scope of both organization and individuals. These changes are always met with resistance, and this resistance correlates to the scope and magnitude of the change introduced by the system. BI is a comprehensive system designed to collect data from all internal and external sources to assist users in decision making, therefore BI causes wide modification in organizational business processes and in how jobs are performed (Wixom & Watson, 2001). Referencing the aforementioned reasons, many researchers referred to effective change management as a critical factor for any BI adoption

success (Dawson & Van Belle, 2013; Egbeniyoko, 2014; Mungree et al., 2013; Olszak & Ziemba, 2012; Poon & Wagner, 2001; Vodapalli, 2009; Yeoh & Koronios, 2010).

Change management is a structured approach for ensuring that changes are smoothly implemented, and the benefits of change are achieved by reducing people resistance. Change management always focuses on how people are affected by an organizational transition to move from the current situation to the new one (Shea, Jacobs, Esserman, Bruce, & Weiner, 2014). Change management factor interacts with and is affected by some others critical factors, for example, *Top Management Support* plays a key role in motivating and encourage people throughout the organization to embrace data warehousing (Wixom & Watson, 2001). In addition, when the *Continuous Improvement Culture* factor is considered as an organizational strength, this means that most of the employees possess personal attributes that are conducive to change such as growth and adaptability. They have the intention to seek new technologies and methods to help them improving their work, thereafter, their resistance to accepting new IT systems is low (Consulting, 2008).

the discussion above emphasizes that end-user involvement, users' expectation management, and training play key roles in increasing user acceptance and satisfaction towards the new system (Hidayanto et al., 2012; Naderinejad et al., 2014; Yeoh & Koronios, 2010).

Technology Factors:

In this part, the research focuses on the factors relevant to the organization possession of the IT and technologies factors that are critical in the BI adoption success. These factors are data sources quality and IT infrastructure. These factors cover adequate ratio of the organization's technology fit, which is critical for BI success.

13- Available Data Quality (ADQ)

Data quality refers to the quality of the data existing in the available internal or external sources. Data accuracy, completeness, comprehensiveness, consistency,

reliability, accessibility and relevance to organization work are critical aspects of data quality (Fisher et al., 2003; Wixom & Watson, 2001). BI solutions have to gather and integrate data from all of the available internal and external sources through different functional departments in the company (Negash, 2004; Yeoh & Koronios, 2010). There is a common view that the quality of data and IS outcomes are strongly correlated (Fisher et al., 2003; Slone, 2006; Wixom & Watson, 2001). Poor data quality input lead to lack of trust and inconsistency in BI information interpretations which is counted as one of the main reasons for many BI systems failure (Slone, 2006; Wixom & Watson, 2001). Ensuring that data input to the analysis tool is correct, clean, validated and trusted is critical for levering BI outcomes and success (Reinschmidt & Francoise, 2000). Systems with poor documentation, no standardization, and poor data quality increase the technical issues that development teams need to overcome (Jamaludin & Mansor, 2011; Reinschmidt & Francoise, 2000). Therefore, solving data quality issues and ensuring correctness, consistency and meaningfulness of data passed to analysis tools through a BI system are very complex and time-consuming process and makes ETL process a real challenge for BI implementation (Reinschmidt & Francoise, 2000; S. Williams & Williams, 2010; Yeoh, Koronios, et al., 2008).

Many organizations of all sizes and structures are negatively affected by the lack of data quality, incompleteness and inaccuracy of data (Egbeniyoko, 2014). The main reason behind the data quality issues is that organizations often focus on getting the data right the first time, but miss the data governance processes to ensure the sustainability of data correctness and quality (Watson et al., 2004; Yeoh, Gao, & Koronios, 2008). To ensure the quality of data input to analysis tools in BI, the development team are required to assess the quality of the data sources and to develop appropriate data cleansing processes. From another side, business units and employees should be responsible for their *Available Data Quality* assurance (Reinschmidt & Francoise, 2000; Yeoh, Gao, et al., 2008).

BI requires to deal with structured data sources like ERP (internal data) and CRM (external data) and semi-structured data sources like business processes (internal data), news, and videos (external data) (Reinschmidt & Francoise, 2000). Negash (2004) found that 60% of Chief Information Officers (CIO) and Chief Technical Officer (CTO) believes that dealing with semi-structured data increases the ability to

discover and take new business opportunities. Semi-structured data is not easy to analyze and transfer it to helpful form of knowledge (Negash, 2004).

14- IT Infrastructure (ITI)

IT Infrastructure is a collection of physical or virtual resources that support an entire IT environment in the organization and usually consist of servers, telecommunications networks, software, databases and storage devices (Reinschmidt & Francoise, 2000). IT infrastructure must be designed to support all the necessary IT applications and an organization's long-term general strategic plans (Hidayanto et al., 2012). The main objective of the IT infrastructure is moving data from one place to another and allowing users to access the data timely (Yeoh & Koronios, 2010). IT infrastructure must be reliable and available on time for all stakeholders in their different places (Negash, 2004). Assessing the IT infrastructure of an organization is to measure the degree to which the current infrastructure meets BI functionality, in collecting data from different sources like suppliers, customers, internal and external sources by providing a suitable connectivity between the legacy systems and the new BI system (Reinschmidt & Francoise, 2000). According to the iterative and incremental methodology used in implementing BI systems, infrastructure should be resilient, flexible and scalable to meet future and incremental needs driven by business needs and users' opinions (Egbeniyoko, 2014; Yeoh & Koronios, 2010).

Egbeniyoko (2014) noted that cloud computing and mobile devices are becoming the international trends to modem BI. Cloud computing provides a flexible IT infrastructure, where resources can be added and removed dynamically as required. Many organizations outsource it's IT infrastructure to gain all benefits provided by cloud computing such as staff reduction, reduction of administrative costs, increased data safety, more security maintenance and support, and faster data recovery and transfer (Dimitrov & Osman, 2012).

2.4 Ministry of Education & Higher Education (MoEHE)

The ministry of education was established soon after the Palestinian National Authority had held responsibility for managing the education sector in Palestine in 1994. Two years later, a new ministry was established for the higher education and scientific research. However, the two ministries were reintegrated in one entity based on a ministerial reshuffle for the Palestinian government in 2002, with the name of Ministry of Education & Higher Education (MoEHE).

MoEHE is responsible for overseeing and developing both of the Palestinian general and higher education sectors and seeks to provide enrollment opportunities for all those who are of school age, as well as improving teaching and learning quality and diversity, in line with the contemporary trends in the world. Moreover, the MoEHE works hard on developing human resources in the education sector in order to create well-qualified Palestinian citizens, capable of performing duties efficiently and effectively.

Since taking over the education sector, the MoEHE has initiated many development strategies in collaboration with national and international partners and exerted great efforts to advance and enhance the educational process. Despite the difficult political situation and lack of regional support, the MoEHE has shouldered a great burden by inheriting a heavy legacy with a semi-collapsed educational structure left over by the Israeli government that was responsible for Palestinian education before 1994. Nevertheless, the Ministry took upon itself to succeed, and started a wide-sector reform plan to reshape the complete educational system, and put it on the right track.

The MoEHE has gone through many challenges which include management of 1.1 million students and more than 50 thousand teachers, overseeing nearly two thousand schools and dozens of universities and colleges. As well as MoEHE was responsible for initiating and implementing comprehensive development plans (i.e. education for all), and providing infrastructure for the rapid increase in numbers of students. All these challenges require local, regional and international interventions to support school construction and development programs that target safe access to school for all children.

Based on the ministry's understanding of developing the quality of general education, the ministry has worked hard on teacher training and qualification strategy in collaboration with universities to create an educational base capable of leading Palestinian children towards modern education, which includes ICT as the main component.

As part of its efforts to create a vocational and technical infrastructure, the MoEHE has adopted a strategy, which aims to develop the vocational and technical education, training system, human resources as well as the material resources, curriculum, and legislative regulations related to vocational education.

2.4.1 ERP system of Ministry of Education & Higher Education

In 2008, Palestinian Authority has taken a decision to invest in information systems' tools to increase and improve work and deliver its services and facilities in an effective and efficient way. This decision became a strategic objective for many Palestinian Authority ministries including the MoEHE, which implemented the Enterprise Resource Planning (ERP) sponsored by UNICEF. ERP is a comprehensive software that integrates information from different applications into one universal database. ERP system of the MoEHE, In addition to its being integrated with all internal sub system, is integrated with systems in other ministries such as interior, health, and social affairs. In 2012, local studies together with the ministry's published reports showed successful implementation of ERP.

ERP is a web-based system built on Oracle database and consisted of many *Online Transaction Processing* (OLTP) sub-systems such as:

1- School Management Information System (SMIS):

SMIS is a comprehensive and integrated system for school administration; it supports most of school's functions and student data management. SMIS includes student enrollment, grades, tests' results, health records, class schedules, attendance, and many other student related data.

2- HR Management System (HRMS):

HRMS is a software for managing business processes related to human capital management (HCM). HRMS combines a number of necessary HR functions, such as saving existing employee data, managing payrolls, recruitment processes, tracking employee promotions, updating ministry structure and keeping track of attendance records. HRMS stores employee related data including personal data, career records, competencies, qualifications, job grades, accomplishments and annual evaluations.

3- Inventory Management System (IMS):

Inventory management system is a software for tracking inventory levels, orders, deliveries and manages all inventory and custody data. It monitors the existing stock and helps ministry determine what to buy, how much to buy and when to buy. The inventory system supports all inventory reports and purchase budgets.

4- Purchasing System (PS):

Purchasing System is a software that is used by the ministry to buy products and/or services. It manages the entire acquisition process, from requisition, to purchase order, to product receipt, to payment and all related documentation processes. Purchasing system makes the purchasing process more efficient, reduces supply costs, shortens the length of the purchase cycle and reduces human error. It can also simplify order tracking and make it easier to manage purchasing budgets by quickly creating expenditure reports. The Purchasing system is fully integrated with the inventory management system.

5- School Planning System (SPS):

The planning system works on investigating the proposed class formations for schools for the year next in terms of the number of student anticipated to be enrolled and in turn determining the number of required schools and the distributions of schools in proportion to population distribution. It also facilitates the calculation of deficit and surplus of the teaching staff. Furthermore, SPS facilitates direct follow-up on teacher

transitions and teachers' period quotas. It also stores a comprehensive statistical data related to all schools across the country (governmental, UNRWA and private sector) and generates all types of necessary reports.

6- Private schools and kindergartens license system (PLS):

This system manages the process of private schools and kindergartens online registration. After proper registration submission, proper procedures are followed to review submitted applications and then forwarding them to concerned staff for further processing. Registration certificates are then generated and handed over to concerned parties to start delivering recognized educational service.

This system serves public and saves time and efforts, it also facilitates easier communications with other ministries such as interior ministry.

7- Examination management System:

This system manages general secondary examination and the related administrative processes starting from student registration, to student grouping and dissemination of seat numbers. The system also helps in nominating staff involved in each stage of the examination and affects the financial transactions in connection. The system also manages centralize exams initiated by the ministry and facilitates a unified marking system. High variation of statistical reports can be generated to satisfy the different needs of the ministry.

8- Employee Training System:

This system manages the continuous improvement of ministry staff members through identifying personnel training and capacity building needs. It also coordinates training delivery, follows up participant attendance and generates reports illustrating the continuous improvement of staff members and the real effects of the delivered training.

9- Library Management System:

A library management system is a software developed to handle basic housekeeping functions of school libraries. It helps to provide information on any book present in school library to the students as well as staff member. In addition, it keeps a track of book issued, returned and added to library. Key features include, but are not limited to, eliminating paper work in school libraries, recording every library's transaction in computerized system including adding, removing, transporting books, and finally exporting all related reports.

After utilizing the ERP system of the ministry for more than eight years, the ministry has gathered huge amount of data which is essential in moving to a more evidence-based planning and decision-making system, supporting rigorous scientific research and identifying variations in educational trends. Therefore, the ministry is looking forward to utilizing the existing ERP system data and other external data to support decision making in the light of business intelligence.

2.5 Chapter Summary

This chapter presented review of literature in relation with the field of the current research. This chapter was divided into four sections. The first section included a brief introduction of business intelligence in terms of defining, values, benefits, and architecture. The second section addressed the organizational readiness of BI adoption. The third section deeply addressed the critical success factors (CSFs) of BI implementation and the impact of these factors on BI success during the pre-implementation phase. In the last section, researchers shed light on Ministry of Education & higher Education (MoEHE), what it is and what it does, before expanding on the ERP system of the ministry.

Next chapter lists and elaborates on a number of previous study that had dealt with similar topics.

Chapter Three

Previous Studies

Chapter Three: Previous Studies

This chapter lists and investigates a number of previous studies and research that addressed the critical success factors and/or the main challenges and obstacles of implementing business intelligence (BI) or data warehouse (DW). Some of these studies follow the qualitative method to determine these factors while others used a quantitative method for investigating and validating the relationship among these factors and BI success. By reviewing previous studies, the researchers drew a wider picture of the so far exerted efforts to understand the impact of CSFs on BI implementation and developed a readiness assessment framework for BI adoption. Finally, this chapter stops at the distinction between this study and the other previous studies.

3.1 List of Relevant Previous Studies

1- (Pham, Mai, Misra, Crawford, & Soto, 2016) Critical Success Factors for Implementing Business Intelligence System: Empirical Study in Vietnam:

This study followed a qualitative (case study) methodology to investigate the framework developed by Yeoh and Koronios (2010). Researchers aim to rank the importance of CSFs for BI implementation in Vietnam environment. They conducted four case studies in four different Vietnamese companies, who already implemented BI system, and executed in-depth semi-structure interviews with 18 managers, work for these companies. Six of them were face-to-face while the remaining 12 interviews were conducted over internet.

This research inspected in more depth the seven critical factors compiled by Yeoh & Koronios (2010) framework. These factors were categorized into three categories: **Organization** (*Vision, Business Case & Planning, and Top Management Support*), **Process** (*Team & Presence of Champion, Project Management & Business Driven Methodology, Change Management and User Involvement*) and **Technology** (*Data, Infrastructure*). The successful implementation was then measured by two dependent variables: **Infrastructure Performance** (*System Quality, Information Quality, and System Use*) & **Process Performance** (*Budget, and Time Scheduler*).

This study concluded that one of the four studied cases was successful, two were partially successful, and the last one was a failure. In addition, based on the factor scores calculated through the analysis of the four subject cases, the critical factors were ranked from first to last as follows: *Change Management and User Involvement, Vision, Business Case & Planning, flexible Infrastructure, Top Management Support, Project Management & Methodology, Team & Presence of Champion* and finally *Data Quality*. Researchers recommended that future studies should focus on the highly ranked factors for ensuring the success of BI project. Other studies may examine more case studies for more generalization of this study results.

2- (Hejazi, Abdolvand, & Harandi, 2016) Assessing The Organizational Readiness For Implementing Bi Systems

The objective of this study was to examine whether the factors affecting the organizational readiness for BI implementation in all organizations are identical. Based on a comprehensive literature review, four factors of *Culture, Individual, Strategy,* and *Management* and 18 sub-factor were extracted as the most important factors affecting the readiness and implementation of BI. These factors were empirically studied in three Iran educational, commerce, and IT organizations with similar infrastructure to examine their effect on different fields. Researchers followed a quantitative methodology and distributed a questionnaire to collect data from 118 experts working for the three-targeted organizations.

The evaluation of the proposed readiness model was ensured for good of fitness. Analysis of the gathered data resulted in the fact that *Strategy* had a positive effect on the educational organization. While *Individual* had a positive effect on the educational and commerce organizations. In general, there was no general model for all organizations as factors may differently affect different organizations. Researchers recommended more future research to find a more comprehensive readiness model valid for all types of organizations.

3- (Nasab et al., 2015) A Delphi Study Of The Important Factors For Bi System Implementation In The Public Sector Organizations

This research focused on investigating and rating the CSFs of BI in Malaysian public sector. A two-round quantitative Delphi study was conducted to address and rate seventeen factors that were extracted from previous studies. Ten BI experts were selected from LinkedIn to help the authors in conducting their study. The included CSFs were: *Continuous Management Support, Resource Allocation, Well Established Business Case, BI Strategy, Clear Vision, Coordination Between IT And Business Units, Business Champion, External Consultant, Iterative And Incremental Approach, User Involvement, Scalable And Flexible System, User Access, Integration With Other System, Data Quality And Integration, User Skill, BI Team Skill and Organization Culture*.

The findings of Delphi study highlighted the *Continuous Management Support, Scalable & Flexible System, BI Team Skill, Resource Allocation, Organization Culture, And Coordination Between IT And Business Units* as the most important CSFs for implementation of BI system. Researchers recommended that more investigation is required on CSFs by using action or ethnography research in public organizations where BI system has already been implemented. Also, it is recommended that the proposed framework should thoroughly be inspected using quantitative studies.

4- (Grublješič & Jaklič, 2015) Business Intelligence Acceptance: The prominence of organizational factors

This study aimed to discover and identify the factors that influence the acceptance of BI adoption. Researchers followed an exploratory approach in order to develop a BI acceptance model. Firstly, an extensive literature review was carried out in order to identify and systemize all acceptance determinants. Then, Researchers observed two case studies during BI implementations and conducted four semi-structured interviews with experts to achieve the objectives of the study.

Researchers investigated nearly 50 factors that influence BI acceptance. These factors were categorized into five main domains, namely: *Individual*, *Technological*, *Organizational*, *Social*, and *Environmental* domain. After investigation, researchers found that only 14 factors were important for BI acceptance. These factors were:

Individual (*Personal Innovativeness and Readiness for Change*), Technological (*Compatibility, Information Quality and System Quality*), Organizational (*Management Support, User Participation, User Training, Information Culture, Change Management, and Organizational Resources*) and Environmental (*Competitiveness*).

This study found that the extracted factors were a vital part of CSFs mentioned in Yeoh & Koronios (2010) and Wixom & Watson (2001). The findings exposed the importance of organizational factors in modifying individual's beliefs and the contribution of these factors on improving the BI acceptance and success. The study recommended performing future studies that examine and evaluate the proposed model and its relationships.

5- (Eskandari, Amirsadri, & Nikfarjam, 2015) Develop a model to assess organizational readiness for implementation of Business Intelligence systems: A Case Study: Banking Industry

The objective of this study was to develop a model to evaluate organizational readiness in Iran banking industry. To achieve the study goal, researchers firstly reviewed related literature and conducted interviews with experts to identify organization readiness factors. A questionnaire was distributed on 23 experts to investigate these factors in the banking industry. Eleven readiness factors categorized into three domain were extracted. These factors were **Management** (*Top Management Support, Alignment to Vision & Mission, Perceived Usefulness, Project Cost, and Organizational Culture*), **Process** (*Virtual Degree of Organization and Project Management*) and **Technology** (*Organizational Infrastructure, Internal Experts, Expected Benefits for Organization Experience, and Data Quality*). In the second phase, researchers designed a quantitative 9-degree Likert scale questionnaire to measure the impact and weight these factors. 93 participants completed the questionnaire.

Results revealed that the impact of *Alignment to Vision & Mission*, *Organizational Infrastructure* and *Expected Benefits for Organization Experience* factors was not approved. Researchers attributed the negative conclusion of the vision & mission to the non-quantitative nature of the factor. They also expanded that

infrastructure can easily be obtained by outsourcing, and that BI experience in Iran is limited which lead to classifying these two factors as non-critical. Researchers strongly recommended that organizations should apply a BI readiness assessment before starting their real investment.

6- (Egbeniyoko, 2014) Exploring the Critical Success Factors of Business Intelligence System Implementation

This research performed deep analysis to understand the relationship between sixteen CSFs and the successful implementation of BI, and to develop a BI implementation model. Researchers used a mixed method approach that comprised both quantitative and qualitative techniques. Firstly, researchers conducted a quantitative survey applied on 102 of key stakeholders in UK organizations that adapted BI to confirm and validate the CSFs for BI implementation model. Secondly, semi-structured interviews were conducted with four organizations to deeply analyze and understand the effect of these CSFs in real life implementation of BI.

The author categorized these factors into 4 categories: **Technical** factors (Technical *infrastructure, Software selection & support, Implementation methodology, Data management*), **Process** factors (*Communication with stakeholders, Change management, Project management, User participation*), **Organizational** factors (*Management support, Executive sponsorship, Team skills, Business case & vision*), **User** factors (*User intuition, User training*).

The results concluded the existence of the relationship between the CSFs and the BI success factors, and the research model explained about 61% of the total variance in BI implementation success. In addition, the study found that adequate budget and nature of organization have no relationship with BI success. The Research recommendation was to refine the relationships and impacts embodied in the proposed model to increase its explanatory power and to test the applicability of the model to other information management systems.

7- (Naderinejad et al., 2014) Recognition and Ranking Critical Success Factors of Business Intelligence in Hospitals - Case Study: Hasheminejad Hospital

This research focused on implementing BI in health and treatment sector, researchers studied the CSFs identified by previous studies and developed CSFs model for BI implementation by identifying and ranking all CSFs included in proposed model. A quantitative case study methodology was followed and a survey was conducted to collect data from managers and employees of Hasheminejad hospital.

Researchers categorized all critical factors into three categories: **Organizational Perspective** (*Goals And Organization Strategy, Financial Resources, Human Resources, Organization Culture, Leadership, Coincidence Of Business And IT, Management Support*), **Process Perspective** (*Process Maturity, Methodology, Change Management, Frequent Development Model, Process Documentation, Project Team Combination*) and **Technological Perspective** (*Technology And Knowledge Transfer Speed, Data Quality, Suitable Infrastructure And Technology, Application Capability, Training And Support*).

Researchers model was similar to Yeoh & Koronios (2010) model in that both included similar factors. In addition, researchers concluded that organizational, process and technological factor domains equally affected implementation of BI, therefore, non-technological factors (Organization and Process factors combined) had higher importance and influence compared to technological factors. Researchers also ranked all factors based on their importance levels, *organization goals & strategies, resources and culture* had the highest rank. In contrast, *infrastructure & technology, application capability*, and *training* had the lowest rank. Researchers recommended addressing the relationship between the selected CSFs and managers' satisfaction within decision-making process.

8- (Fedouaki, Okar, & El Alami, 2013) A Maturity Model For Business Intelligence System Project In Small And Medium-Sized Enterprises: An Empirical Investigation

Objective of this study was to develop a maturity assessment model for BI systems in Moroccan small and medium-sized enterprises (SMEs). A quantitative

questionnaire was distributed to collect data from 65 Moroccan SMEs; only 17 valid responses were returned. Within each company, the survey was addressed to one person at the management level.

The proposed assessment model was built upon the following three dimensions: maturity level (*Initial, Defined, and Managed*), life cycle stages (*Justification & Planning, Business analysis & Design, and Construction & Deployment*) and critical success factors (CSFs) of BI implementation. Researchers adopted the CSFs proposed by Olszak & Ziemba (2012). Fourteen CSFs were distributed among BI life cycle stages; the Justification & Planning stage included Clear Business Vision & Plan, Leadership, Adequate Budget, Senior Management Support, and Change Management factors. While the Business analysis & Design stage included Skilled Staff, Users' Expectation, and Align to Business Needs. Finally, Construction & Deployment stage included Data Quality, BI Flexibility, Appropriate Technology & Tools, User-Friendly, and Integration between BI System & ERP.

The study found that the maturity of BI Systems implemented in Moroccan SMEs was at the Defined level. In addition, the maturities of the different life cycle stages of BI were independent from each other. This means that, the maturity of a company may be in the Managed level at some stage while being in the Initial level at another stage. Researchers recommended doing future empirical studies to examine the proposed Maturity Model in different contexts.

9- (Mungree et al., 2013) A Framework for Understanding the Critical Success Factors of Enterprise Business Intelligence Implementation

This exploratory study aimed to develop a BI CSFs framework by investigating the success factors and their contextual issues that lead to a successful BI system implementation. Researchers began by collecting BI success factors from literature, and then they used qualitative analysis and a mixed-method approach by conducting a semi-structured interview with 16 BI experts (Consultants, Team Leaders, and Managers).

Researchers introduced a framework with ten factors. A deep discussions and investigation with sixteen BI experts had been implemented to rank these factors.

Authors found that all included factors were strongly related to BI success except Flexible Technological Framework. These factors were ranked from the most to the least important as follows: Committed management support, Committed and informed executive sponsor, Clear vision and well-defined system requirements, User-oriented change management, Alignment of BI strategy with business objectives, Appropriate team skills, Adequate resources and Project scope management.

Another finding was that all participants' positions (Consultants, Team Leaders, and Managers) had rated all the ten critical success factors approximately in the same way. Likewise, the contextual elements of each factor were addressed. Researchers recommended that future studied should practically investigate the validity of the framework and inspect the drivers of the framework factors.

10- (Dawson & Van Belle, 2013) Critical Success Factors For Business Intelligence In The South African Financial Services Sector

The objective of this research was to identify the most important CSFs in the financial services sector of South Africa and to compare these factors with related European studies. Researchers selected three financial organizations adopted BI in different maturity levels to apply a two-round Delph method aiming to rank CSFs in 3 dimensions (importance, variability, and controllability). They used a questionnaire with five-degree Likert scale to rank factors. Researchers reached consistency results after the second round and found that the most important factors in descending order were *Data Quality, Business Case, Influence Of IT On Business Unit Strategy, User Involvement, Business Champion And, Top Management Support*.

Researchers also found that the proposed CSFs and the outcomes of this study were partially correlated to European studies. Moreover, researchers could conclude that IT and business participants drew the same comparisons for the top ten business CSFs. The study recommended that these CSFs should be carefully addressed during the implementation of BI, and additional researches were suggested to deeply investigate the different ways to measure and implement these factors during the project life cycle.

11- (Phiriyayotha & Rotchanakitumnuai, 2013) Data Warehouse Implementation Success Factors and the Impact of Leadership and Personality on the Relationship between Success Factors

This research investigated the relationship and the influence of CSFs on BI implementation and deeply analyzed the influence of project manager's leadership styles and team member's personality types on the CSFs. A quantitative survey with five-point Likert scale was conducted to collect data from 164 DW project members from Thailand.

The results from the regression analysis of the data identified a significant correlation between all proposed CSFs (*Organization Culture, Technical Tools, Management Support, User Involvement, Quality Of Data Sources, Self-Efficacy, Knowledge Sharing And Clear Objective & Goals*) and the success of the DW implementation. Besides, researchers found that leadership styles affected both *Quality Of Data Sources* and *Clear Objective*. On the other hand, a difference in the personality of team members affected user involvement and knowledge sharing.

Research recommend considering the leadership style and personality type in determining team composition.

12- (Olszak & Ziemba, 2012) Critical Success Factors for Implementing Business Intelligence Systems in Small and Medium Enterprises (SME)on the Example of Upper Silesia, Poland

This study aimed to fill the gap of implementing BI in small and medium enterprises (SME) by identifying the critical success factors for BI implementation in SME. Researchers used a three-stage method with a population consists from 20 SMEs from Upper Silesia in Poland, which had implemented or were in the process of implementing BI systems. Researchers used critical thinking, inductive reasoning and in-depth interview to collect data then analyzed the gathered raw data using qualitative analysis.

The finding from the last stage identified 15 CSFs for implementing of BI in SME. These factors were classified into three categories (Organization, Process and Technology), these factors were:

Adequate Budget, Senior Management Support, Leadership, Skilled Staff, Clear Business Vision & Plan, Cooperation With BI Supplier, Align To Business Needs, Users' Expectation, Change Management, Integration Between BI System And ERP, Data Quality, BI Flexibility, Appropriate Technology And Tools And User-Friendly.

Researchers also found significant differences between their findings and other previous research in the degree of impact of CSFs. Due to the fact that SME had limited financial resources and lack of experience, researchers concluded that Adequate budget, leadership and staff skilled **(Organization perspective)**, users' expectations (**Process perspective**) and integration between BI system and other systems **(Technology perspective**) had the highest impact on the success of BI implementation. Also, this research compiled that Yeoh & Koronios (2010) model was a suitable and applicable model to assess the readiness of organizations to adopt BI initiative, researchers mention that Yeoh & Koronios (2010) model must be adjusted to fit the adopting organization and its main purpose of implementing BI system.

Researchers recommended that any SME must be aware of its reserved budget, stakeholders' expectations and the integration of the new BI system with the other existing systems such as ERP to achieve profit expectation of adopting BI.

13- (Olbrich et al., 2012) Critical Contextual Success Factors for Business Intelligence: A Delphi Study on Their Relevance, Variability, and Controllability

This research focused on CSFs of BI implementation from contextual perspective. All previous studies investigated CSFs for BI from one dimension (the degree of relevance), this study investigated and ranked the critical factors for BI from three dimensions (relevance, variability and controllability).

Researchers studied all factors investigated by previous studies, they conducted a three round Delphi method using a list of 25 factors extracted from previous studies and investigated by a group of 13 BI experts. Then researchers conducted a hierarchical cluster analysis to identify meaningful groups of elements that have similar attributes. The model factors were: Top Management Support, Data Sources, Corporate Strategy, IT Budget, Degree of User Involvement, Sophistication of IT

Infrastructure, Financial Situation, BI Strategy & Reporting Standards, Market Dynamics, Technical Capability of IT Personnel, Location of IT Department, Degree of Business Process Automation, Influence of IT On Corporate Strategy, Product Range, IT Literacy of Employees, Management Methods, Heterogeneity of IT Infrastructure, Time Restrictions, Legislation, Informal Communication In The Organization, Organization Size, Organizational Structure, Industry, Sophistication of Competitors' BI Technology, And Ownership Structure.

From relative dimension perspective, researchers found that Top Management Support, Data Sources, and Corporate Strategy had the highest rank while Organization Industry, Competitors' BI Technology, and Ownership Structure had the lowest rank.

Researchers clustered factors into six clusters, each of which included similar factors. Clusters helped BI managers to deal with all factors in the same cluster in the same way.

Researchers recommended that more investigation and examination of factors in practical case studies should be conducted to validate the relationship between CSFs and BI success implementation.

14- (Hidayanto et al., 2012) Business Intelligence Implementation Readiness: A Framework Development and Its Application to Small Medium Enterprises (SMEs)

This research added a significant contribution for BI implementation, the objective of this research was to develop a framework for measuring the organization's readiness level for BI implementation. Researchers developed a framework included 18 CSFs gathered from previous literature, and they then used Analytic Hierarchy Process (AHP) to assign weights for each factor. Five BI experts were selected to investigate and weight the CSFs, researchers used Delphi method in order to achieve consensus among the involved experts.

Strategic Alignment, Committed Management Support And Sponsorship, Clear Vision & Well-Established Business Case, Business-Centric Championship And

Balanced Team Composition are considered the most important and the highest weight factors to measure BI implementation readiness.

Then researchers applied the assessment framework in Mode Fashion Group to measure its readiness level for implementing BI. Semi-structured interviews were conducted to collect data, then each factor was mapped to one of the suggested levels of readiness (Small, Some, and Adequate degrees) and the overall readiness score was calculated. Researchers recommended that readiness level of BI implementation should be measured to reduce risk.

15- (Adamala & Cidrin, 2011) Key Success Factors in Business Intelligence

This is a master research applied in Poland aimed to develop tools needed to assess the success and manage BI and Data Warehouse initiatives. In order to achieve this goal, researchers began by identifying the factors presented in successful BI projects, then organized these factors in a CSFs framework with the objective of measuring each factor. A quantitative survey was conducted to collect data from 68 organization which already had implemented BI systems.

Researchers began by investigating 25 independent factors. After analyzing the collected data, researchers conducted a framework with 17 independent variables that found to explain 61% of the variability in BI success. Researchers then found that limiting the number of factors to 5, those with the highest correlation to success, kept the model capable of explaining 58% of the success variability. The top five factors were: *End Used Involvement, clear strategic vision, aligned to Business Needs, best opportunities Seeking, Solve all technological & Non-technological problems.*

Researchers found that non-technological issues were more important, harder and take longer time to solve than technological issues. In addition, authors found that successful BI projects share common factors that are usually absent in unsuccessful BI projects. This fact helped organizations to focus on the most important matters.

All CSFs used in this research model were included in Yeoh & Koronios (2010) CSFs framework. Consequently, this research found that Yeoh & Koronios (2010) model is a suitable and applicable model to assess the readiness of organizations to adapt BI initiative.

One significant limitations of this research was that researchers measured BI success based on participants attitudes instead of using objective measures like ROI or NPV for profit organizations, quality of services and productivity for nonprofit and public sector. Work in this research proposed several objective measurements for CSFs but cannot be considered as universal and applicable for all projects thus it is recommended that future studies address this limitation.

16- (Yeoh & Koronios, 2010) Critical success factors for business intelligence systems

This exploratory study aimed to fill the gap between academic research and practical implementation of BI by investigating the CSFs influencing the success of BI implementation and developing a CSFs framework. Researchers followed two-stage qualitative approach, in the first stage researchers used three rounds Delphi method with 15 BI experts to investigate and develop CSFs framework. The objective of the second stage was to verify and empirically examine the CSF's framework generated in the first stage, five large and complex organizations were selected as case studies. A cross-case analysis was used on data collected by semi-structured interviews to examine the absence or presence of CSFs and to examine the applicability of the generated CSFs framework.

Researchers developed a model focusing on seven critical factors that impact BI implementation. These factors were categorized into three broad categories: **Organization** (*Vision, Business Case & Planning, and Top Management Support*), **Process** (*Team & Presence of Champion, Project Management & Business Driven Methodology, Change Management and User Involvement*) and **Technology** (*Data, Infrastructure*). All previous factors caused business orientation and in turn lead to successful implementation. The successful implementation was then measured by two dependent variables: **Infrastructure Performance** (*System Quality, Information Quality, and System Use*) & **Process Performance** (*Budget, and Time Scheduler*).

Researchers concluded that the model was suitable and applicable to assess the readiness of implementing BI successfully. All seven factors were critical and significantly affected BI adopting. In addition, researchers found that non-technical

issues (organization and process factors) were more important than Technology issues, so focusing on business perspective, needs, and addressing the 7 factors using business orientation approach are consider a cornerstone for successful BI implementation.

Researchers recommended that CSFs of BI systems should not be applied without giving careful consideration to the relevant contextual issues.

17- (Hawking & Sellitto, 2010) Business Intelligence (BI) Critical Success Factors

This research studied the implementation of BI as an extension of ERP system, researchers aimed to investigate CSFs associated with BI in an ERP systems environment. The researchers collected data from 69 SAP related industry events and used a qualitative content analysis to identify the CSFs related to BI and ERP systems. The research found that most of the factors - with the highest frequencies noted in literature- were common to both ERP systems and BI, these common factors were: *Management Support, Champion, User Participation and Team Skills. Source Systems* and *Development Technology* were solely linked to BI while *training* and *change management* were identified as ERP factors. Researchers recommended further research to investigate each of the identified CSFs separately.

18- (Arnott, 2008) Success Factors for Data Warehouse and Business Intelligence Systems

BI Researchers updated the IS models and added CSFs in the domain of management and project process to fulfill the BI special success needs. This research extracted CSFs from IS, DW, and BI previous research and investigated their behavior and effectiveness on a BI implementation case study over the project life cycle. This study used CSFs theory to analyze a case after the event. Researchers used a qualitative analysis on the data collected by semi-structured telephone/face to face interviews. Ten critical success factors used in this research as independent variables were:

Committed and Informed Executive Sponsor, Management Support, Appropriate Team, Appropriate Technology, Adequate Resources, Effective Data

Management, Clear Link With Business Objectives, Well-Defined Systems Requirements, Evolutionary Development And Management Of Project Scope.

The research compiled that all CSFs changed dynamically over the project life cycle affecting the success or failure of the BI system. The ten factors, used in the research, had important effect in explaining BI project success or failure. The major limitation of this research was the difficulty in generalizing the results of the single case study, also it had a construct validity problem because the analysis and interpretation of qualitative data were partly subjective.

Researchers recommended that further case studies should investigate CSFs for BI implementation and the ability of such factors to act as a predictive tool.

19- (Wixom & Watson, 2001) An Empirical Investigation of The Factors Affecting Data Warehousing Success

This is an empirical study aimed to understand and investigate the relationship among the implementation of CSFs and the success of Data Warehouse, a core component of BI systems. Researchers used two-phase methodology, firstly, a DW model was developed depending on literature review, then exploratory survey and structured interviews with 10 DW experts were conducted. Subsequently, a cross-sectional survey was held to investigate the model by collecting data from 111 organizations. Seven implementation factors were included in the model: *Management support, Champion, Resources, User participation, Team skills, Source systems and Development technology*. Next, system success was measured by three dimensions namely, *Data quality, System quality and Net benefits*.

Researchers found that all implementation factors significantly affected the DW success. Focusing on these factors saved time, money and overcame all implementation problems, which in turn helped managers to achieve the expected DW benefits. Researchers recommended further understanding of infrastructure and determining the differences between infrastructure and application-level IT phenomenon.

3.2 Evaluation and comment on previous studies of CSFs of BI

The aforementioned previous studies have adopted different methodological approaches. Most of the literature focused on identifying CSFs using qualitative approaches. Some researchers adopted Delphi method which gives allows reaching a consistent results from a panel of experts such as Dawson & Van Belle (2013), Nasab et al. (2015), Olbrich et al. (2012) Yeoh & Koronios (2010), and Yeoh, Koronios et al. (2008), while other researchers such as Arnott (2008), Hawking & Sellitto (2010), Olszak & Ziemba (2012), and Sangar & Iahad (2013) used case study with semi-structured interviews to deeply analyze these factors. On other hand, Adamala & Cidrin (2011), Bargshady et al. (2014), Naderinejad et al. (2014), and Phiriyayotha & Rotchanakitumnuai (2013) adopted purely quantitative method to identify CSFs and verify the relationship between the CSFs and the implementation success.

This research uses a mixed-method with three-phase exploratory methodology. In the first phase, an investigation on previous studies has been used to identify Critical Success Factors (CSFs) for BI success implementation. In the second phase, AHP method together with interviews with a panel of experts have been adopted to develop a CSFs readiness framework for BI success implementation. Finally, a case study has been adopted to deeply analyze the readiness assessment framework developed in the previous phase.

The above listed previous studies presented different sets of CSFs, often depending on the research interest and background. Some of these factors were highly frequent like *Top Management Support* and *Vision & Planning*, where others were rarely presented like *Organization Culture* and *Presence of Champion*. Some research focused only on investigating and addressing the CSFs of BI like Dawson & Van Belle (2013), Mungree et al. (2013) Naderinejad et al. (2014), Nasab et al. (2015), and Phiriyayotha & Rotchanakitumnuai (2013), while other literature such as Delone & McLean (2003), Wixom & Watson (2001), and Yeoh & Koronios (2010) focused on addressing the relationship between implementation factors and success factors of BI. Additionally, some researchers went behind identifying the success factors by ranking or weighting them, in other words, they measured the priority or the rate of contribution of each factor in the implementation success. Most of the researchers

ranked the CSFs by conducting quantitative survey distributed among BI experts, such as Dawson & Van Belle (2013), Gartner (2016), Mungree et al. (2013), Naderinejad et al. (2014), Olszak & Ziemba (2012), and Yeoh, Koronios, et al. (2008), only Hidayanto et al. (2012) weighted the factors by using Analytic Hierarchy Process (*AHP*), which gives the ability to execute a pairwise comparison between all factors and achieve a consensus weight of each factor among involved experts. This research focuses on weighing and measuring the CSFs which determine the organizational level of readiness for implementing BI systems by using Analytic Hierarchy Process (AHP) method.

Some research classified the CSFs in order to further understand the role and behavior of these factors during the system life cycle. BI CSFs were broadly categorized according to their domain, particularly, *Organizational*, *Process* and *Technical* domains (Egbeniyoko, 2014; Naderinejad et al., 2014; Olbrich et al., 2012; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010). Another classification was presented by Dawson & Van Belle (2013) and Olbrich et al. (2012), who clustered the CSFs based on three dimensions (*Relevance*, *Variability*, and *Controllability*). Each cluster includes similar attributes helping BI managers to deal with all factors in the same cluster in the same way. Hawking & Sellitto (2010) and Sangar & Iahad (2013), on the other hand, divided CSFs according to system implementation phase as they found that the level of relevance of CSFs varies from BI system implementation phase to another. This research adopts the domain categories by dividing CSFs into *Organizational*, *Process*, and *Technical* factors, in addition, this research emphasizes on pre-implementation factors to measure the level of organizational readiness of adopting BI system.

While reviewing literature, researchers has not stopped at any previous studies that addressed the CSFs of BI or the readiness assessment for BI adoption in the environment of this study, precisely, Gaza Strip. The previous studies targeted different environments and communities like Malaysian, UK, South African, etc. This study may be the first one that targets Gaza Strip for identifying and measuring the CSFs importance weights and developing a readiness assessment framework suitable for this environment. Gaza environment has special characteristics different from other environments. Gaza is a developing country, so it suffers from a lack of the necessary

experiences in the field of information systems, especially in the comprehensive and large systems such as ERP and BI. It is also considered as a volatile environment in which many political conflicts affected the performance of institutions and ministries. In addition, for more than 10 years, Gaza is suffering from the blockade that significantly influences allocating the necessary resources for grantee institutions success.

3.3 Research Distinction

Through reading and examining previous studies that have addressed similar topics as the current research, it can be concluded that the majority investigated and addressed the CSFs of BI and their relationship with system success. Most of those studies used qualitative methodologies to address these factors after implementation. Only one research measured these factors before implementation with the intent for measuring the level of readiness for BI system. The following points summarize how this study differs from other studies:

1- It is one of few studies addressing readiness assessment toward BI systems.

2- The first to address Gaza Strip as study environment.

3- Research findings can provide significant guidelines for organizations that are targeting BI.

4- This study covers both theoretical and practical perspectives of BI implementation. It carries out an extensive literature review, followed by in-deep interviews with experts to strengthen the theoretical field with practical experience.

5- This study distinguishes among CSFs impacts on BI success during pre-implementation phase. It measures the contribution weight of each factor by using Analytic Hierarchy Process *(*AHP) method.

6- It introduces a new readiness assessment framework that organizations can utilize to measure their readiness and focus on essential areas that need more attention during BI implementation. In addition, it presents a list of acceptable guidance points to measure each factor.

7- The current study not only proposes a readiness assessment framework but also tests it via conducting a case study on MoEHE to measure the overall readiness ratio of the ministry and to uncover its weaknesses.

3.4 Chapter Summary

This chapter has listed a number of previous studies dealt with critical success factors of Business Intelligence implementation. It also registered a general commentary on reviewed studies to present the matching and mismatching between the current study and other studies in terms of the environment, methodology, and data analysis tools used to test gathered data. Finally, it shed light on what makes this study distinguished.

Chapter Four

Research Methodology

Chapter Four: Research Methodology

This chapter discusses the research methodology adopted by the current study to answer the research questions. It follows a mixed methodology with three phases. The chapter begins with describing the methodology of identifying the Critical Success Factors (CSFs) for BI implementation. Then, it describes the Analytic Hierarchy Process (AHP) method, which has been utilized to determine the importance weight of each factor and to employ these CSFs in developing a quantitative readiness assessment framework. Then, the third phase focuses on applying the proposed framework to a case study and describing phase design, characteristics of the population, primary and secondary data collection, and questionnaire design. In addition, it presents the statistical methods and tools used to carry out data analysis to answer the research questions. Finally, it presents the pilot study and addresses the different statistical analysis tools used to test the research questionnaire for validity and reliability.

4.1 Research Methodology

The objective of the research is to develop a readiness assessment framework for BI implementation. Many researchers identified CSFs by using qualitative approaches, the most adopted method was Delphi method which gives the ability to reach a consistent results from a panel of experts (Dawson & Van Belle, 2013; Nasab et al., 2015; Olbrich et al., 2012; Yeoh & Koronios, 2010; Yeoh, Koronios, et al., 2008) . While other researchers used semi-structured interviews with a case study to deeply analyze these factors (Arnott, 2008; Hawking & Sellitto, 2010; Olszak & Ziemba, 2012; Sangar & Iahad, 2013).

This research uses a three-phase exploratory methodology: In the first phase, Critical Success Factors (CSFs) for BI implementation have been identified. An investigation of previous studies has been used to analyze, consolidate and extract these factors. In the second phase, a Critical Success Factors (CSFs) framework for BI implementation has been developed by ranking and weighting factors using AHP method and face-to-face interviews with BI panel of experts. Finally. A case study has been conducted to deeply analyze the BI implementation success framework. The

assessment framework has been applied in Ministry of Education & Higher Education (MoEHE) to measure the organizational readiness. Descriptive analytical and quantitative (deductive) approaches have been followed. A 7-degree Likert scale questionnaire was used to collect the primary data. The overall ministry readiness degree and score have been identified; In addition, a deep factors investigation has been conducted to identify the ministry's strengths and weaknesses for BI system adoption. The overall research process is depicted in Figure (4.1)

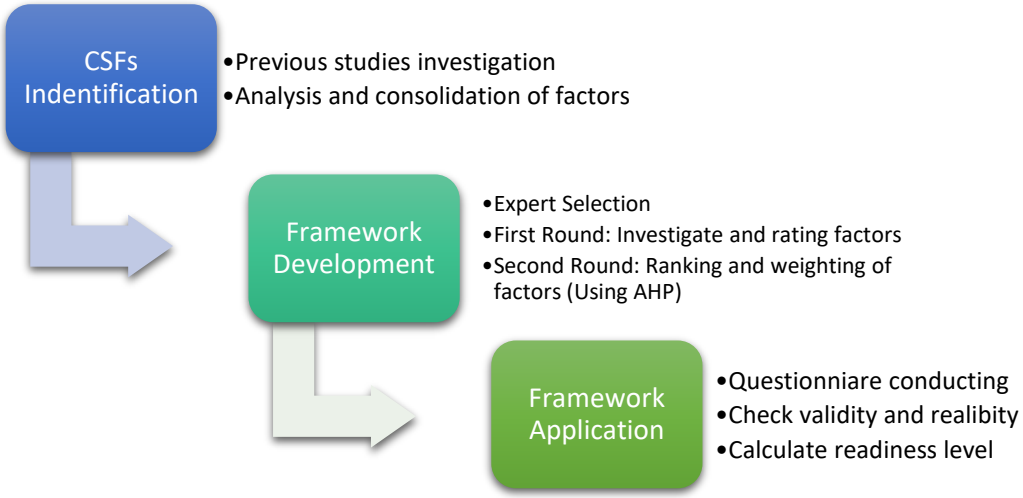

Figure (4.1): Steps of the research process

Source: developed by Researchers

4.2 Phase One: Critical Success Factors (CSFs) Identification

Critical Success Factors (CSFs) are important aspects that should be considered by organizations in order to lever BI implementation success. This study adopted the CSFs as a readiness factors for BI implementation. By investigation of the previous studies in the previous section, a comprehensive list of thirteen CSFs with significant impact on BI implementation have been extracted. These factors were derived via a process of identifying, filtering, and scoring CSFs used in 30 studies, some factors were eliminated because of low scoring and other factors were merged or mapped under a comprehensive name. Many other studies followed the very same approach

such as Baker & Chasalow (2015), Dawson & Van Belle (2013), Egbeniyoko (2014), Naderinejad et al. (2014), and Nasab et al. (2015).

4.3 Phase Two: Framework Development

In this phase, the researcher aims to develop a quantitative framework for measuring the organization's readiness ratio for successful BI implementation based on the derived CSFs. This framework was developed to facilitate organizations in Gaza to understand its current state and to evaluate its readiness toward BI initiative. The readiness tool is critical when an organization decides to adopt BI as it gives the organization ability to determine its weakness areas, identify opportunities to improve. Such tool avails valuable insights to rise the successful implementation ratio and benefits.

In order to utilize the readiness tool introduced in this phase to evaluate the overall readiness of any organization, the readiness level of each factor should be fairly and clearly quantitatively measured. Although qualitative assessment could be better and more professional, it may be tough for organizations to carry out and to conduct interviews with relatively big number of respondents in addition to its being long, costly, and subjective method. Therefore, the researchers preferred to develop a quantitative framework to substitute the qualitative one for assessing the organizational readiness toward BI for the fact that quantitative approach is much easier, faster and less expensive to apply in institutions (Johansson, Eckerstein, & Malmros, 2016).

AHP method has been adopted to rank and weight the CSFs derived in the first phase. A BI expert panel has been carefully selected to cover all the readiness assessment framework aspects. Face-to-face interviews are considered one of the best and fastest ways to investigate a problem and identify its dimensions (Yeoh & Koronios, 2010). Therefore, the researchers have applied semi-structure interviews in two rounds with the expert panel to explore and refine the CSFs, to rank and weight these factors and to identify the contextual terms for each factor.

4.3.1 Experts Panel (Expert Selection)

Due to the research problem nature; experience, preferences, and perspectives of BI experts are necessary for achieving consistent and reliable outcomes. Therefore, a panel of experts was selected very carefully to ensure effective results. Giving that the BI sector is a relatively new field in Gaza, it is a little bit difficult to find experts with strong background and specialization related with the theoretical and practical parts of the BI systems.

Sixteen experts were selected based on their experience, domain of work and qualifications to cover all BI system aspects. In the selection process, researchers have considered the organizational type (Academic, Private, and Public), domain of work (IT, Management, or both), diversity of university degrees and years of experience to ensure a certain level of direct theoretical and practical experiences and knowledge of the panel members. The panel of experts included managers, consultants, developers and lecturers in IS and BI fields. The demographic profiles for experts are described in Table (4.1). More details, are elaborated in *Appendix C*.

This panel of experts has almost been distributed equally among sector types and likewise among qualifications. 81.3% of these experts were found to have experience in both IT and Management and 93.8% of these experts were found to have tenure longer than 7 years. Therefore, these distribution rates are appropriate to investigate the research's factors and develop the BI readiness assessment framework.

4.3.2 First Round: Factors Rating and Modifications

After a careful selection of the experts, the first round of developing the research framework has begun. A semi-structured interview has been conducted with each expert to deeply understand, investigate and rate the importance of each factor. A 5-degree Likert scale in addition to open questions questionnaire, shown in *Appendix A*, was used to collect the experts' opinions. Experts have rated the importance of the 13 critical factors of BI affiliated with pre-implementation phase. The experts' suggested importance rates consolidated three different dimensions: relevance (how much the factor impact the BI success), variability (how fast the factor changes) and controllability (how much the BI team is able to control and influence the factor).

Microsoft Office Excel has been used to analyze the opinions of the experts, and then the sum, average, and percent were calculated for each factor. After rating process, experts were given the floor to suggest any additional factors they deem critical to the success of BI systems.

Table (4.1): Demographic profiles for experts

Place Of Work				**Education**			
	Freq.	**Percent**	**Cumulative**		**Freq.**	**Percent**	**Cumulative**
Academic Sector	5	31.3%	31.3%	Bachelor	4	25.0%	25.0%
private sector	5	31.3%	62.5%	Doctorate	6	37.5%	62.5%
public sector	6	37.5%	100.0%	Master	6	37.5%	100.0%
Grand Total	16	100.0%		Grand Total	16	100.0%	
Domain of Work				**Experience**			
	Freq.	**Percent**	**Cumulative**		**Freq.**	**Percent**	**Cumulative**
IT	3	18.8%	18.8%	3-7 years	1	6.3%	6.3%
IT & Management	13	81.3%	100.0%	More than 7	15	93.8%	100.0%
Grand Total	16	100.0%		Grand Total	16	100.0%	

4.3.3 Second Round: AHP Model Applying (Weighting Factors)

All suggested CSFs resulted from the first round are considered as an input to the second round. These CSFs do not have equal impact on the success of BI during the pre-implementation process. In order to develop a readiness assessment framework and provide a fair method to measure an organizational readiness toward BI, the impact degree of each critical factor on BI implementation should be determined. Thus, the researchers started the second round to weight the impact of each factor on the successful implementation of BI system using Analytic Hierarchy Process (AHP) method. Firstly, an introduction, the theoretical background and the mechanism of AHP method are described, followed by how the researchers adjust AHP to be used in the current study.

4.3.3.1 Introduction of Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP) is one of Multi-Criteria Decision Making (MCDM) methods that was developed by Thomas L. Saaty in 1970s. AHP is one of the most famous methods for solving complex problems involving multiple criteria and multiple alternatives. Saaty (1987) defined AHP as a simple mathematical tool that deals with complex and unstructured problems by building a hierarchical structure that presents the relationships among the problem goal, criteria, sub criteria, and alternatives. AHP provides a framework that enables decision makers to think of complex problems in a simple way by decomposition a complex problem into hierarchy of simple sub-problems (Hidayanto et al., 2012).

AHP was designed to handle situations in which subjective judgments of individuals are considered an important part of the decision process by organizing the individual feelings, judgments, and intuition into a logical structured framework for proper decision making (Cheng, 1997). In addition, it helps decision makers to solve problems that involve a mixture of qualitative, quantitative and conflict factors in a systematic manner (Rajput & Shukla, 2014). Furthermore, AHP reduces bias in decision making process by checking the consistency of the decision maker's judgments.

Fundamentally, AHP method is used to prioritize alternatives to select the optimal one. In order to do so, firstly, decision makers should decompose and break down their problems into a hierarchy of more easy to understand sub-problems. The criteria used to judge the alternatives are selected by decision makers and weighted in terms of their importance to achieving the problem goal. Higher weights indicate more importance. Then, decision makers assign a score to the performance of each alternative based on that criterion. Finally, the overall priority and rank for each alternative are calculated in terms of how they contribute to the goal by combining the criteria weights and the alternatives scores. The output of the AHP is the ranking that indicates the overall preference for each of the decision alternatives, the best alternative is the one with the highest weight (Golden, Wasil, & Harker, 1989; Saaty, 1987).

4.3.3.2 AHP Methodology and Axioms

AHP has been developed to solve multi-criteria problems through determining the extent to which each alternative contributes to the problem goal. It depends on three major principles: decomposition, comparative judgments, and synthesis. First, the decomposition principle is applied to break down the complex problem (multiple criteria) into a hierarchy of easier to understand sub-problems called clusters. The second principle is comparative judgments that means applying pairwise comparisons of all two-element combinations within a cluster with respect to the parent of the cluster, which greatly reduces the complexity of the analysis. These pairwise comparisons determine the local weight of each element within a cluster with respect to their parent. The synthesis principle is applied to determine the global weight of elements throughout the hierarchy by multiplying the local weight of each element by the global weight of its parent. After calculating the global weights for all elements throughout the hierarchy, these global weights are added to determine the priorities for the alternative (Saaty, 1987). Figure (4.2) illustrates AHP steps in more details to include 9-step process as shown.

An axiom is a statement that everyone believes is true and requires no proof. All methodologies or techniques are based on axioms. Originally, four axioms for AHP were introduced by Saaty (1987):

1. *Reciprocal Axiom*: This axiom is presented in pairwise comparison matrices, for all pairwise comparisons where Z[X,Y] is a comparison between X and Y with respect to their parent, element Z. Reciprocal axiom means that Z[Y,X] = 1/ Z[X,Y]. For example, if X is three times heavier than Y, then Y is automatically one-third as heavy as X.
2. *Homogeneity Axiom*: As an individual tends to make large errors in comparing widely disparate elements, homogeneity is considered vital in pairwise comparisons. This means that to reduce errors and inconsistency in pairwise comparisons, elements being compared within the same cluster should not differ too much. This axiom depends on a good decomposition process that presents the entire problem through a homogeneous hierarchical structure.

3. *Synthesis Axiom*: this axiom is important for the composition process to be applicable, it means that judgments about the importance of elements in a hierarchy do not depend on weights of any lower level elements.

4. *Expectation Axiom*: having weights of alternatives been derived from prior knowledge of decision makers, beliefs, knowledge, and expectations of decision makers must be adequately represented in AHP outcomes. More clearly, the output weights for criteria or alternatives should be radically similar to prior knowledge or expectations of decision makers.

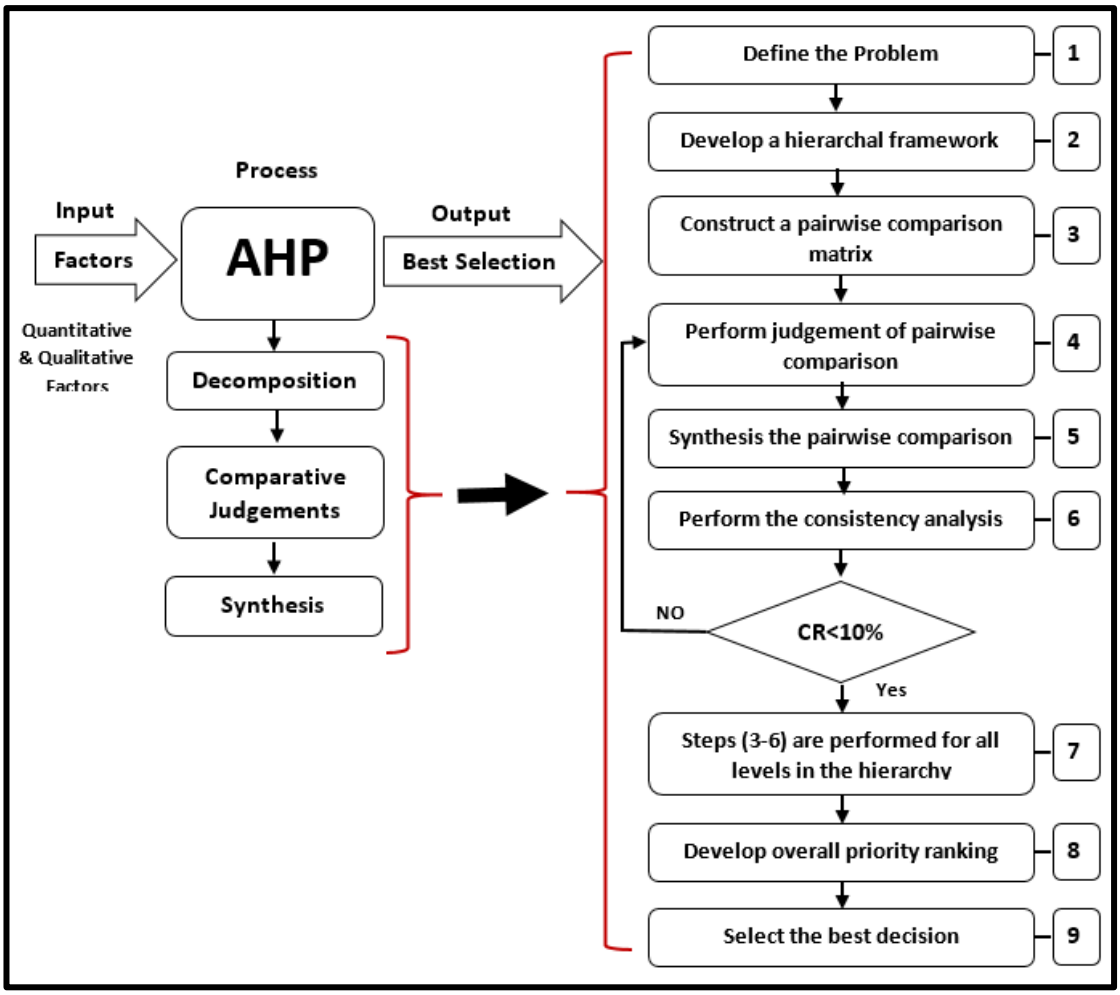

Figure 4.2): AHP methodology and its steps

Source: (Hambali, Sapuan, Ismail, & Nukman, 2009)

4.3.3.3 Hierarchical Structuring of the Problem:

AHP method uses several small sub-problems to present a complex decision problem. Thus, the first step in the AHP method is to develop a graphical hierarchical representation of the problem in terms of the overall goal, the criteria, and the decision alternatives (Saaty, 1987). This step is the most creative part of AHP process. A good representation of the problem into a hierarchical structure make the problem more understandable and easier to evaluate (Golden et al., 1989). The hierarchical structure represents the relationships among the three major components of the problem, which are the goal (the targeted end results), criteria (the factors needing consideration), and alternatives (all available alternatives to achieve the overall goal). In addition, the hierarchical structure only allows relations among elements in different levels assuming that all elements in the same level are mutually independent.

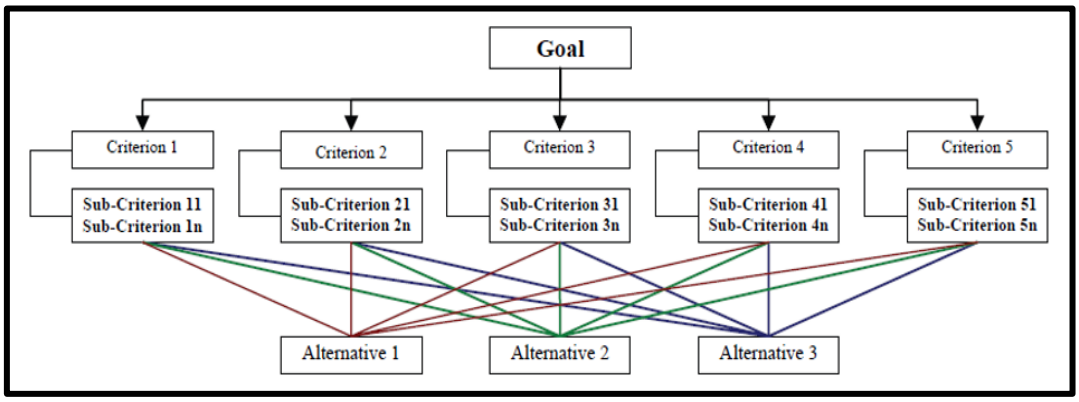

Figure (4.3): AHP Hierarchy

Source: Saaty (1987)

Figure (4.3) illustrates the general hierarchical structure of AHP, the top level of the hierarchy represents the objective or the overall goal of the decision problem. The intermediate levels represent the criteria and sub-criteria that must be considered during prioritizing the alternatives. Finally, the decision alternatives are represented at the leaf level of the hierarchy. The number of the levels in the hierarchical structure depends on the complexity of the problem.

4.3.3.4 Pair-wise Comparisons:

After decomposing the problem by presenting the interrelationships among elements using a hierarchical structure, the next step is to establish priorities and determine the relative weights of elements by collecting data from experts in a pairwise comparison form. A pairwise comparisons matrix is designed for each cluster in the hierarchy as shown in matrix **A**. The pairwise comparisons matrix is a square, reciprocal and systematic matrix that enables each element to be addressed (n-1) times in a set contains n elements. Thus, to fill a pairwise comparisons matrix with n elements, the decision maker must apply n*(n-1)/2 comparisons.

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{pmatrix}, \text{ where } a_{ij} = \frac{1}{a_{ji}}$$

To apply a pairwise comparison, the decision maker determines how many times the first element dominates over the second element with respect to the parent element. To identify the difference intensity between the elements in term of importance, Saaty (1987) used verbal assessments (qualitative evaluations) translatable into numbers (quantitative evaluations) using the scale given in Table (4.2). Number 1 means that the two compared elements are in the same importance according to the element in the higher level. Thus, the pairwise comparisons matrix has diagonal elements equals 1, as each element is as important as itself. In addition, Numbers that are greater than 1 in the matrix cell illustrate that the element in the relative row is more important than the element in the relative column. Otherwise, the element in the relative column is more important than the element in the relative row. Also, the matrix cell (J, I) has a reciprocal value of the matrix cell (I, J). For example, entering value 5 for the element I when compared to the element J means that I is 5 times as important as J, and J is 1/5 as important as I.

Table (4.2): Saaty (1987) Scale of Importance Intensities

Number	Description
1	The criterion (x) is of the **Same Importance** of criterion (y)
3	The criterion (x) is **Moderate Importance** than criterion (y)
5	The criterion (x) is **Strong or Essential Importance** than criterion (y)
7	The criterion (x) is **Very Strong Importance** than criterion (y)
9	The criterion (x) is **Extreme Importance** than criterion (y)
2, 4, 6, 8	Intermediate values between the two adjacent judgments
Reciprocals	If activity (x,y) comparison has one of the above numbers assigned to It, then (y,x) comparison has the reciprocal value

Saaty (1987) described that the eigenvector of the comparison matrix represents the relative weights of the compared elements in regards with the parent element. The average of normalized columns (ANC) method is considered the most accurate method to compute the eigenvector. The ANC (w_i), the relative weight of the element in row i, can be computed by the following equation:

$$w_i = \frac{1}{n} \cdot \sum_{j=1}^{n} \frac{a_{ij}}{\sum_{k=1}^{n} a_{kj}} \qquad (4.1)$$

Where a_{ij} is the element located in row I and column j, and a_{kj} is the element located in row k and column j.

Figure (4.4) illustrates the steps to compute the relative weights for the compared elements as follow:

1. Calculate the column sum vector by summing all values in the same column.
2. Compute the normalized matrix by dividing each cell value in the comparison matrix by the relative cell in the column sum vector.

3. Compute the eigenvector by averaging all values of the same row.
4. The relative weight of the element in row i equals the value of row i in the eigenvector.

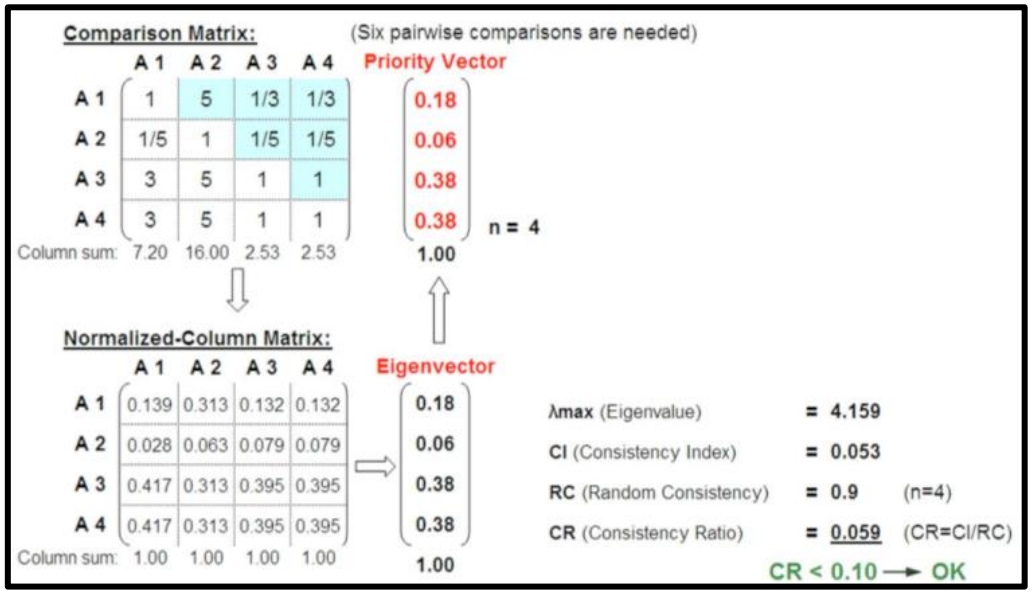

Figure (4.4): AHP pairwise comparison example

4.3.3.5 Consistency Evaluation:

The subjective judgment of decision makers' based on their experience is considered one of the advantages of using AHP. This has convinced Saaty (1987) to develop the consistency ratio (CR) which is used to control judgment quality by measuring the degree of consistency among the pairwise judgments. The comparisons judgment should be consistent in two ways, firstly, judgments should be transitive (if element A is better than B, and B is better than C, then A is better than C). Secondly, judgments should be numerically consistent (if A=3B and B=2C, then A=6C). Despite the consistency ratio name, CR measures inconsistency ratio, it does not guarantee the correct judgment but it prevents the intolerable conflicts in the comparison process. Saaty (1987) noted that to have acceptable results, CR should be less than 10%, otherwise, it's recommended to revise the comparison process before proceeding with the analysis. To compute the consistency ratio (CR), consistency index (CI) should firstly be calculated using the following equations:

Where n is the number of elements being compared, λmax is the maximum eigenvalue of the judgment matrix.

CI is then compared with Random Index (RI). RI is the consistency index of a randomly generated pairwise comparison matrix which can be identified by using

$$CI = (\lambda_{max} - n) / (n-1) \quad (4.2)$$

$$CR = CI / RI. \quad (4.3)$$

Table (4.3). RI depends on the number of elements being compared and ranges between 0 and 1.49. Finally, CR can be computed by dividing CR by RI.

Table (4.3): Random Consistency Index (RI)

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	.58	.9	1.12	1.24	1.32	1.41	1.45	1.49

4.3.3.6 Synthesis:

Once relative weights and local priorities with respect to the parent element are calculated for each element in the hierarchy with acceptable CRs, the weight for each leaf element with respect to the problem goal and global weight can be obtained. The global weight can be computed by multiplying the local weight with the local weight of the parent element until the top of the hierarchy is reached. The overall priority for each alternative is obtained by summing the product of the criterion global weight with the preference of the alternative in respect with that criterion. Finally, problem alternatives can be easily ranked based on these priority values. The sum of global weight for all leaf elements must eventually equal one.

4.3.3.7 Group Decision

In AHP method, the pairwise comparison process is often applied to a single decision maker or a small group of decision makers who conduct the comparisons collectively. In a group of experts based decision-making process, aggregation of the judgmental ranking of individuals into a consensus rank is the major problem. In this research, researchers conduct an interview with 15 experts separately and combined all their comparisons into a consistent and trusted outcome. Three different techniques can be used to generate an aggregate single weight for each factor. The first technique is to compute the mean weight for each factor by applying the aggregation function on the final global weights obtained from experts. The second technique is to compute the mean weight for each factor by applying the aggregation function on the local relative weights followed by aggregation of the results to obtain the final global weight. The third technique focuses on aggregating the experts' comparison matrices by calculating a mean value for each cell to generate a new mean comparison matrix for each set of factors, and then the local and global weights are computed for each factor.

This research adopted the third technique because the first and the second techniques fail to represent a group decision combination process. The first and the second techniques emphasize on aggregating the final experts' decisions outcome while the third technique focuses on aggregating the experts' pairwise comparisons to reflect the experts' judgments truly.

4.3.3.8 Adjustment of AHP To Current Application

As we have mentioned previously, AHP helps decision makers in organizing and analyzing complex decisions to evaluate the available alternatives and select the best alternative that suits their goal. In this research, there are no alternatives. So, AHP is used here to determine the relative weight for each BI factor in the final list. This means that the last stage of AHP, in which alternatives are evaluated according to criteria, will not be applied. Instead, the resulted factors' weights will be used in the readiness assessment framework. The main objective of the factors' relative weights is to help managers to determine the level of attention they need to pay to different factors

during BI implementation. In other words, managers should give suitable attention to each factor according to its relative weight.

Researchers designed the hierarchical structure of the research problem. The hierarchical structure included the goal of using AHP method in the top level, the main domains of the factors as criteria in the middle level, and the CSFs for BI as sub-criteria in the leaf level. Then, a second face-to-face semi-structured interview with each expert was conducted to apply AHP's pairwise comparisons. One of the experts left the panel because of his private reasons that prevented him from continuing the second round. Hence, only fifteen experts have participated. A closed-question questionnaire, shown in *Appendix B,* was used to collect the experts' preferences and opinions. Each expert made 35 comparisons by making pairwise comparisons among the three main domains (Organization, Process, Technology), and then he compared factors within each domain separately. The results of each expert's pairwise comparisons were checked immediately by calculating the Consistency Ratio (CR) to confirm the validity of expert's judgments.

4.3.3.9 AHP Implementation

Expert Choice (EC) is a decision-making software that supports resolving complex problems based on Multi-Criteria Decision Making (MCDM). The software uses the AHP methodology to build the hierarchical structure of the problem and evaluate the relative desirability of alternatives. This tool supports many features such as the matrix consistent check, panel of experts' judgments, and sensitive analysis. The software is supplied by Expert Choice Inc.

For this research, Expert Choice (EC), Version 11.1, was used to weight the critical success factors (CSFs) of BI implementation in Gaza.

4.4 Phase Three: Framework Application

In order to test and deeply analyze the proposed readiness assessment framework, Researchers have used a case study methodology as it provides better explanations of the examined phenomenon (Yin, 2013). The CSFs readiness

assessment framework, which has been derived from the AHP method in the second phase, has been applied in Ministry of Education & Higher Education –Gaza (MoEHE).

The developed readiness assessment framework includes 14 CSFs, which cannot be entirely covered in this limited-time study; therefore, the researcher has selected the top seven factors with the highest weights. These seven factors cover more than 70% of the success of a BI system. In addition, this shortlist allows managers in the organizations to focus more on most important factors, which leverage BI success. These factors are *Top Management Support (TMS), Vision & Planning (VP), Available Data Quality (ADQ), Resource Allocation (RA), Appropriate Team Skills (ATS), IT Governance (ITG), and Continuous Improvement Culture (CIC)*.

Researchers developed a 7-degree Likert questionnaire based on the contextual terms of each factor as a data collection tool to survey and analyze the attitudes of ministry staff toward the top seven CSFs. Collected data are extracted, coded, analyzed and tested using convenient statistical tests to measure the level of readiness for each factor separately, and to find the overall readiness ratio. In addition, a set of propositions are recommended for helping the ministry to overcome its weaknesses.

4.4.1 Population and Sample

The researchers selected the Ministry of Education & Higher Education –Gaza (MoEHE) to be the case used in the third phase for two reasons; firstly, one of the researchers works in the ministry as an IT team manager, responsible for implementing and evaluating all ministry's information systems including ERP system. Secondly, BI adoption became a strategic objective for MoEHE, which had a successful implementation of ERP in 2012. The ministry is looking forward to utilizing the existing ERP system data and other external data sources to support decision making in the light of business intelligence. This phase comes to fulfill this need by investigating the readiness and determining the success ratio of implementing business intelligence tools.

Targeted population of this study was all business managers in MoEHE, its directorates excluding schools, and IT staff who is responsible for implementing BI

system. Table (4.4) illustrates the distribution of population among the supervisory positions sorted by the ministry hierarchical structure from top to bottom, number of staff members in each position and the rate of population per position.

Table (4.4): The distribution of population

Supervisory Positions	Positions Population	Rate
Deputy	1	0.3%
Assistant Deputy	2	0.7%
Director General	19	6.3%
Assistant Director General	12	4.0%
Director	59	2.3%
Head of Directorate	7	19.5%
Section Head	195	64.4%
IT Staff	8	2.6%
Total	**303**	**100%**

SOURCE: Admin Affairs Department, MoEHE -Gaza (Dec-2016)

The questionnaire should be filled by a wide range of respondents from all management levels of the key business sectors such as senior managers, HR, Finance and IT. This will provide a balanced view and cover all major differences in perceptions.

Samples size was calculated based on the following equation of Cochran (1989),

Sample-size (SS)	= (Z-score)² x StdDev x (1-StdDev) / (margin of error)²
Adjusted Sample size(ASS)	= (SS) / [1 + (SS – 1) / population]
Where Z-score	= Given as 1.96 for 95% confidence level
StdDev	= Standard Deviation of the worst case, taken as 50%
Margin of error	= the error interval and I used it as 5%,

Substituting population as 303 in the above equation, sample is calculated as follows:

Sample-size	$= (1.96)^2 \times 0.5 \times (1 - 0.5) / (0.05)^2$	$= 384$
Adjusted Sample size	$= 384 / [1 + (384 - 1) / 303]$	$=$ **170**

According to sampling theory, the suitable sample size for this population was found to be 170 based on confidence level equal to 95% and Confidence Interval equal to 5. The simple random sampling technique was used to pick participants from the population (the ministry and its 7 directorates).

4.4.2 Research Instruments

According to the objective of the third phase, a closed-question questionnaire was developed and used to survey the participants. It is considered as one of the most effective tools in information systems research as it can easily cover large population with least time, cost and effort (Sequist et al., 2007). The questionnaire was designed to fit the readiness assessment framework of this study with a clear and appropriate language suitable for most organization types. 7-degrees Likert-type scale with a set of 66 paragraphs was used to draw attitudes of respondents toward the top seven CSFs with the highest weights, derived from the readiness assessment framework in phase two.

The questionnaire comprised eight parts; the first part covered the demographic traits of the respondents such as age, sex, specialization, experience…etc. While the remain seven parts covered the measurement of the top seven factors which are Top *Management Support (TMS), Vision & Planning (VP), Available Data Quality (ADQ), Resource Allocation (RA), Appropriate Team Skills (ATS), IT Governance (ITG), and Continuous Improvement Culture (CIC)*. The questionnaire was initially designed based on the contextual terms and dimensions of each factor, which was determined by a deep investigation carried out in the first phase and the opened discussion with experts in the second phase. Next, it was translated into Arabic to overcome any miscommunication, and then it was examined for content validity by presenting it to nine experts to criticize and comment on the questionnaire paragraphs. Then the construct, internal and structural validity and reliability were verified by testing a pilot

on a 30-respondent sample. Comments and recommendations were implemented. Eventually, the final version of the questionnaire was produced.

Refer to *Appendix D* and *Appendix E* for the final English and Arabic versions of the questionnaire.

4.4.3 Data Collection

Collected and used data in this phase is a primary data which was collected directly by the researchers. A questionnaire instrument was distributed to survey and investigate the attitudes of participants toward the readiness of the ministry to adopt BI system.

Given that all the expected participants in this phase are managers having access to the ministry ERP system, researchers utilized online questionnaire posted on the ministry portal website to facilitated easy access to all targeted respondents. The researchers sent notification messages via ERP system and an email for each participant asking them to attend to the online questionnaire within two weeks. The online questionnaire is more accurate and saves time and effort in data gathering. Only 221 copies were filled out of which 16 were found invalid (either partially filled or have been excluded because of the extreme tendency).

Collected data was extracted from the online questionnaire and copied into SPSS for further statistical tests and analysis. Table (4.5) illustrates the number of valid returned questionnaire copies and rate of responses returned per positions.

Table (4.5): Respondents by supervisory positions

Supervisory Positions	Positions Population	Number of Respondents	Positions Rate
Deputy	1	0	0.0%
Assistant Deputy	2	2	100.0%
Director General and Their Assistant	38	22	57.9%
Director	59	48	81.4%
Section Head	195	125	64.1%
IT Staff	8	8	100.0%
Total	**303**	**205**	**67.7%**

4.4.4 Statistical Analysis Tools

This section addresses the different statistical analysis tools and tests used to investigate validity and reliability of the proposed questionnaire and to analyze collected data to answer the research questions. SPSS version 18 were utilized to run the following list of tests and describe results.

- ❖ Cronbach's Alpha
- ❖ Pearson Correlation

4.4.5 Validity of the Readiness Assessment Questionnaire

The validity of a measurement instrument means that it can measure what it was originally designed for. It also proves quality and trustworthiness of the instrument. The following subsections are discussing the different techniques used by the researchers to ascertain the validity of the questionnaire utilized in this study.

The Experts Validation (Content Validity)

Initially, the readiness questionnaire was designed and translated into Arabic, and then it was presented to nine experts with IT and management background from different workplaces who are known to have excellent experience in criticizing and assessing research measurement tools. They were asked to review and comment on the study questionnaire by identifying weak, ambiguous, inconsistent or contradicting paragraphs and to evaluate whether questionnaire sections do look to measure the intended variables. The questionnaire was then modified based on their recommendations.

After the final version of the questionnaire was designed, the researcher applied tests for ensuring the validity and the reliability of the questionnaire by selecting a pilot target group of 30 participants randomly. The pilot group was asked to respond to questionnaire paragraphs using the ministry online questionnaire system then data was extracted and copied into SPSS software for criterion and structural validity and reliability investigation.

Criterion Validity

This validity measures the degree to which questions within an instrument agree with each other, it is calculated by evaluating the correlation among each of the questionnaire constructs and their related paragraphs. Table (4.6) illustrates the correlation coefficient for *Vision & Planning (VP)* factor and its related paragraphs. The p-values for all paragraphs are less than 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$. Therefore, it can be said that the paragraphs of this factor are consistent and valid to measure what it was set for.

Table (4.6): Correlation coefficient of Vision & Planning factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
VP1	Our organization has a clear, actionable strategy for our business	0.735**	.000
VP2	The key management and business processes the organization uses effectively execute our strategy	0.819**	.000
VP3	Our organization measures strategically relevant performance factors.	0.722**	.000
VP4	Our leaders and managers are IT savvy	0.778**	.000
VP5	Our IT leaders and managers are business-savvy	0.766**	.000
VP6	Derivation of IT strategy from Business Strategy	0.826**	.000
VP7	The organization's Information systems strongly support the strategic goals of the organization	0.627**	.000
VP8	Information from all functional areas is collected during constructing the strategic IT plans	0.712**	.000
VP9	We always identify a clear vision and mission of any new IS system	0.809**	.000
VP10	we always define a clear performance expectation for adopting any new IS system	0.831**	.000
VP11	We always determine how much time it will take to implement any new IS system	0.784**	.000
VP12	We always identify all resources needed during any new IS system implementation	0.732**	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Table (4.7) illustrates the correlation coefficient for *Top Management Support (TMS)* factor and its related paragraphs. The p-values for all paragraphs are less than 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$. Therefore, it can be said that the paragraphs of this factor are consistent and valid to measure what it was set for.

Table (4.7): Correlation coefficient of Top Management Support factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
TMS1	Your organization's top management is committed to supporting Information Systems because it's key to competitiveness, growth, and operational excellence	0.776**	.000
TMS2	Your organization's top management willing to help surmount rather than create obstacles for BI system	0.836**	.000
TMS3	Your organization's top management will actively encourage users to use BI	0.814**	.000
TMS4	Your organization's top management believe that organization required data analytical and advanced reports to support decision-making.	0.798**	.000
TMS5	Your organization's top management consider BI to be strategic for the goals of the organization.	0.857**	.000
TMS6	Your organization's top management is aware of the benefits of BI	0.841**	.000
TMS7	Your organization's top management generally has realistic and achievable expectation of the BI system	0.872**	.000
TMS8	Your organization's top management believe that adoption of BI will lead to significant improvement in managerial decisions and organization performance	0.883**	.000
TMS9	Your organization's top management willingly assign time and resources to the BI system as it's needed	0.855**	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Table (4.8) illustrates the correlation coefficient for *Resource Allocation (RA)* factor and its related paragraphs. The p-values for all paragraphs are less than 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$. Therefore, it can be

said that the paragraphs of this factor are consistent and valid to measure what it was set for.

Table (4.8): Correlation coefficient of Resource Allocation factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
RA1	Your organization has the equipment needed to implement the BI system	0.79**	.000
RA2	Your organization has an enough team members to get the work done for the BI system	0.768**	.000
RA3	Your organization able to allocate adequately fund for the BI system	0.917**	.000
RA4	Your organization has the technological resources to adopt the BI system	0.938**	.000
RA5	Your organization has the time needed to implement and complete the BI system	0.912**	.000
RA6	Your organization has the ability to provide adequate resources for the BI system as needed	0.906**	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Table (4.9) illustrates the correlation coefficient for *Continuous Improvement Culture (CIC)* factor and its related paragraphs. The p-values for all paragraphs are less than 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$. Therefore, it can be said that the paragraphs of this factor are consistent and valid to measure what it was set for.

Table (4.9): Correlation coefficient of Continuous Improvement Culture factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
CIC1	Your leaders are always looking to improve your organization's core business processes	0.9**	.000
CIC2	Your leaders are adept at driving changes to your organization's core business processes	0.914**	.000
CIC3	Your organization is working on an organizational assessment (performance, costs,	0.893**	.000

Table (4.9): Correlation coefficient of Continuous Improvement Culture factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
	and ways the quality of work) regularly in order to improve performance		
CIC4	Your organization frequently analyze feedback to inform and make rapid changes that foster adoption of best practice.	0.938**	.000
CIC5	Your leaders understand that the best practices mature and are replaced over time	0.911**	.000
CIC6	Your organization apply data-driven improvement techniques such as Six Sigma, and/or TQM	0.904**	.000
CIC7	Your organization has a training and /or educational programs to update employees skills	0.801**	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Table (4.10) illustrates the correlation coefficient for *IT Governance (ITG)* factor and its related paragraphs. The p-values for all paragraphs are less than 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$. Therefore, it can be said that the paragraphs of this factor are consistent and valid to measure what it was set for.

Table (4.10): Correlation coefficient of IT Governance factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
ITG1	The makers of IT strategies and policies, in your organization, understands the business and IT objectives	0.797**	.000
ITG2	IT strategies and policies are enacted in a flexible manner to suit the changes occurring in the enterprise work environment.	0.875**	.000
ITG3	Members from all major areas of your organization are involved in the development of IT strategies and policies	0.849**	.000
ITG4	IT strategies and policies are clearly written so that user can understand them	0.923**	.000

Table (4.10): Correlation coefficient of IT Governance factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
ITG5	IT strategies and policies provide user with extensive guidance regard how to manage IT projects	0.903**	.000
ITG6	IT strategies and policies define objectives and expectations of the use of Information systems in your organization, such as accountability and responsibility	0.924**	.000
ITG7	IT strategies and policies are accessible by all users impacted by IT projects	0.894**	.000
ITG8	Feedback related to the organization's IT strategies and policies are communicated to the makers of IT strategies	0.869**	.000
ITG9	Your organization has an IT projects evaluation , metrics and performance measurement	0.838**	.000
ITG10	Your organization already has rules for data governance, like data retention policies, and privacy.	0.896**	.000
ITG11	Your organization's IT rules can guide the new data-driven solutions as big data, analytics, and BI.	0.842**	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Table (4.11) illustrates the correlation coefficient for *Appropriate Team Skills (ATS)* factor and its related paragraphs. The p-values for all paragraphs are less than 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$. Therefore, it can be said that the paragraphs of this factor are consistent and valid to measure what it was set for.

Table (4.11): Correlation coefficient of Appropriate Team Skills factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
ATS1	Your organization's development team has strong data analysis skills	0.853**	.000
ATS2	Your organization's development team has strong skills in query and reporting	0.887**	.000

Table (4.11): Correlation coefficient of Appropriate Team Skills factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
ATS3	Your organization's development team has strong systems integration skills	0.919**	.000
ATS4	Your organization's development team are up-to-date with recent advances in IT technologies including data analytics, web programming, and open source platforms	0.869**	.000
ATS5	Your organization's development team able to solve the technical problems arose during the BI implementation	0.866**	.000
ATS6	Your organization's development team has the expertise prior experience in large IT projects like ERP,DW, and BI	0.883**	.000
ATS7	Your organization's development team includes cross-functional business members beside technical members	0.814**	.000
ATS8	Your organization's development team knows how to work with business users to design what they see via BI applications	0.879**	.000
ATS9	If Your organization miss needed skills, your organization obtained it either through hiring new employees or by utilizing consultants	0.654**	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Table (4.12) illustrates the correlation coefficient for *Available Data Quality (ADQ)* factor and its related paragraphs. The p-values for all paragraphs are less than 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$. Therefore, it can be said that the paragraphs of this factor are consistent and valid to measure what it was set for.

Table (4.12): Correlation coefficient of Available Data Quality factor and its paragraphs

Code	Paragraphs	Pearson Correlation	P-Value (Sig)
ADQ1	Your organization has an accurate data	0.813**	.000
ADQ2	Data available in your organization is up-to-date and regularly updated	0.834**	.000
ADQ3	Data available in your organization is highly available and easily accessible	0.815**	.000
ADQ4	Data available in your organization is clear and easy to understand	0.827**	.000
ADQ5	Data available in your organization is valid and reliable	0.895**	.000
ADQ6	Data available in your organization is Strongly relevant to your work	0.852**	.000
ADQ7	Data available in your organization provide a comprehensive view of your work	0.811**	.000
ADQ8	Data available from different sources in your organization is consistency and seamlessly integrated	0.85**	.000
ADQ9	Most of your organization data is stored in the central integrated database	0.612**	.000
ADQ10	Your organization has already huge data that can be analyzed to support decisions	0.54**	.002

***. Correlation is significant at the 0.01 level (2-tailed).*

Structure Validity

Structure validity is calculated by evaluating the correlation among each of the questionnaire constructs and the whole of the questionnaire. Table (4.13) illustrates the correlation coefficients between constructs and the whole of the questionnaire. The p-values for all constructs are less than 0.01, therefore, the correlation coefficients of all the constructs are significant at $\alpha = 0.01$ and hence, it is concluded that all constructs are valid to measure what they were set to measure.

Table (4.13): Correlation coefficients between constructs and the whole of the questionnaire

Code	Constructs	Pearson Correlation	P-Value (Sig)
VP_Mean	Vision & Planning	0.822**	.000
TMS_Mean	Top Management Support	0.856**	.000
RA_Mean	Resource Allocation	0.897**	.000
CIC_Mean	Continuous Improvement Culture	0.842**	.000
ITG_Mean	IT Governance	0.925**	.000
ATS_Mean	Appropriate Team Skills	0.585**	.001
ADQ_Mean	Available Data Quality	0.764**	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

4.4.6 Reliability of the Readiness Assessment Questionnaire

Reliability of a measuring instrument is its ability to create reproducible results, meaning that we get same or similar scores each time it is used. Hence, a questionnaire is said to be reliable if similar answers are produced repeatedly. Reliability can be measured using Cronbach's Coefficient (Alpha).

Cronbach's alpha is a measure of internal consistency that measures the level of the relationship among items in one group. It ranges from zero to one and a higher value of alpha indicates a higher consistency meaning that the different items in the group are closely related. The researcher has used of this coefficient to investigate the reliability of the readiness assessment questionnaire used in this phase by inspecting how closely the different constructs of the questionnaire relate to the questionnaire as a whole. Table (4.14) illustrates the calculated values of Cronbach's coefficient (Alpha) for each construct and for the whole questionnaire. Alpha values range from .931 to .969, which is taken to be a high Cronbach's coefficient values. The overall alpha value for the whole questionnaire was found to be .981, which is considered as very high and indicates very high reliability and internal consistency.

Table (4.14): calculated values of Cronbach's coefficient (alpha) for each construct and for the whole questionnaire

Code	Construct	No of Items	Cronbach's Alpha
VP	Vision & Planning	12	.932
TMS	Top Management Support	9	.945
RA	Resource Allocation	6	.936
CIC	Continuous Improvement Culture	7	.958
ITG	IT Governance	11	.969
ATS	Appropriate Team Skills	9	.947
ADQ	Available Data Quality	10	.931
All Paragraphs		64	.981

Having this excellent outcome for validity and reliability tests, the researcher has proved dependability on the readiness assessment questionnaire and he will rely on it to measure the readiness ratio of the MoEHE.

4.5 Chapter Summary

This chapter presented a detailed explanation of the research design, phases, and methodologies. Firstly, the chapter explained the examination process of the previous studies to identify the critical success factors (CSFs) for BI implementation. Then, it presented a brief introduction to the analytic hierarchy process (AHP) method, which was adopted to determine the importance weight of each factor and to develop the readiness assessment framework. Thereafter, the chapter described the framework application on MoEHE as a case study. It specified the population and data collection methodology used in the case study, including measurements and questionnaire design. Finally, it presented the results of the statistical validity of the piloting sample.

Chapter Five
Data Analysis & Results

Chapter Five: Data Analysis & Results

This chapter identifies the critical success factors (CSFs) derived from previous studies. These extracted CSFs were deeply discussed by a panel of experts to refine and determine the importance weight of each factor using Analytic Hierarchy Process (AHP). Thereafter, a readiness assessment framework for BI system was developed with a guideline for addressing the readiness characteristics of each factor. Finally, the chapter addresses the top seven CSFs by applying the proposed framework on MoEHE. Statistical analysis on the collected data was performed to calculate the level of readiness of each factor and the overall readiness of MoEHE for adopting BI system based on the proposed framework.

5.1 Phase One: Critical Success Factors (CSFs) Identification

The process of surveying and investigating 30 previous related studies has extracted a comprehensive list of 13 CSFs having significant impact on BI implementation. These factors were categorized into *Organization, Process, and Technology* domains. Table (5.1) and Figure (5.1) below summarize the CSFs derivation process. For each author, a tick was put against all unranked factors addressed by this author while for ranked factors, the rank number was inserted.

Table (5.1): Analysis of CSFs from the Supporting literatures

Researchers	Organization						Process					Technology	
	VP	TMS	RA	CIC	ITC	OCC	ATS	PC	PMM	UI	CM	ADQ	ITI
(Poon & Wagner, 2001)	✓	✓					✓		✓		✓	✓	✓
(Wixom & Watson, 2001)		✓	✓				✓	✓		✓		✓	✓
(S. Williams & Williams, 2004)	✓			✓	✓							✓	✓
(Xu & Hwang, 2005)	1	2	7				5		6	3		4	
(Xu & Hwang, 2007)	✓	✓					✓		✓	✓		✓	✓
(Arnott, 2008)	✓	✓	✓				✓		✓			✓	✓
(Vodapalli, 2009)	✓	✓			✓		✓	✓	✓	✓	✓	✓	✓

Table (5.1): Analysis of CSFs from the Supporting literatures

Researchers	Organization						Process					Technology	
	VP	TMS	RA	CIC	ITC	OCC	ATS	PC	PMM	UI	CM	ADQ	ITI
(Hawking & Sellitto, 2010)		✓	✓					✓		✓		✓	✓
(Yeoh & Koronios, 2010)	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓
(Adamala & Cidrin, 2011)	✓				✓			✓			✓	✓	✓
(Olszak & Ziemba, 2012)	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
(Olbrich et al., 2012)	3	1	4		8	9	7			5		2	6
(Hidayanto et al., 2012)	1	2		5	6	10	3	3	7	7	7	8	11
(Mungree et al., 2013)	2	1	6				5		7	3	3	4	8
(Dawson & Van Belle, 2013)	2	5	9	6		6		3	8	4	2	1	7
(Phiriyayotha & Rotchanakitumnuai, 2013)	✓	✓		✓	✓	✓	✓			✓		✓	✓
(Farrokhi & Pokoradi, 2013)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(Sangar & Iahad, 2013)	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(Kimpel & Morris, 2013)	✓	✓	✓				✓		✓	✓		✓	✓
(Fedouaki et al., 2013)	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
(Ravasan & Savoji, 2014)	✓	✓	✓				✓		✓	✓	✓	✓	✓
(Bargshady et al., 2014)	✓	✓					✓			✓		✓	✓
(Naderinejad et al., 2014)	1	6	2	3			8	4	7		5	8	9
(Egbeniyoko, 2014)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(Eskandari et al., 2015)	7	1	2		6	6	4		3			5	7
(Nasab et al., 2015)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
(Baker & Chasalow, 2015)				✓		✓						✓	✓

Table (5.1): Analysis of CSFs from the Supporting literatures

Researchers	Organization						Process					Technology	
	VP	**TMS**	**RA**	**CIC**	**ITC**	**OCC**	**ATS**	**PC**	**PMM**	**UI**	**CM**	**ADQ**	**ITI**
(Grublješič & Jaklič, 2015)		✓	✓		✓					✓	✓	✓	
Hejazi, Abdolvand, & Harandi (2016)	✓	✓	✓	✓	✓						✓		
Pham, Mai, Misra, Crawford, & Soto (2016)	2	3					5	5	4	1	1	6	2
Summation	**26**	**27**	**19**	**13**	**13**	**12**	**23**	**15**	**20**	**22**	**17**	**29**	**27**

Source: Developed by Researchers

VP	Vision & Planning	PC	Presence Of Champion
TMS	Top Management Support	PMM	Project Management & Business Driven Methodology
RA	Resource Allocation	UI	User Involvement
CIC	Continuous Improvement Culture	CM	Change Management
ITC	User IT & Analytical Culture	ADQ	Available Data Quality
OCC	Cross-Organization Collaboration Culture	ITI	IT Infrastructure
ATS	Appropriate Team Skills		

Referring to Figure (5.1), factors with higher frequencies should be given higher attention during the implementation process. Table (5.1) and Figure (5.1) illustrate that *Available Data Quality* is the highest in frequency followed by *Top Management Support, IT Infrastructure,* and *Vision& Planning* respectively. While organization culture (*Collaboration Culture, User IT & Analytical Culture,* and *Continuous Improvement Culture*) is the lowest in frequency.

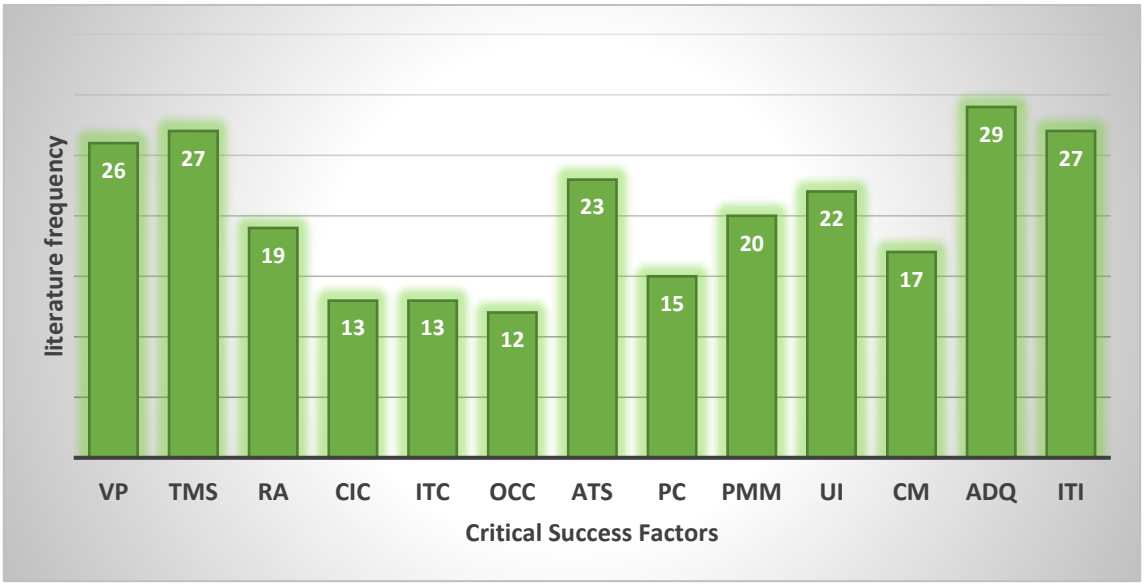

Figure (5.1): Literature Frequency of CSFs from the literature

5.2 Phase Two: Framework Development

The previously extracted CSFs of BI are considered a foundation stone for developing a readiness assessment framework for BI. Experts and researchers deeply investigated and analyzed these factors to get them weighted, contextual terms identified and adapted with Gaza environment.

5.2.1 First Round: Factors Rating and Modifications

A questionnaire for evaluating the derived factors was developed, refer to *Appendix A*, and distributed to the experts to investigate and rate for importance. Importance degree of the 13 critical factors was rated according to Gaza environment taking into consideration the relevance, variability, and controllability dimensions. Table (5.2) shows the experts' rates, sum, average and percent for each factor.

Table (5.2): The experts' ratings for the derived criteria success factors (CSFs)

Expert	Organization						Process					Technology	
	VP	TMS	RA	CIC	ITC	OCC	ATS	PC	PMM	UI	CM	ADQ	ITI
Al mabhouh	4	5	5	4	4	4	5	4	5	5	5	4	4
Al madhoun	5	5	5	4	4	5	4	5	5	5	4	4	4

Table (5.2): The experts' ratings for the derived criteria success factors (CSFs)

Expert	Organization						Process					Technology	
	VP	**TMS**	**RA**	**CIC**	**ITC**	**OCC**	**ATS**	**PC**	**PMM**	**UI**	**CM**	**ADQ**	**ITI**
Al zinaty	5	5	3	4	5	4	4	5	5	4	5	3	3
Baraka	5	5	5	5	4	5	4	3	5	4	4	5	3
El- khatib	5	5	5	4	4	4	5	4	4	5	4	5	4
El-halus	5	4	4	3	4	3	4	3	4	3	4	5	5
El-matrabie	5	5	4	4	4	5	4	5	5	4	5	5	5
El-nadeem	5	5	5	4	5	4	5	5	4	5	5	5	4
Ghazal	4	5	5	5	2	2	4	5	5	5	2	2	4
Hamada	5	5	4	3	4	5	4	5	4	4	5	5	5
Kehail	5	5	5	4	4	4	5	5	4	4	5	4	5
Nasman	5	5	5	4	4	4	4	5	5	4	4	5	3
Qusa	5	4	4	5	3	5	4	5	4	5	5	5	2
Radwan	4	5	5	3	4	5	4	3	4	4	4	5	3
Saqer	4	5	4	3	3	2	5	5	4	2	3	5	3
Younis	5	5	5	4	4	4	5	4	4	4	4	5	5
SUM	**76**	**78**	**73**	**63**	**62**	**65**	**70**	**71**	**71**	**67**	**68**	**72**	**62**
AVERAGE	**4.75**	**4.88**	**4.56**	**3.94**	**3.88**	**4.06**	**4.38**	**4.44**	**4.44**	**4.19**	**4.25**	**4.50**	**3.88**
PERCENT	**95%**	**98%**	**91%**	**79%**	**78%**	**81%**	**88%**	**89%**	**89%**	**84%**	**85%**	**90%**	**78%**

VP	Vision & Planning	PC	Presence Of Champion
TMS	Top Management Support	PMM	Project Management & Methodology
RA	Resource Allocation	UI	User Involvement
CIC	Continuous improvement culture	CM	Change Management
ITC	User IT & Analytical Culture	ADQ	Available Data Quality
OCC	Cross-Organization Collaboration Culture	ITI	IT Infrastructure
ATS	Appropriate Team Skills		

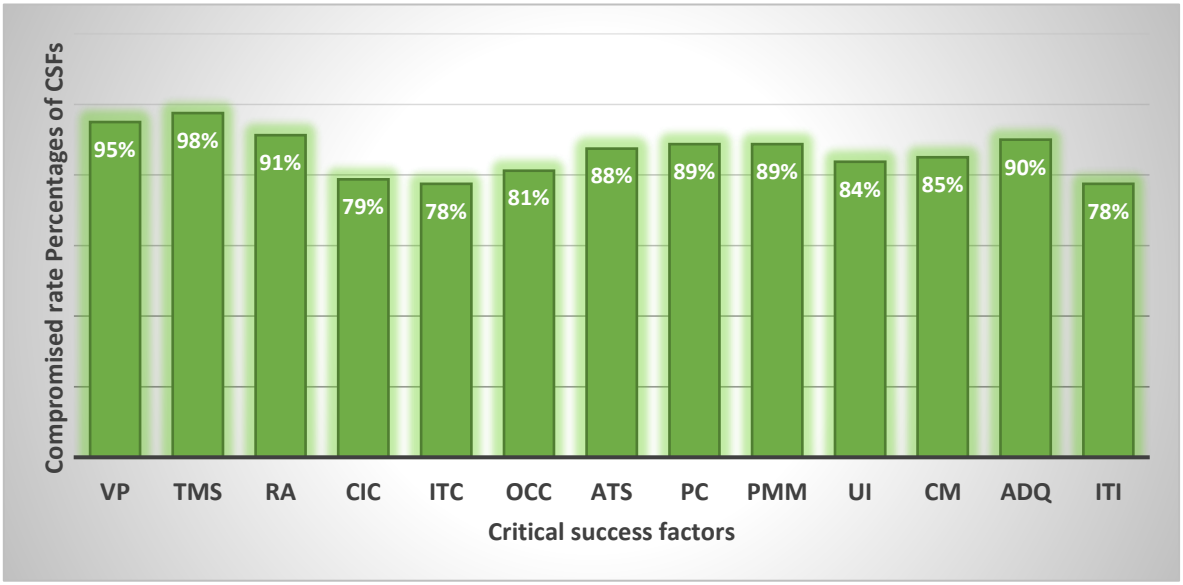

Figure (5.2): The experts' compromised rate percentages of the CSFs

As shown in Table (**5.2**) and Figure (5.2), all derived factors have importance percentages higher than or equal 78%. This means that, from experts' points of view, all the suggested factors are critical and highly important to facilitate a successful implementation of BI systems. *Top Management Support* and *Vision & Planning* are considered the most important factors with 98% and 95% respectively. Experts advised that organizations with strong *Top Management Support* and a Clear *Vision & Planning* have the ability to control and overcome most implementation issues. *Resource Allocation* and *Available Data Quality* come in third and fourth place with 91% and 90% respectively. Nonetheless, experts gave 78% to *User IT & Analytical Culture* and *IT Infrastructure* as the least important factors, which is consistent with the fact that *User IT & Analytical Culture* and *IT Infrastructure* are the most controllable and the easiest achievable factors.

Referring to Table (**5.2**), it could be noticed the ratings of the experts were relatively consistent with each other. Most factors had nearly the same rate among all experts except for *Available Data Quality* factor. Some experts considered it a very important factor with rate (5). This evaluation stems from the embracing argument "Garbage In, Garbage Out", while others considered it less important relying on the fact that date quality can be improved using some analytical and cleansing tools.

After rating the 13 factors, experts were asked to suggest any additional factors they deem critical to the success of BI systems. All experts except Mr. Mohamed Al Madhoun, Dr. Alaa El-Halus, and Dr. Alaa Almabhouh had recommended adding *IT Governance* under the organization domain as another critical factor for BI success. They emphasized that *IT Governance* draws a roadmap for BI system to support the organization's business strategies and goals. The absence of *IT Governance* leads to missing alignment between IT goals, including BI, and the organization's business goals.

Mr. Issam Al Zinaty suggested considering the external consultancy as a separate key factor and excluding it from the *Appropriate Team Skills* factor. He mentioned that during BI implementation, the external skills and knowledge are extremely needed, so it is very important for an organization to have the ability reach external consultancy to lever the overall benefits. On the other hand, Dr. Rebhi Baraka advised that the supplier and the intelligent tools, used in BI implementation, are other important factors. Where other experts disagree with this recommendation considering that, the supplier and the intelligence tools can be easily selected by reviewing the BI market during the pre-implementation stage.

After taking all the previously mentioned suggestions into consideration, the IT Governance has been added to the critical factors under the organization domain. The final critical success factors are shown in Table 5.3), with 3 main domains and 14 CSFs.

5.2.2 Second Round: Applying AHP Model (Weighting Factors)

In this round, researchers have applied the AHP method to get the final rank and the importance weight of each factor. The following steps explains the process application:

Table 5.3): The final critical success factors (CSFs)

Domain #	Domain	Factor #	CSFs
1	Organization	1	Vision & planning
		2	Top Management Support
		3	Resource Allocation
		4	Continuous Improvement Culture
		5	User IT & Analytical Culture
		6	Collaboration Culture
		7	IT Governance
2	Process	8	Appropriate Team Skills
		9	Presence Of Champion
		10	Project Management & Methodology
		11	User Involvement
		12	Change Management
3	Technology	13	Available Data Quality
		14	IT Infrastructure

5.2.2.1 Hierarchical structure of the problem

Researchers have designed the hierarchical structure of the problem. It consists of three levels: The first level presents the goal of the research problem namely, *The Success Implementation for BI*. The second and the third levels present the criteria and sub-criteria that affect the decision-making process. In the current research, the three main domains of the CSFs stand for the main criteria while the CSFs are presented on the third level as the sub-criteria. The final structure of the problem including the goal, criteria, and sub-criteria was designed on the EC software; see Figure (5.3), to start the pairwise comparison.

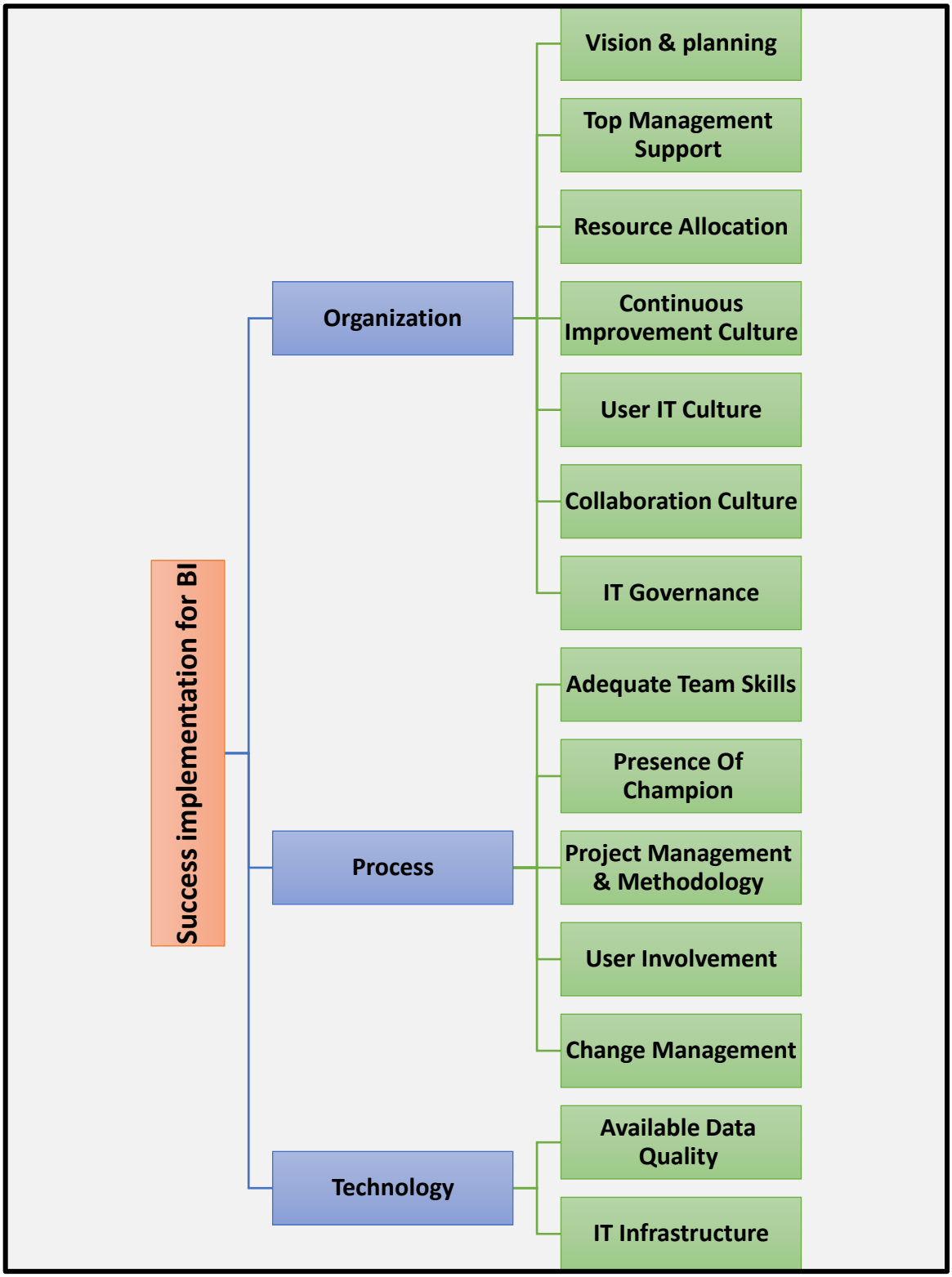

Figure (5.3): Hierarchical structure of the AHP model

5.2.2.2 Pairwise Comparison Conducting

After identifying the critical success factors (CSFs) of BI systems and designing the hierarchical structure of the research problem, a pairwise comparison step is ready to be conducted. The 14 CSFs and their main domains were arranged into pairwise comparison matrices in the questionnaire shown in *Appendix B*. This questionnaire was distributed to the experts to gather the necessary data that would be further analyzed and calculated to get the final ranks and importance weights of each factor. Depending on experts' experiences and preferences, each expert has applied pairwise comparisons among the three main domains as well as pairwise comparisons among the critical success factors within each domain.

A panel of experts was created on the Expert Choice (EC) tool to manage the comparison and synthesis processes. Each expert's pairwise comparison matrices were entered to the EC and the Consistency Ratio (CR) was calculated immediately to confirm the validity of the expert's judgments. According to Saaty (1987) recommendations, a consistent and homogenate experts opinions should have a CR value less than 10%. Thereafter, the synthesis process was conducted to combine all experts' judgments and generate the mean pairwise comparison matrices. Finally, the relative weights vector of main criteria and sub-criteria with respect to the main goal were calculated.

Main criteria pair wise comparison

After constructing the hierarchical model, entering all experts' judgments of the three main domains pairwise comparisons to the EC software, and execute the synthesis process, the mean pairwise comparison matrix was produced.

Table (5.4) shows the mean pairwise comparison matrix while Figure (5.4) shows the main domains relative importance weights.

Table (5.4): The mean pairwise comparison matrix of main domains

Domain	Organization	Process	Technology
Organization		2.669	4.492
Process			2.128
Technology			

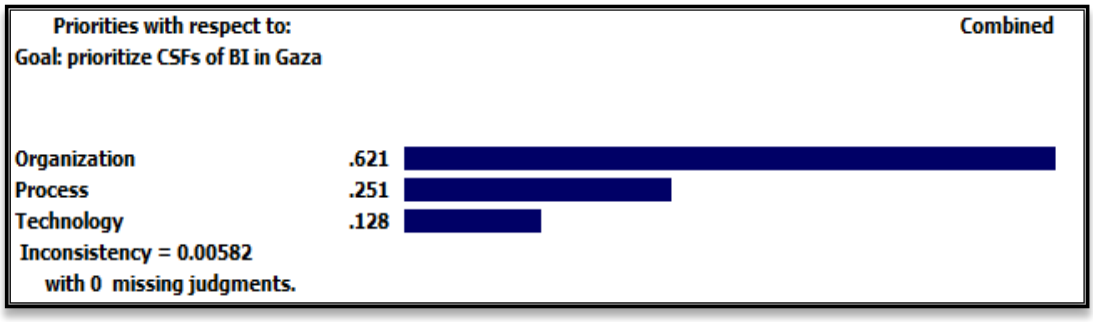

Figure (5.4): Main domains pairwise comparison results

As we can see in Figure (5.4), the *Organization* domain got the highest importance weight with respect to BI successful implementation with a percentage of 62.1%, almost two times and a half of the *Process* domain percentage which is 25.1%. While the Technology domain got the lowest percentage of 12.8%. This means that the *Organization* and the *Process* domains cover 87.2% of BI successful implementation. These findings are consistent with the previous studies findings. (Adamala & Cidrin, 2011; Egbeniyoko, 2014; Farrokhi & Pokoradi, 2013; Hawking, 2013; Naderinejad et al., 2014; Olbrich et al., 2012; Yeoh & Koronios, 2010) mentioned that the Technology factors are less affecting, more easily to be managed and more controllable against the Organization and Process factors which are out of team control and more time-consuming. They also mentioned that to leverage the BI benefits, the Organization must be changed which is considered a difficult and a long-term process. Therefore, they considered the Organization factors as the highest important factors.

Remarkably, the Consistency Ratio (CR) for the main criteria pairwise comparison equals 0.00582, which is nearly zero, less than 0.1 or (10%), thus the experts' judgments are consistent and acceptable.

Sub-Criteria Pair wise Comparison

1- Organization Factors

According to all experts' judgments of the factors related to the Organization domain, the resulted mean comparison matrix is presented in Table 5.5), and the resulted relative weights for the Organization's factors are shown in Figure (5.5).

Table 5.5): The mean pairwise comparison matrix of the Organization domain

CSFs	Vision, & Planning	Top Management Support	Resource Allocation	Continuous Improvement Culture	User IT & Analytical Culture	Collaboration Culture	IT Governance
Vision, & Planning		0.613	1.773	2.058	2.876	2.688	2.035
Top Management Support			3.392	3.596	4.100	3.740	2.546
Resource Allocation				1.637	2.103	1.885	1.360
Continuous Improvement Culture					1.570	1.393	0.981
User IT & Analytical Culture						0.981	0.763
Collaboration Culture							0.724
IT Governance							

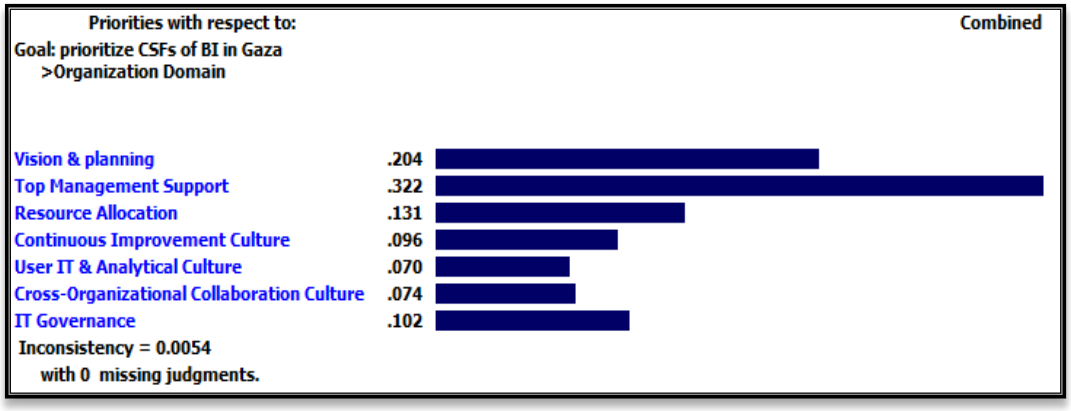

Figure (5.5): Organization domain pairwise comparison results

Figure (5.5) illustrates that *Top Management Support* (TMP), *Vision & Planning* (VP), *Resource Allocation* (RA) got the highest relative weights within the Organization domain with a percentage of 32.2%, 20.4%, and 13.1% respectively. Most of the experts have demonstrated that the *Top Management Support* (TMP) is the leader for all other factors as such managerial support from the executive and senior managers can change the vision, adopt new plans, allocated adequate resources, give a suitable training for employee and enforce interdepartmental collaboration. This explains the reason why Top Management Support (TMP) got the highest importance weight. The second top rated factor was *Vision & Planning* (VP) because it was considered as a roadmap for the implementation process. Due to the unstable political and economic situations in Gaza and the dramatic lack of resources, the Resource Allocation (RA) factor was considered as one of the highest important factors.

In contrast, the lowest factors were the *User IT & Analytical Culture* (ITC) and the *Collaboration Culture* (CC) with percentages of 7% and 7.4% respectively. Experts have considered that the *User IT & Analytical Culture* (ITC) is controllable and can be enhanced by training. In addition, they have mentioned that the concept of profit centers is not adopted in Gaza environment; therefore, the high contentions do not exist between departments and in turn the collaboration between departments can be easily enforced.

The Consistency Ratio (CR) for the Organization factors pairwise comparison equals 0.0054 which is less than 0.1 or (10%), thus the experts' judgments are consistent and acceptable.

2- Process Factors

The resulted mean pairwise comparison matrix of the factors related to the Process domain is illustrated in Table (5.6), and the resulted relative weights of the Process factors are shown in Figure (5.6).

Table (5.6): The mean pairwise comparison matrix of the Process domain

CSFs	Team Skills	Presence Of Champion	Project Management & Methodology	User Involvement	Change Management
Team Skills		1.305	1.305	1.967	2.028
Presence Of Champion			1.158	1.689	1.852
Project Management & Business Driven Methodology				1.644	1.63
User Involvement					1.236
Change Management					

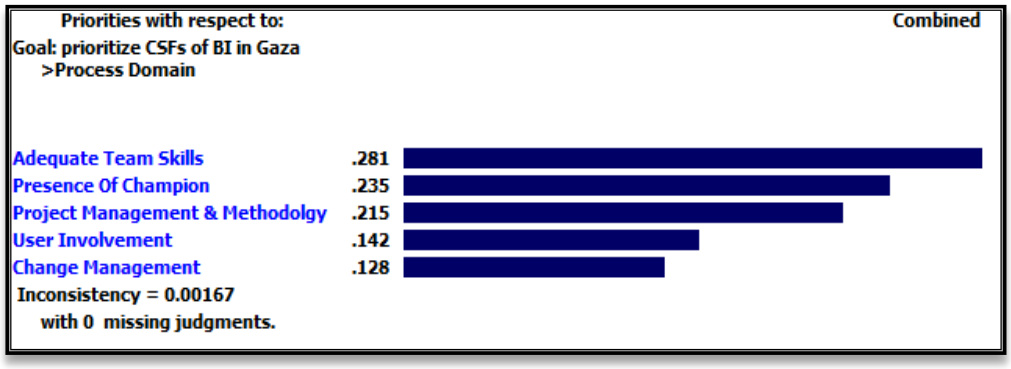

Figure (5.6): Process domain pairwise comparison results

As noticed from Figure (5.6), *Appropriate Team Skills* (ATS), *Presence of Champion* (PC), *Project Management & Methodology* (PMM) got the highest relative weights within the Process domain with slight differences. They have percentages of 28.1%, 23.5% and 21.5% respectively. Some experts declared that a team with suitable skills has the ability to cover the absence of the champion and to find a suitable

implementation methodology for the project. In the same time they confirmed that a strong champion can positively influence the internal marketing of the project and can increase the degree of user involvement and system acceptance. *Change Management* (CM), on the other hand, got the lowest percentage of 12.8%. Experts have strongly supported the conception that the existence of a strong champion together with the full user involvement makes the change management process a piece of cake.

The Consistency Ratio (CR) for the Process factors pairwise comparison equals 0.00167 which is less than 0.1 or (10%), thus the experts' judgments are consistent and acceptable.

3- Technology Factors

The resulted mean pairwise comparison matrix of the factors related to the Technology domain is illustrated in Table (5.7), and the resulted relative weights of the Technology factors are shown in Figure (5.7).

Table (5.7): The mean pairwise comparison matrix of the Technology domain

CSFs	Available Data Quality	IT Infrastructure
Available Data Quality		3.515
IT Infrastructure		

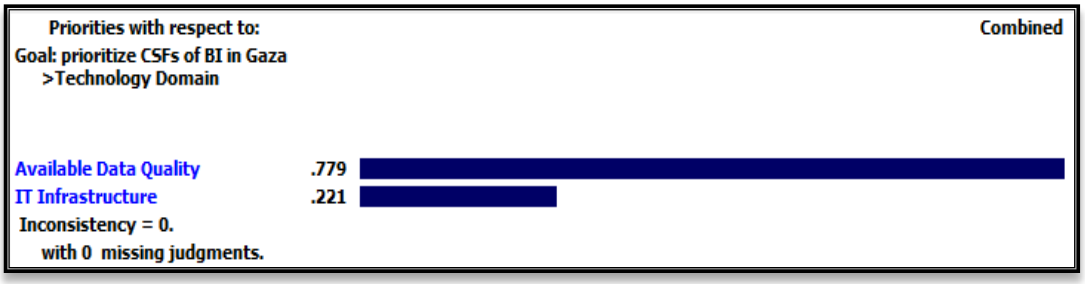

Figure (5.7): Technology domain pairwise comparison results

Figure (5.7) shows that *Available Data Quality* (ADQ) has the highest relative weight within the Technology domain with a percentage of 77.9%. It can be noticed that *Available Data Quality* is significantly higher than *IT Infrastructure* (ITI). Based on the fact that the major objective of BI system is to translate data into valid decisions, many experts consider *Available Data Quality* (ADQ) as one of the most critical factors that significantly affect BI success. Lack of such quality often breeds mistrust of BI and causes invalid or delayed decisions and in turn leads to system failure. *IT Infrastructure* (ITI) has been considered easy to obtain, and most organizations with BI initiative already have adequate Infrastructure that can support the new initiative together with their already existing systems (like ERP or online transactions systems).

5.2.2.3 Inconsistency Analysis

A pairwise comparison is a subjective process depending on experts' preferences, so, it is normal that inconsistency exists among expert's answers or among experts' judgments. This controversy can be useful to open space for creativity and to add new knowledge as long as this controversy is within the accepted range. Saaty (1987) mentioned that the value of Consistency Ratio (CR) should be less than 0.1 (or 10%). If CR is greater than 0.1, the level of inconsistency is considered unacceptable and the comparison process has to be repeated. During each expert interview, the CR was calculated immediately, using EC tool, to ensure consistency and to admit the expert judgments. The Consistency Ratios (CR) for experts' judgments are displayed in Table (5.8). The table illustrates that all experts' judgments and the combined judgment (the aggregation for all experts' judgments) have CR less than 10%.

Table (5.8): The inconsistency ratios for all experts

Expert ID	Expert Name	Inconsistency	Consistency Ratios (CR)
1	Al mabhouh	0.025	2.5%
2	Al madhoun	0.007	0.7%
3	Al zinaty	0.008	0.8%
4	Baraka	0.041	4.1%
5	El- khatib	0.032	3.2%
6	El-halus	0.058	5.8%
7	El-matrabie	0.048	4.8%
8	El-nadeem	0.021	2.1%
9	Hamada	0.081	8.1%
10	Kehail	0.040	4.0%
11	Nasman	0.046	4.6%
12	Qusa	0.025	2.5%
13	Radwan	0.046	4.6%
14	Saqer	0.036	3.6%
15	Younis	0.008	0.8%
Combined (All Experts)		**0.005**	**0.5%**

5.2.2.4 CSFs Weighting Analysis

All weights displayed above are local weights, relative to factor's domain. The global weight is identified by multiplying the local weight of the factor by the weight of its main domain. The global weights of critical success factors (CSFs) are presented in Table (5.9).

Table (5.9): The global weights of CSFs

Domain	Weight (1)	CSFs	Local Weight (2)	Global Weight (1)*(2)	Percent
Organization	0.621	Vision & planning	0.205	0.127	12.7%
		Top Management Support	0.322	0.2	20.0%
		Resource Allocation	0.131	0.081	8.1%
		Continuous Improvement Culture	0.096	0.06	6.0%
		User IT & Analytical Culture	0.07	0.043	4.3%
		Cross-Organizational Collaboration Culture	0.074	0.046	4.6%
		IT Governance	0.102	0.063	6.3%
Sum			**1**	**0.621**	**62.1%**
Process	0.251	Team Skills	0.281	0.071	7.1%
		Presence Of Champion	0.235	0.059	5.9%
		Project Management & Methodology	0.215	0.054	5.4%
		User Involvement	0.142	0.036	3.6%
		Change Management	0.128	0.032	3.2%
Sum			**1**	**0.251**	**25.1%**
Technology	0.128	Available Data Quality	0.779	0.1	10.0%
		IT Infrastructure	0.221	0.028	2.8%
Sum			**1**	**0.128**	**12.8%**

The critical success factors ranking according to the global weight are shown in Table (5.10) and Figure (5.8):

Table (5.10): CSFs ranking according to the global weight

Domains	Critical Success Factors	Global Weight	Priority	Cumulative	Rank
Organization	Top Management Support	0.2	20.0%	20.0%	1
Organization	Vision & Planning	0.127	12.7%	32.7%	2
Technology	Available Data Quality	0.099	9.9%	42.6%	3
Organization	Resource Allocation	0.081	8.1%	50.7%	4
Process	Appropriate Team Skills	0.071	7.1%	57.8%	5
Organization	IT Governance	0.063	6.3%	64.1%	6
Organization	Continuous Improvement Culture	0.06	6.0%	70.1%	7
Process	Presence Of Champion	0.059	5.9%	76.0%	8
Process	Project Management & Methodology	0.054	5.4%	81.4%	9
Organization	Cross-Organizational Collaboration Culture	0.046	4.6%	86.0%	10
Organization	User IT & Analytical Culture	0.044	4.4%	90.4%	11
Process	User Involvement	0.036	3.6%	94.0%	12
Process	Change Management	0.032	3.2%	97.2%	13
Technology	IT Infrastructure	0.028	2.8%	100%	14

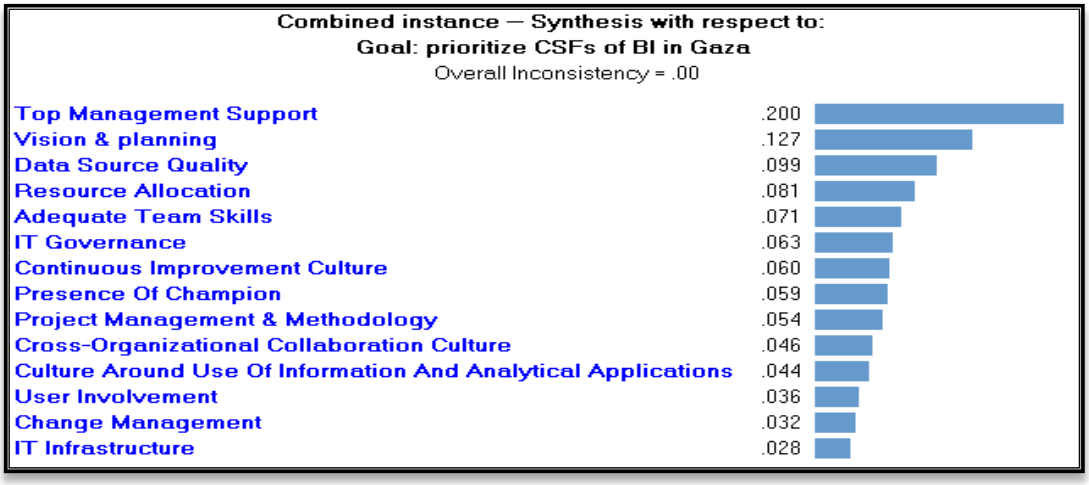

Figure (5.8): The global weights of CSFs from EC tool

The critical success factors global weights are graphically illustrated in Figure (5.9).

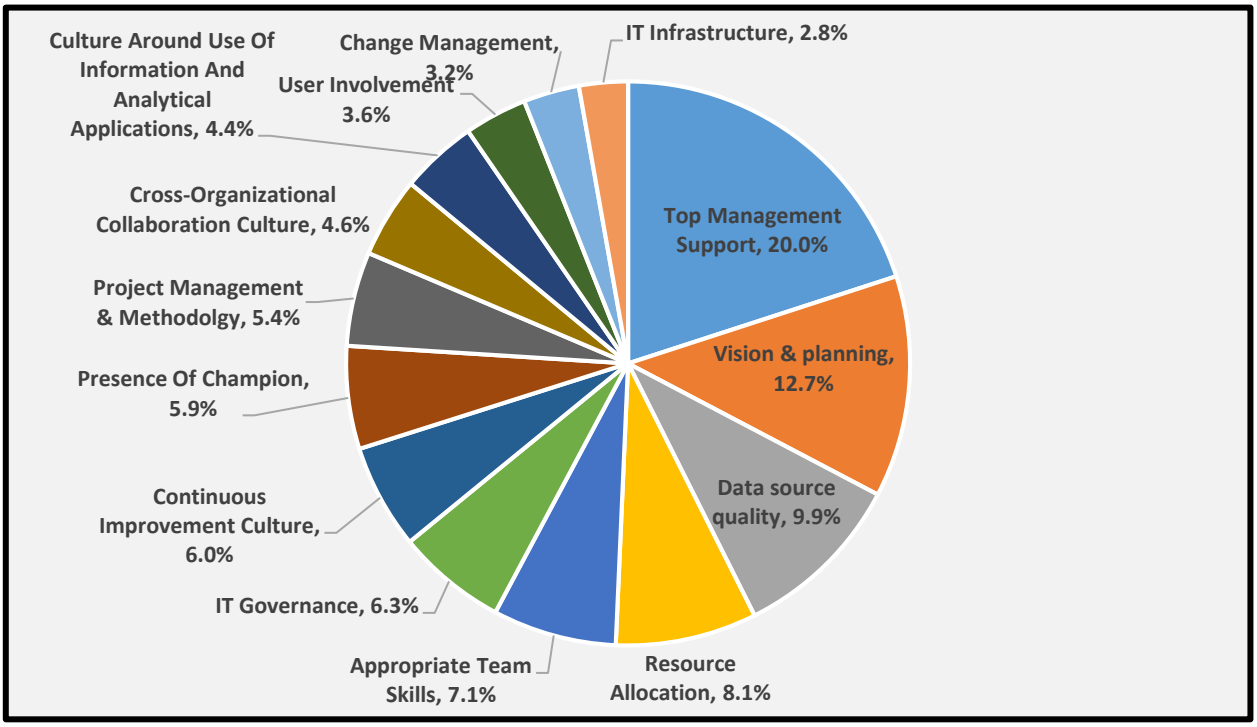

Figure (5.9): Chart of CSFs global weights

Table (5.10) and Figure (5.9) contain the core findings of this phase, which can be briefed as follows:

- *Top Management Support* (TMS) and *Vision & planning* (VP) are the most important factors with global weight percentages of 20% and 12.7% respectively. Both of them belong to Organization domain. An organization with a strong *Top Management Support* and a clear *Vision & Plan* for BI ensure over 30% of BI implementation success. This finding is consistent with (Slevin & Pinto, 1986) findings in that at the early stages of a project, there is no factor can predict the project success as the top management support can.
- Previous studies of Dawson & Van Belle (2013), Hidayanto et al. (2012), Mungree et al. (2013), Naderinejad et al. (2014), and Xu & Hwang (2005) found that *Vision & Planning* factor was the highest important factor, greater than or equal to Top Management Support. This study disagreed with these results and concluded that *Top Management Support* came in the first place with a significant distance gap of 7.3% from *Vision & Planning* factor. This result illustrates the domination of top management in Gaza environment. There was a consensus among experts that in Gaza environment, power of management can change the organization's vision and strategies easily.
- *Available Data Quality* (ADQ), which belongs to *Technology* domain, comes third with a global weight percentage of 9.9%. Regardless of the fact that Technology domain has the least weight amongst other domains; experts have considered *Available Data Quality* the core element of BI systems. Poor data quality often leads to mistrust in BI and causes invalid decisions.
- The fourth rank belongs to *Resource Allocation*, which belongs to *Organization* domain, has a global weight percentage of 8.1%. Figure (5.9) illustrates the highest four factors (*Top Management Support, Vision & Planning, Available Data Quality, and Resource Allocation*) cover more than 50% of the system success.
- The first place factor within *Process* domain is the *Appropriate Team Skills* (ATS), which came in the fifth rank having a global weight of 7.1%. In addition, the *IT Governance* (ITG) and the *Continuous Improvement Culture* (CIC), which

belong to *Organization* domain, got the sixth and seventh ranks with slight difference, the former got a global weight of 6.3% while the latter got 6%.

- *Presence of Champion* (PC) and *Project Management & Methodology* (PMM), which belong to *Process* domain, came in eighth and ninth ranks, with slight difference. They scored global weight percentages of 5.9% and 5.4% respectively.
- Remarkably, *User Involvement* (UI), *Change Management* (CM) and *IT Infrastructure* (ITI) are the lowest ranks with 3.6%, 3.2%, and 2.8% respectively. Experts mentioned that the existence of appropriate team skills along with strong champion and suitable project management & methodology guarantee an effective participation of users leading to a successful change process. *IT Infrastructure* (ITI) has been considered easy to obtain, and most organizations with BI initiative already have adequate Infrastructure that can support the new initiative together with their already existing systems such as ERP and online transactions systems.

The previous results, illustrated in Table (5.10) and Figure (5.8), are compared with results from previous studies. Table (5.11) presented a comparison between the importance weights of CSFs in this research and the important weights concluded by Hidayanto et al. (2012). Knowing that both studies relied on AHP in calculating weights.

Both studies concluded top weights for both *Top Management Support* and *Vision & Planning* factors. Unlike Hidayanto et al. (2012) results that compiled same weights (12.5%) for both factors, this study compiled much higher weight (20.0%) for *Top Management Support.* This discrepancy can be due to the domination of top management and its ability on changing existing organizational strategies in the unstable political environment of Gaza strip. *Available Data Quality* on the other hand is consistent in both studies that reflects the importance of data quality in making accurate success supporting decisions.

There is an obvious difference between this study and Hidayanto et al. (2012) in regards with *Adequate Team Skills* factor. The former study indicated that *Adequate Team Skills* has a relatively high importance of 7.1% where the latter showed a lower importance of 1.6%. This can be explained by the fact that the majority of the large

institution in Gaza depend on internal development units where in Indonesia, organizations usually rely on outsourcing. Based on the aforementioned fact, *Presence of Champion* factor in Hidayanto et al. (2012) found to have relatively high weight of 10.4% compared to what this study concluded namely 5.9%. Noteworthy that in Hidayanto et al. (2012) the champion acts as an intermediary between external BI suppliers and the internal environment of the institution.

Table (5.11) shows a comparison among CSFs ranking in this study and previous studies and illustrates consistency between the conclusions of this study and Olbrich et al. (2012), Mungree et al. (2013), and Eskandari et al. (2015) in regards with *Top Management Support* being the most important factor impacting the successful implementation of BI. Whereas, Dawson & Van Belle (2013) and Naderinejad et al. (2014) disagreed with these results and ranked *Top Management Support* as moderate. Ranking of *Vision & Planning* in this study as one of the most important factors was found consistent with all of the previous studies except for Eskandari et al. (2015) which attributed this difference to the wrong measurement of the factor due to fact that it was measured quantitatively ignoring the qualitative nature of the factor.

The table also shows that Xu & Hwang (2005), Olbrich et al. (2012), Mungree et al. (2013) and Dawson & Van Belle (2013) have similar ranking to what this study identified for *Available Data Quality* which was classified as one of the four most factors impacting IB success. On the contrary, Naderinejad et al. (2014) reported *Available Data Quality* at a very low rank (eighth level). *Adequate Team Skills* being ranked at this study in the fifth level agrees with Xu & Hwang (2005), Mungree et al. (2013), and Pham et al. (2016).

Comparing this study with previous studies in terms of *Presence of Champion* factor indicated a lower ranking in the current study that points out the absence of project champion contribution in supporting IS implementation in local organizations. This is attributed to the limited technical skills and knowledge of the managers in the business realm. Furthermore, all studies including the current one concluded low rank for *IT Infrastructure* factor because this factor is controllable, invariable and easy to obtain, in addition, recently many organizations tend to rely more on outsourcing and cloud computing.

Table (5.11): Comparison of CSFs weighting and ranking of this research and previous studies

CSFs	Factor Weights		Factor Ranks							
	This study	Hidayanto (2012)	This study	Xu & Hwang, (2005)	Olbrich et al., (2012)	Mungree et al., (2013)	Dawson & Van Belle, (2013)	Naderinejad et al., (2014)	(Eskandari et al., 2015)	Pham, Mai, & Soto, (2016)
Top Management Support	20.0%	12.5%	1	2	1	1	5	6	1	3
Vision & Planning	12.7%	12.5%	2	1	3	2	2	1	7	2
Available Data Quality	9.9%	9.0%	3	4	2	4	1	8	5	6
Resource Allocation	8.1%		4	7	4	6	9	2	2	
Appropriate Team Skills	7.1%	1.6%	5	5	7	5		8	4	5
IT Governance	6.3%		6							
Continuous Improvement Culture	6.0%	5.0%	7				6	3		
Presence Of Champion	5.9%	10.4%	8				3	4		5
Project Management & Methodology	5.4%	4.0%	9	6		7	8	7	3	4
Cross-Organizational Collaboration Culture	4.6%	3.5%	10		9		6		6	
User IT & Analytical Culture	4.4%	4.0%	11		8				6	
User Involvement	3.6%		12	3	5	3	4			1
Change Management	3.2%	4.0%	13			3	2	5		1
IT Infrastructure	2.8%	2.3%	14		6	8	7	9	7	2

As a result of this phase, a readiness assessment framework for BI system has been developed as illustrated in Figure (5.10). The CSFs assessment framework summarizes how and to what extent a set of critical factors contributes to the success

of a BI system implementation. For each CSFs included in the proposed framework, a guideline has been developed for assessing the characteristics of the factor readiness. These guidance points have been determined by applying deep analysis and investigation on previous studies, then conducting open conversations with a set of experts to identify the factors' contextual terms. Table (5.12) presents a list of the accepted guidance points used in CSFs measurement.

Due to limitation in time and the large number of factors proposed in the readiness assessment framework, the researcher selects the top seven factors with the highest weights to apply further analysis by conducting a case study in the third phase. These seven factors cover more than 70% of the success of a BI system. In addition, this shortlist allows managers in organizations to focus more on the factors with highest importance to facilitate leverage of BI benefits. These factors are *Top Management Support (TMS), Vision & Planning (VP), Available Data Quality (ADQ), Resource Allocation (RA), Appropriate Team Skills (ATS), IT Governance (ITG),* and *Continuous Improvement Culture (CIC).*

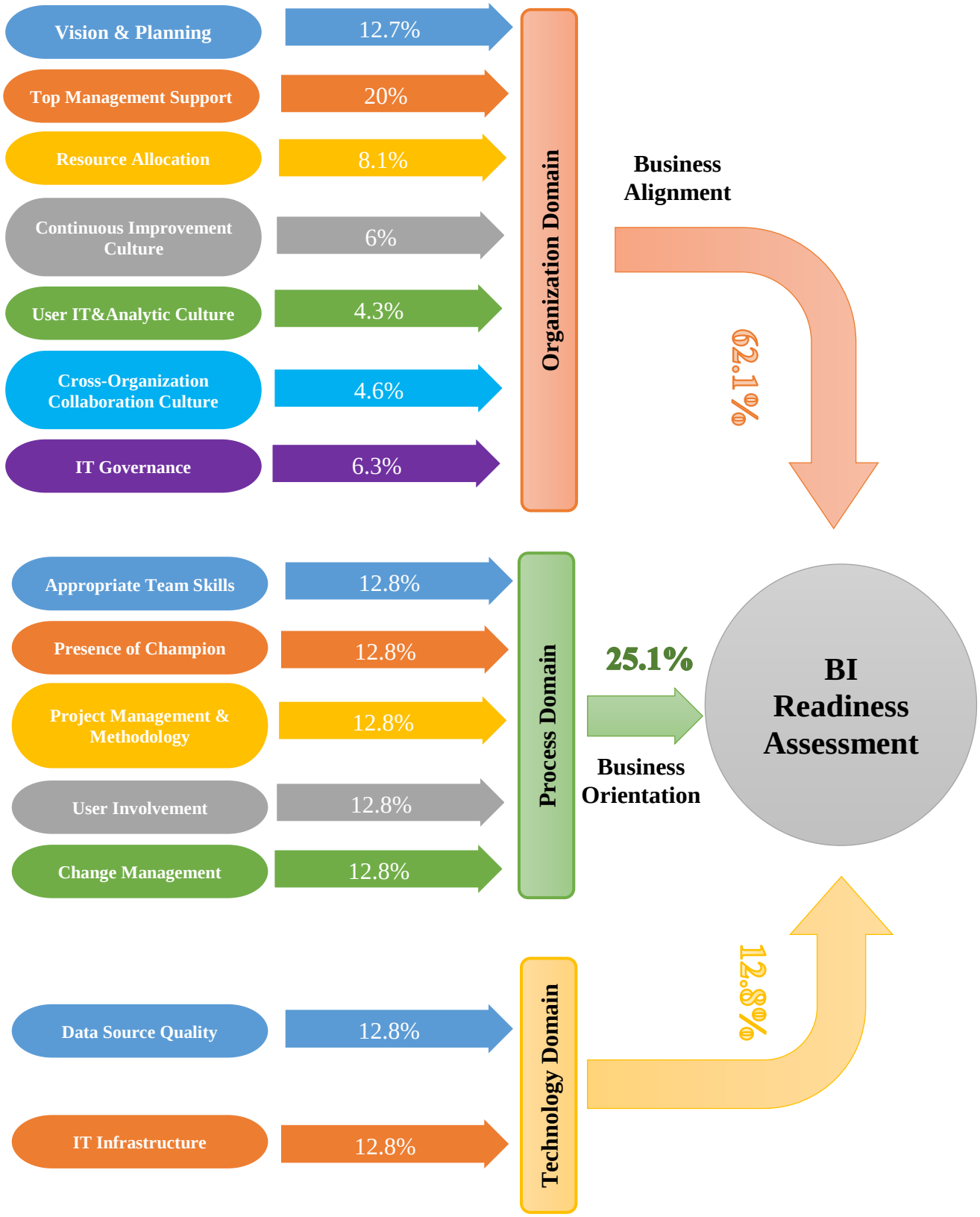

Figure (5.10): CSFs Readiness Assessment Framework For BI System

Table (5.12): Guidance points to measure the readiness factors of BI

CSFs	Guidance Points
Vision & Planning	1. Clear vision for new IS systems (including BI) 2. realistic expectation and business needs 3. aligning BI project with organization vision, mission, and strategies 4. Good planning and Well-established business case 5. Requirements estimation (budget, experts, consultants, time scheduler, human resources)
Top Management support	1. Commitment of senior management 2. Considering BI as a strategic tool for the organization 3. Effective participation to leverage the success of BI 4. Awareness of BI benefits and realistic expectation 5. Existence of policies and strategies supporting BI implementation
Resource Allocation	1. Suitable resources can be allocated and provided (Fund, Team member, Equipment, Time and Technological resources). 2. Ability to solve resource issues.
Continuous Improvement Culture	1. Continuously driving improvements to core business processes. 2. Appling organizational assessment (performance, costs, and quality) regularly. 3. Using data-driven improvement techniques. 4. Having training and /or educational programs.
User IT & Analytical Culture	1. Emphasizing on analytical frameworks and fact-based decision-making 2. Using information technology to formally collaborate in decision-making. 3. Extensive use of IS
Cross-Organization Collaboration Culture	1. Teamwork is the typical way to solve problems. 2. Existence of confidence and trust between departments. 3. Efficient communication channels for information transfer.
IT Governance	1. Guarantee an effective Business/IT Partnership. 2. Clear IT strategies and policies. 3. Regular IT projects evaluation and performance measurement. 4. Existence of rules for data governance to facilitate data-driven solutions.
Appropriate Team Skills	1. A cross-functional team with mixed skills (technology - business). 2. Adequate data analysis, reporting and systems integration skills.

Table (5.12): Guidance points to measure the readiness factors of BI

CSFs	Guidance Points
	3. Up-to-date with recent advances in IT technologies. 4. Experience in large IT Solutions. 5. Using external consultancy.
Presence of Champion	1. Existence of high-level BI implementation champion from a functional area. 2. Encourage staff training and lead project staff development 3. Boost project staff motivation 4. Negotiate with top management and apply internal marketing
Project Management & Methodology	1. Business-oriented. 2. Iterative implementation process (incrementally approach). 3. Each phase accumulates on other phases and adds new values. 4. Using prototype to prove a concept. 5. Continuous improvements based on effective feedback.
User Involvement	1. User participation/involvement across all implementation phases (user-oriented) 2. Periodic education and training 3. Use end user opinions as a guide for improvement process. 4. Timely and in place user support.
Change Management , User involvement	1. Raise awareness about the benefits of BI. 2. Reduce Change Resistance. 3. User commitment to pursue action that leads to successful implementation. 4. User valence: Users are assigned to a BI changes compatible with their values
Available Data Quality	1. Stable, various, reliable, internal and external data sources 2. Quality, consistency, interpretability, and ease of understanding data 3. Availability of structured and semi-structured data 4. Business-oriented data in measurement, classification, and governance
IT Infrastructure	1. Establishment of strategic scalable and flexible technical framework. 2. Business-oriented hardware and software systems. 3. Appropriate technology and tools (Servers and networks).

5.3 Phase Three: Framework Application (MoEHE as a case study)

This section addresses the top seven CSFs. They are deeply investigated in the third phase by applying the proposed framework on MoEHE as a case study. SPSS v18 was used to analyze data and to calculate the level of readiness for each factor and the overall readiness of MoEHE for adopting BI system based on the assessment framework.

5.3.1 Demographic Characteristics of the Sample

Table (5.13) illustrates the respondents' demographic description in terms of gender, age, job experience, field of work, and IT background. In terms of gender, the majority of respondents is male (86.83%). This is not a surprising fact, as the target society of this research is executives, senior managers, and middle managers from MoEHE, which is dominated by male personnel.

Regarding age, the group of respondents whose are less than 30 in age forms the smallest percentage (3.9%), while other groups have almost equal percentages. From the researchers' point of view, this can be attributed to the limited opportunities for the young employees to occupy supervisory positions.

As for working experience, more than 80% of the respondents have been working for MoEHE for more than 10 years, with 22.44% of these respondents have been working for 10 to 15 years. While others (58.05%) have served the MoEHE for more than 15 years. A small percentage of (.98%) represents the relatively new staff members to the ministry, having served less than 5 years. These percentages are consistent with promotion nature, more experience in the organization leads to more opportunities to have a job promotion.

In term of field of work, Majority of the respondents (81.95%) are from business, (11.22%) from IT, and the rest (6.83%) are from finance. In terms of IT background, analysis of sample data concluded that (17.07%) have very good IT background (11.22%) of which are the IT staff. While the majority of respondents (62.44%) have good IT background, other (34.8%) have fair IT knowledge and only (11.7%) classified themselves as poor in IT. This indicates that MoEHE is rich with qualified

human resources who have high potential to deal with information systems including BI systems.

Table (5.13): Demographic profiles of respondents

Demographic	Profile	Frequencies	Percentage
Gender	Male	178	86.83%
	Female	27	13.17%
	Total	**205**	**100%**
Age	Less than 30	8	3.90%
	from 30 to 40	66	32.20%
	from 40 to 50	66	32.20%
	more than 50	65	31.71%
	Total	**205**	**100%**
Job Experience	less than 5 yrs.	2	0.98%
	from 5 to 10 yrs.	38	18.54%
	from 10 to 15 yrs.	46	22.44%
	more than 15 yrs.	119	58.05%
	Total	**205**	**100%**
Work Domain	IT	23	11.22%
	Business	168	81.95%
	Finance	14	6.83%
	Total	**205**	**100%**
IT Background	Very Good	35	17.07%
	Good	128	62.44%
	Fair	36	17.56%
	Poor	6	2.93%
	Total	**205**	**100%**

5.3.2 Readiness Level Description

In order to make participants attitudes more understandable and easier to interpret, researchers have introduced a three-level readiness classification scale inherited from ASSESSMENT (2004) and Hidayanto et al. (2012). The 7-degree Likert scale used to survey participants' attitudes spans six intervals. Each two of which make up one class in the new introduced classification scale. Mapping of the Likert scale into the new three-level scale as shown in Table (5.14). A mean value that falls

in the first two intervals is classified as *poor or Low degree* where a mean value that falls in the third and fourth intervals is classified as a *Moderate degree*. Finally, a mean value that falls in the last two intervals is classified as *an adequate degree*.

Table (5.14): Mapping of Mean values into one of the readiness level

Mean	Level of Readiness	Description
[1-3]	Poor	The factor is weakly addressed and supported.
]3,5[	Moderate	The factor is partially addressed and supported.
[5,7]	Adequate	The factor is strongly addressed and supported.

Source: Develped by Researchers based on *(ASSESSMENT, 2004; Hidayanto et al., 2012)*

5.3.3 Readiness Level of CSFs

Researchers addressed and evaluated respondents' attitudes toward the top seven CSFs. The T-test was used to calculate the means of the sample responses for all paragraphs in each factor separately and test whether these means significantly equal to the hypothesized mean of the population, which was proposed to be equal to the mean of the used scale, namely equal to four.

1- Vision & Planning (VP)

The Mean, Mean percent, t-test value and the significance (p-value) of the test were calculated for each paragraph of the *Vision & Planning* factor. These values were used to evaluate attitudes of respondents towards the readiness of *Vision & Planning* factor. Each paragraph was ranked and classified into a readiness level.

Table (5.15) illustrates that all paragraphs have p-value =.000 with positive t-test values. This means that null hypothesis is rejected and the alternate hypothesis of mean $\neq 4$ is accepted. Therefore, paragraphs have statistically significant means above the hypothesized value of 4 at the level of significance of $\alpha = 0.01$. Most paragraphs have Mean values between 4 and 5 (Moderate level) except for two paragraphs with Mean greater than 5 (Adequate level). The *Overall Mean* falls in the moderate level of

readiness scale which means that respondents, generally, confirm that the vision & planning process of MoEHE is partially supported and needs more improvement to be adequate for BI implementation. Mean values range from 4.327 (61.8%) to 5.420 (77.4%) with an overall mean of 4.916 (70.2%).

(VP5) "IT leaders are business-savvy" got the highest rank where (VP4) "Business leaders are IT savvy" got the lowest rank, this mean that respondents trust the ability of IT managers to recognize the business needs, but they question the ability of business managers to understand and deal with IT environment and its requirements. Business managers in MoEHE should be trained to improve their IT skills and knowledge. In addition, (VP11) "Determine how much time needed in IS implementation" and (VP10) "Clear expectations for adopting any new IS system" got the ranks right before the last, which clarifies the existing weaknesses in determining the time and expectations needed from newly adopted systems.

Table (5.15): Readiness of Vision & Planning of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
VP1	Your organization has a clear, actionable strategy for our business.	4.985	71.2%	13.376	.000	3	Moderate
VP2	Your organization uses an effective managerial tools and business processes that lead to achieving its strategic goals efficiently.	4.893	69.9%	11.601	.000	7	Moderate
VP3	Your organization measures strategically relevant performance factors.	4.863	69.5%	10.260	.000	9	Moderate
VP4	Your leaders and managers are IT savvy.	4.327	61.8%	3.917	.000	12	Moderate
VP5	Your IT leaders and managers are business-savvy.	5.420	77.4%	18.741	.000	1	Adequate
VP6	Your organization derives its IT strategies from Business Strategies.	4.976	71.1%	13.246	.000	4	Moderate
VP7	Your organization's Information systems strongly support the strategic goals of the organization.	5.132	73.3%	15.916	.000	2	Adequate
VP8	Information from all functional areas is collected during constructing your	4.883	69.8%	11.724	.000	8	Moderate

Table (5.15): Readiness of Vision & Planning of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
	organization strategic IT plans.						
VP9	Your organization always identifies a clear vision and mission of any new IS system.	4.951	70.7%	12.217	.000	5	Moderate
VP10	Your organization always defines clear performance expectations for adopting any new IS system.	4.839	69.1%	11.906	.000	10	Moderate
VP11	Your organization always determines how much time it will take to implement any new IS system.	4.815	68.8%	11.580	.000	11	Moderate
VP12	Your organization always identifies all resources needed during any new IS system implementation.	4.907	70.1%	12.706	.000	6	Moderate
All Paragraphs		**4.916**	**70.2%**	**17.475**	**.000**		**Moderate**

2- Top Management Support (TMS)

The Mean, Mean percent, t-test value and the significance (p-value) of the test were calculated for each paragraph of the *Top Management Support* factor. These values were used to evaluate attitudes of respondents towards the readiness of *Top Management Support* factor. Each paragraph was ranked and classified into a readiness level.

Table (5.16) illustrates that all paragraphs have p-value =.000 with a positive t-test values. This means that null hypothesis is rejected and the alternate hypothesis of mean $\neq 4$ is accepted. Therefore, paragraphs have statistically significant means above the hypothesized value of 4 at the level of significance of $\alpha = 0.01$. Most paragraphs have Mean values above 5 (Adequate level) except for three paragraphs with Mean between 4 and 5 (Moderate level). The *Overall Mean* falls in Adequate level of readiness scale which means that respondents, generally, confirm that the top managers of MoEHE are strongly supporting BI adoption. Mean values range from 4.849 (69.3%) to 5.278 (75.4%) with an overall mean of 5.018 (71.7%).

(TMS1) "Commit to supporting IS" got the highest rank followed by (TMS4) "Data analytics and advanced reports are needed to support decisions", which clarify that the top management of MoEHE tends to rely on IS to improve its internal processes and services. In addition, the top management believes that the ministry needs an analytical tool to support decision making, which is the core function of BI. In contrast, (TMS7) "Having realistic and achievable expectations" got the lowest rank; this means that respondents believe that there is a problem in top management expectations from BI system. This finding supports the previously mentioned result from Vision & Planning analysis, which illustrate a weakness in determining the time and expectations needed from newly adopted systems and the weaknesses in IT skills of business managers.

Table (5.16): Readiness of Top Management Support of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
TMS1	Your organization's top management is committed to supporting Information Systems because it's key to competitiveness, growth, and operational excellence	5.278	75.4%	18.159	.000	1	Adequate
TMS2	Your organization's top management willing to help surmount rather than create obstacles for BI system	5.049	72.1%	14.678	.000	3	Adequate
TMS3	Your organization's top management will actively encourage users to use BI	5.000	71.4%	13.146	.000	6	Adequate
TMS4	Your organization's top management believe that organization required data analytics and advanced reports to support decision-making.	5.102	72.9%	14.903	.000	2	Adequate
TMS5	Your organization's top management considered BI as a strategic tool to achieve goals of the organization.	4.902	70.0%	12.275	.000	8	Moderate
TMS6	Your organization's top management is aware of the benefits of BI	5.010	71.6%	13.275	.000	5	Adequate
TMS7	Your organization's top management generally has realistic and achievable expectations of the BI system	4.849	69.3%	11.197	.000	9	Moderate

Table (5.16): Readiness of Top Management Support of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
TMS8	Your organization's top management believe that adoption of BI will lead to significant improvement in managerial decisions and organization performance	5.034	71.9%	14.234	.000	4	Adequate
TMS9	Your organization's top management willingly assign time and resources to the BI system as it's needed	4.941	70.6%	11.732	.000	7	Moderate
All Paragraphs		**5.018**	**71.7%**	**16.880**	**.000**		**Adequate**

3- Resource Allocation (RA)

The Mean, Mean percent, t-test value and the significance (p-value) of the test were calculated for each paragraph of the *Resource Allocation* factor. These values were used to evaluate attitudes of respondents towards the readiness of *Resource Allocation* factor. Each paragraph was ranked and classified into a readiness level.

Table (5.17) illustrates that all paragraphs have p-value =.000 with a positive t-test values. This means that null hypothesis is rejected and the alternate hypothesis of mean ≠ 4 is accepted. Therefore, paragraphs have statistically significant means above the hypothesized value of 4 at the level of significance of $\alpha = 0.01$. Mean values for all paragraphs and the *Overall Mean* of the factor as a whole are between 4 and 5 (Moderate level). This means that respondents, generally, confirm that the resources available in MoEHE are limited and not adequate for BI implementation. This finding fits with the reality that Palestinian government in Gaza is significantly suffering shortage in resources. The existence of some NGOs that donate for education raises the level of readiness to Moderate level. The paragraphs' Mean values range from 4.376 (62.5%) to 4.971 (71%) with an overall mean of 4.720 (67.4%).

(RA6) "Solve problems of resource requirement" and (RA5) "Has the time needed to implementation process" got the highest ranks, which indicates that MoEHE is partially able to solve the resource allocation issues. Furthermore, MoEHE is not in

hurry and has the plenty of time to complete BI implementation. Yet, (RA1) "Has the needed equipment" got the lowest rank which means that respondents believe that there is a limitation in the needed equipment for BI adoption.

Table (5.17): Readiness of Resource Allocation of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
RA1	Your organization has the equipment needed to implement the BI system	4.376	62.5%	9.950	.000	6	Moderate
RA2	Your organization has an enough team members to get the work done for the BI system	4.663	66.6%	11.825	.000	5	Moderate
RA3	Your organization able to allocate adequately fund for the BI system	4.683	66.9%	4.280	.000	4	Moderate
RA4	Your organization has the technological resources to adopt the BI system	4.785	68.4%	8.431	.000	3	Moderate
RA5	Your organization has the time needed to implement and complete the BI system	4.839	69.1%	11.576	.000	2	Moderate
RA6	Your organization able to solve problems of resource requirement with regard to the BI system	4.971	71.0%	8.483	.000	1	Moderate
All Paragraphs		**4.720**	**67.4%**	**10.748**	**.000**		**Moderate**

4- Continuous Improvement Culture (CIC)

The Mean, Mean percent, t-test value and the significance (p-value) of the test were calculated for each paragraph of the *Continuous Improvement Culture* factor. These values were used to evaluate attitudes of respondents towards the readiness of *Continuous Improvement Culture* factor. Each paragraph was ranked and classified into a readiness level.

Table (5.18) illustrates that all paragraphs have p-value =.000 with a positive t-test values. This means that null hypothesis is rejected and the alternate hypothesis of mean $\neq 4$ is accepted. Therefore, paragraphs have statistically significant means above the hypothesized value of 4 at the level of significance of $\alpha = 0.01$. Most paragraphs have Mean values between 4 and 5 (Moderate level) except for two paragraphs with

mean greater than 5 (Adequate level). The *Overall Mean* falls in the Moderate level of readiness scale which means that respondents, generally, confirm that the continuous improvement culture process of MoEHE is partially supported and needs more improvement to be adequate for BI implementation. Mean values range from 4.654 (66.5%) to 5.210 (74.4%) with an overall mean of 4.833 (69%).

(CIC1) "Always looking to improve the organization's core processes" got the highest rank where (CIC2) "Leaders are adept at driving changes" got the lowest rank preceded by (CIC3) "Conducting an organizational assessment regularly". This indicates that the leaders of MoEHE always try to improve the core processes of business but they get under expected results because they do not realize the importance of evaluation process, which assesses the work performance, costs, and quality to enhance the improvement process correctly. (CIC7) "Owning training and educational programs" came in the second rank with Adequate level of readiness to illustrate that MoEHE focuses on informing their employees and keeping them up to date by adopting a continuous training process.

Table (5.18): Readiness of Continuous Improvement Culture of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
CIC1	Your leaders are always looking to improve your organization's core business processes	5.210	74.4%	16.756	.000	1	Adequate
CIC2	Your leaders are adept at driving changes to your organization's core business processes to improve performance.	4.654	66.5%	7.899	.000	7	Moderate
CIC3	Your organization is conducting an organizational assessment (performance, costs, and ways the quality of work) regularly in order to improve performance	4.659	66.6%	8.105	.000	6	Moderate
CIC4	Your organization frequently analyze feedback to inform and make rapid changes that foster adoption of best practice.	4.737	67.7%	8.295	.000	4	Moderate
CIC5	Your leaders understand that the best practices mature and are replaced over time	4.741	67.7%	9.380	.000	3	Moderate

Table (5.18): Readiness of Continuous Improvement Culture of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
CIC6	Your organization apply data-driven improvement techniques such as Six Sigma, and/or TQM	4.732	67.6%	8.938	.000	5	Moderate
CIC7	Your organization has a training and /or educational programs to update employees skills	5.098	72.8%	14.368	.000	2	Adequate
All Paragraphs		**4.833**	**69.0%**	**12.426**	**.000**		**Moderate**

5- IT Governance

The Mean, Mean percent, t-test value and the significance (p-value) of the test were calculated for each paragraph of the *IT Governance* factor. These values were used to evaluate attitudes of respondents towards the readiness of *IT Governance* factor. Each paragraph was ranked and classified into a readiness level.

Table (5.19) illustrates that all paragraphs have p-value =.000 with a positive t-test values. This means that null hypothesis is rejected and the alternate hypothesis of mean $\neq 4$ is accepted. Therefore, paragraphs have statistically significant means above the hypothesized value of 4 at the level of significance of $\alpha = 0.01$. Most paragraphs have Mean values between 4 and 5 (Moderate level) except for one paragraph with Mean greater than 5(Adequate level). The *Overall Mean* falls in the Moderate level of readiness scale which means that respondents, generally, confirm that the IT governance process of MoEHE is partially supported and needs more improvement to be adequate for BI implementation. Mean values range from 4.507 (64.4%) to 5.044 (72.1%) with an overall mean of 4.769 (68.1%).

(ITG1) "IT strategies makers understands the business and IT objectives" got the highest rank followed by (ITG2) "IT strategies are flexible". This indicates that respondents trust the ability of IT strategy makers to recognize business and IT needs. In addition, they believe that IT strategies are able to change flexibly to align with MoEHE environment. This finding supports the previously mentioned result from Vision & Planning analysis, which illustrate a strong of IT managers in determining

the business needs and developing a suitable policies and strategies. (ITG11) "IT rules can guide the new data-driven solutions", however, got the lowest rank which indicates that the existing IT strategies and rules are not suitable enough to manage the big data-driven solutions and need more improvement. (ITG9) "Evaluation of IT projects" was ranked right before the last, this finding supports the previously mentioned result from *Continuous Improvement Culture* analysis, that evaluation process of the changes emerged from the newly adopted systems are insufficiently performed.

Table (5.19): Readiness of IT Governance of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
ITG1	The makers of IT strategies and policies, in your organization, understands the business and IT objectives.	5.044	72.1%	14.505	.000	1	Adequate
ITG2	IT strategies and policies are enacted in a flexible manner to suit the changes occurring in the enterprise work environment.	4.966	70.9%	13.478	.000	2	Moderate
ITG3	Members from all major areas of your organization are involved in the development of IT strategies and policies.	4.663	66.6%	8.111	.000	9	Moderate
ITG4	IT strategies and policies are clearly written so that user can understand them.	4.683	66.9%	8.934	.000	8	Moderate
ITG5	IT strategies and policies provide user with extensive guidance regard how to manage IT projects.	4.824	68.9%	11.374	.000	5	Moderate
ITG6	IT strategies and policies define objectives and expectations of the use of Information systems in your organization, such as accountability and responsibility.	4.941	70.6%	13.001	.000	3	Moderate
ITG7	IT strategies and policies are accessible by all users impacted by IT projects	4.727	67.5%	9.313	.000	6	Moderate
ITG8	Feedback related to the organization's IT strategies and policies are communicated to the makers of IT strategies	4.829	69.0%	11.109	.000	4	Moderate

Table (5.19): Readiness of IT Governance of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
ITG9	Your organization has an IT projects evaluation , metrics and performance measurement	4.576	65.4%	7.327	.000	10	Moderate
ITG10	Your organization already has rules for data governance, like data retention policies, and privacy.	4.698	67.1%	8.034	.000	7	Moderate
ITG11	Your organization's IT rules can guide the new data-driven solutions as big data, analytics, and BI.	4.507	64.4%	6.323	.000	11	Moderate
All Paragraphs		**4.769**	**68.1%**	**12.216**	**.000**		**Moderate**

6- Appropriate Team Skills (ATS)

The Mean, Mean percent, t-test value and the significance (p-value) of the test were calculated for each paragraph of the *Appropriate Team Skills* factor. These values were used to evaluate attitudes of respondents towards the readiness of *Appropriate Team Skills* factor. Each paragraph was ranked and classified into a readiness level.

Table (5.20) illustrates that all paragraphs have p-value =.000 with a positive t-test values. This means that null hypothesis is rejected and the alternate hypothesis of mean $\neq 4$ is accepted. Therefore, paragraphs have statistically significant means above the hypothesized value of 4 at the level of significance of $\alpha = 0.01$. All paragraphs and the factor as a whole have Mean values above 5 (Adequate level) except for one paragraph with Mean between 4 and 5 (Moderate level). This means that respondents, generally, trust and confirm that the development team of MoEHE possesses the necessary skills and competencies that enable them to implement the new BI system successfully. Mean values range from 4.61 (65.9%) to 5.69 (81.3%) with an overall mean of 5.436 (77.7%).

(ATS1) "Owning strong data analysis skills", (ATS2) "Owning strong skills in query and reporting" and (ATS5) "Solve the technical problems during BI implementation" got the first, second and third ranks respectively. This indicates that the development team has strong analytical and reporting skills, a major skills in BI

implementation. In addition, respondents mentioned that the development team has the ability to solve technical issues that show up during the BI implementation. (ATDS9) "Acquire required skills", on the other hand, got the lowest rank within the Moderate level indicating weakness in covering the missing skills through hiring new employees or getting external consultation. This weakness can be attributed to the fact that MoEHE follows the general procedures of the General Personnel Council, which limits MoEHE's ability to apply the optimal selection for the missing skills. (ATS9) "Owning cross-functional business members" was ranked right before the last and falls in the Adequate level. This emphasizes that MoEHE management should be sufficiently conscious of the need for having a balanced development team that has all the needed business skill in addition to the technical skills.

Table (5.20): Readiness of Appropriate Team Skills of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
ATS1	Your organization's development team has strong data analysis skills	5.69	81.3%	24.875	.000	1	Adequate
ATS2	Your organization's development team has strong skills in query and reporting	5.66	80.8%	23.399	.000	2	Adequate
ATS3	Your organization's development team has strong systems integration skills	5.61	80.1%	22.783	.000	6	Adequate
ATS4	Your organization's development team are up-to-date with recent advances in IT technologies including data analytics, web programming, and open source platforms	5.64	80.6%	23.394	.000	4	Adequate
ATS5	Your organization's development team able to solve the technical problems arose during the BI implementation	5.64	80.6%	23.479	.000	3	Adequate
ATS6	Your organization's development team has the expertise prior experience in large IT projects like ERP,DW, and BI	5.63	80.5%	24.272	.000	5	Adequate
ATS7	Your organization's development team includes cross-functional business	5.05	72.1%	12.311	.000	8	Adequate

Table (5.20): Readiness of Appropriate Team Skills of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
	members beside technical members						
ATS8	Your organization's development team knows how to work with business users to design what they see via BI applications	5.39	76.9%	19.076	.000	7	Adequate
ATS9	If Your organization miss needed skills, your organization obtained it either through hiring new employees or by utilizing consultants	4.61	65.9%	6.715	.000	9	Moderate
All Paragraphs		**5.436**	**77.7%**	**23.996**	**.000**		**Adequate**

7- Available Data Quality (ADQ)

The Mean, Mean percent, t-test value and the significance (p-value) of the test were calculated for each paragraph of the *Available Data Quality* factor. These values were used to evaluate attitudes of respondents towards the readiness of *Available Data Quality* factor. Each paragraph was ranked and classified into a readiness level.

Table (5.21) illustrates that all paragraphs have p-value =.000 with a positive t-test values. This means that null hypothesis is rejected and the alternate hypothesis of mean $\neq 4$ is accepted. Therefore, paragraphs have statistically significant means above the hypothesized value of 4 at the level of significance of $\alpha = 0.01$. All paragraphs and the factor as a whole have Mean values above 5 (Adequate level). This means that respondents, generally, highly agreed to all paragraphs of data quality and confirm that the available data in MoEHE is a rich data source for making decisions and adopting BI successfully. Mean values range from 5.01 (71.6%) to 5.43 (77.6%) with an overall mean of 5.235 (74.8%).

Available Data Quality factor got high rank due to the fact that MoEHE has an ERP system that encompasses all other system. This integration of the ministry system is supported by official instructions and strategic policies. (ADQ9) "Data is stored in the central integrated database" got the highest rank to indicate that all internal data of

MoEHE is retained into a central integrated database while (ADQ8) "Consistency and integrated data from different sources" got the lowest rank, within the adequate level, to indicate that MoEHE should make greater efforts to integrate the external sources with its ERP system.

Table (5.21): Readiness of Available Data Quality of MoEHE

Code	Paragraphs	Mean	Mean (%)	T-test value	P-Value (Sig)	Rank	Level of Readiness
ADQ1	Your organization has an accurate data.	5.22	74.6%	15.801	.000	6	Adequate
ADQ2	Data available in your organization is up-to-date and regularly updated.	5.21	74.4%	16.385	.000	7	Adequate
ADQ3	Data available in your organization is highly available and easily accessible.	5.30	75.7%	16.671	.000	4	Adequate
ADQ4	Data available in your organization is clear and easy to understand.	5.36	76.6%	20.019	.000	2	Adequate
ADQ5	Data available in your organization is valid and reliable.	5.32	76.0%	18.226	.000	3	Adequate
ADQ6	Data available in your organization is Strongly relevant to your work.	5.30	75.7%	18.723	.000	5	Adequate
ADQ7	Data available in your organization provide a comprehensive view of your work.	5.15	73.6%	15.187	.000	8	Adequate
ADQ8	Data available from different sources in your organization is consistency and seamlessly integrated.	5.01	71.6%	13.500	.000	10	Adequate
ADQ9	Most of your organization data is stored in the central integrated database.	5.43	77.6%	19.668	.000	1	Adequate
ADQ10	Your organization has already huge data that can be analyzed to support decisions.	5.04	72.1%	12.354	.000	9	Adequate
All Paragraphs		**5.235**	**74.8%**	**20.699**	**.000**		**Adequate**

5.3.4 The Overall Readiness Level of MoEHE

Table (5.22) and Figure (5.11) present a comprehensive view of the CSFs readiness and the overall readiness of MoEHE. The results show that MoEHE has

sufficient level of readiness to adopt BI system in terms of *Appropriate Team Skills, Available Data Quality, and Top Management Support* whereas it is very obvious that it is not as ready in *Vision & Planning, Resource Allocation, Continuous Improvement Culture and IT Governance* as it should be. This means that the latter factors needs more attention from top management. *Appropriate Team Skills* got the highest readiness ratio indicating that the development team of MoEHE possesses the necessary skills and competencies that enable them to implement the new BI system successfully. *Available Data Quality* came in the second rank showing that the available data in MoEHE is considered as a rich data source for the decision-making process and ready to be used in BI system.

Table (5.22) illustrates *Resource Allocation* at the bottom of the list of factors with the lowest readiness ratio. This finding fits with the reality that Palestinian government in Gaza is significantly suffering shortage in resources. Therefore, it is recommended that MoEHE should depend on the NGOs to sponsor the BI initiative. In addition, MoEHE suffers from lack of *IT governance*, which is currently inadequate for BI implementation and needs improvement.

Table (5.22): The Overall Readiness of MoEHE

Code	Critical Success Factors	Factor Readiness	Level of Readiness	AHP Factor Weight(1)	Adjusted Factor Weight(2)	Organization Readiness(3)
VP	Vision & Planning	70.2%	Moderate	12.7%	18.1%	12.7%
TMS	Top Management Support	71.7%	Adequate	20.0%	28.5%	20.5%
RA	Resource Allocation	67.4%	Moderate	8.1%	11.6%	7.8%
CIC	Continuous Improvement Culture	69.0%	Moderate	6.0%	8.6%	5.9%
ITG	IT Governance	68.1%	Moderate	6.3%	9.0%	6.1%
ATS	Appropriate Team Skills	77.7%	Adequate	7.1%	10.1%	7.9%
ADQ	Available Data Quality	74.8%	Adequate	9.9%	14.1%	10.6%
Overall Readiness		**71.4%**				

(1) AHP Factor Weight: the weight from the proposed assessment framework
*(2) Adjusted Factor Weight: Calculated as AHP factor weight*100/70.1 while 70.1 is the total AHP factor weights of the selected seven factors.*
*(3) Organization Readiness: calculated as Factor Readiness *Adjusted Factor weight*

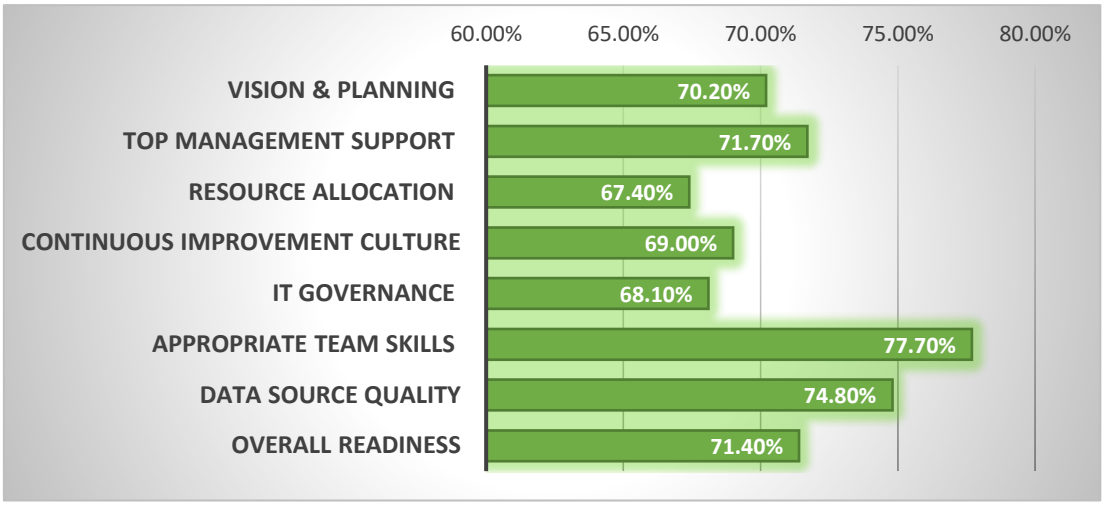

Figure 5.11): CSFs and Overall Readiness Ratios of MoEHE

In Table (5.22), AHP Factor Weight column shows weight percentages as presented in the framework before selecting the top seven for further inspection. These weights had to be adjusted to reflect the actual factors' weight percentages after limiting factors to only top seven. To do the conversion, AHP factor weights were multiplied by 100 and divided by 70.1 which is the total original AHP factor weights of the selected seven factors drawn from the framework. Adjusted Factor Weight column shows the new values of the actual weight percentages.

Values in organizational readiness column were obtained by multiplying the value in the factor readiness column with its corresponding adjusted factor's weight. The overall readiness ratio was calculated by summing all factors' organizational readiness values. The overall readiness ratio for MoEHE equals 71.4%, which is the critical point between the moderate and the adequate levels. Although MoEHE falls in the adequate level, there is still some risks and possible future obstacles that may fail the implementation.

Finally, the ministry should act to enhance its readiness in the *Vision & Planning*, *Resource Allocation, Continuous Improvement Culture and IT Governance* factors and prevent obstacles that might arise. Readiness ratios for the seven CSFs of MoEHE have been illustrated as a radar diagram in Figure (5.12).

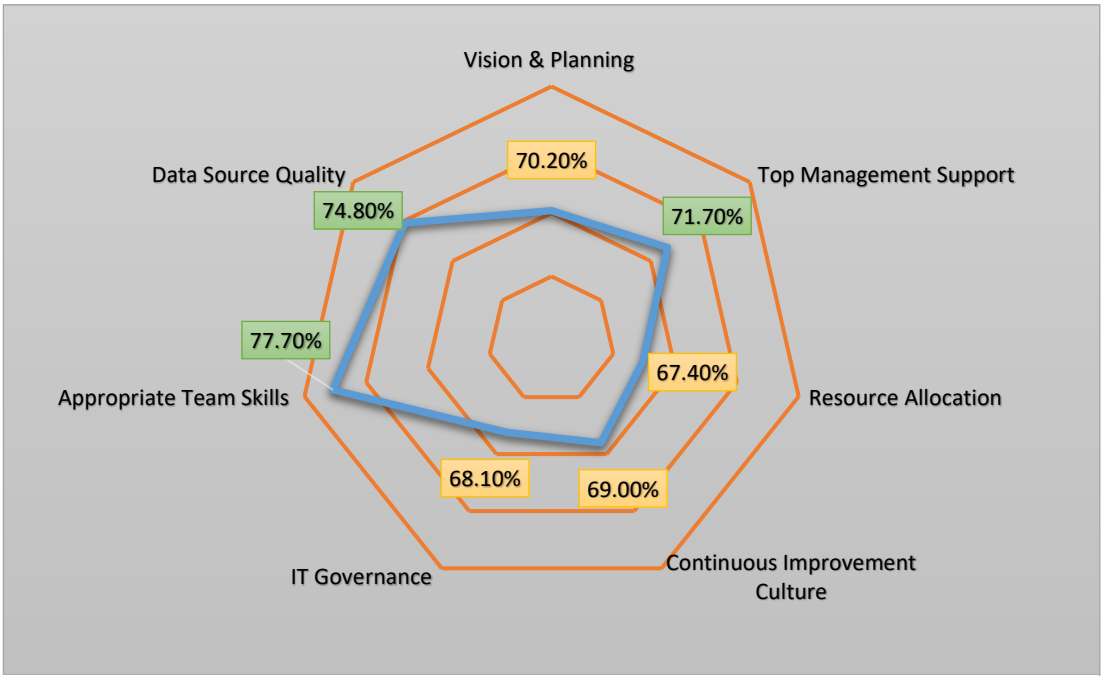

Figure (5.12): Radar diagram for Readiness ratios of MoEHE

5.4 Chapter Summary

This chapter was divided into three main sections; each section addressed the data analysis process and results of a specific phase of the study. Firstly, the chapter identified and described the critical success factors (CSFs) which were derived from previous studies review. In the second phase, the extracted CSFs were deeply assessed and discussed by a panel of experts. Experts' recommendations were analyzed and factors were modified accordingly to come up with the final set of the CSFs. Thereafter, a readiness assessment framework for BI system was developed by determining the importance weight of each factor using Analytic Hierarchy Process (AHP). A guideline was developed for addressing the readiness characteristics of each factor. Finally, the chapter addressed the top seven CSFs by applying the proposed framework on MoEHE. SPSS v18 was used to analyze data and to calculate the level of readiness of each factor and the overall readiness of MoEHE for adopting BI system based on the assessment framework. The next chapter presents the conclusion and the recommendations of the study.

Chapter Six
Conclusion & Recommendations

Chapter Six: Conclusion & Recommendations

This chapter initiates discussion on the results concluded in the previous chapter and summarizes the key findings of this study. Additionally, it spots researchers recommendations for beneficiaries and stakeholders and suggestions for future studies.

6.1 Conclusions

This study achieved its objectives by using a mixed methodology with three phases. Firstly, it identified the CSFs for BI systems in Gaza Strip by reviewing 30 related previous studies. Then, it determined the importance weight and the rank for each factor by using the AHP method, upon which the development of a readiness assessment framework relied. Finally, the study deeply investigated the top seven factors by applying the proposed framework on the Ministry of Education & Higher Education (MoEHE). The study findings can be summarized as follows:

6.1.1 Phase One: Critical Success Factors Identification

- It is essential for any organization to assess its readiness before investing in BI system.
- To assess the organizational readiness toward BI and to capture the full business value of BI adoption, the critical success factors (CSFs) of BI must be determined. A comprehensive list of 14 CSFs with a significant impact on BI implementation have been extracted, These factors were derived through a process of identification, filtering, and scoring of the most commonly reoccurring factors used in twenty-five similar BI and WD studies.
- These CSFs are categorized into three main domains, namely Organization, Process, and Technology.
    - ☆ *Organization factors*: Vision & Planning, Top Management Support, Resource Allocation, Continuous improvement culture, User IT & Analytical Culture, Cross-Organization Collaboration Culture, and IT governance.

- ☆ *Process factors*: Appropriate Team Skills, Presence of Champion, Project Management & Methodology, User Involvement, and Change Management.
- ☆ *Technology factors*: Available Data Quality and IT Infrastructure.

6.1.2 Phase Two: Framework Development

First Round: Factors Rating and Modifications

- All the derived factors have an importance percentages more than or equal 78%, this means, from the experts' points of view, that all the suggested factors are critical and highly important to guarantee a successful implementation of BI systems.
- *Top Management Support* and *Vision & Planning* are considered the most important factors with 98% and 95% respectively. Followed by *Resource Allocation* and *Available Data Quality* with 91% and 90% respectively. On the other hand, the experts gave 78% for *User IT & Analytical Culture* and *IT Infrastructure* as the least important factors.
- Following experts' recommendations, *IT Governance* was added to the CSFs under the organization domain. The final CSFs list is shown in Table 5.3).

Second Round: Applying AHP Model (Weighting Factors)

- The Organization domain got the highest importance weight with a percentage of 62.1% followed by the Process domain with 25.1%. Meaning that the Organization and the Process domains cover 87.2% of BI successful implementation. The Technology domain got the lowest percentages of 12.8%.
- Technology factors are less affected and easier to be managed and more controllable against organization and process factors.
- It is Noticeable from Table (5.10) and Figure (5.9), For the 14 CSFs, that *Top Management Support* and *Vision & planning* are the most important factors with global weight percentages of 20% and 12.7% respectively. *Available Data*

Quality, which belongs to Technology domain, came third with a global weight percentage of 9.9%. The fourth rank belonged to *Resource Allocation* with a global weight percentage of 8.1%. Remarkably, *User Involvement*, *Change Management*, and *IT Infrastructure* were the lowest ranks with 3.6%, 3.2%, and 2.8% respectively.

- A quantitative framework for measuring the organization's readiness toward BI has been developed as illustrated in Figure (5.10). The proposed framework had a list of accepted guidance points, presented in Table (5.12), used in assessing the characteristics of each factor readiness.

6.1.3 Phase Three: Framework Application (MoEHE as a case study)

This study investigates and addresses the top seven CSFs by applying the proposed framework on MoEHE as a case study. These seven factors support more than 70% of the success of a BI system. These factors are *Top Management Support*, *Vision & Planning*, *Available Data Quality*, *Resource Allocation*, *Appropriate Team Skills*, *IT Governance*, and *Continuous Improvement Culture*.

- It is obvious from Table (5.22) and Figure (5.11), that *Appropriate Team Skills*, *Available Data Quality*, and *Top Management Support* are classified in the adequate level of readiness and suitable for BI adoption.
- *Vision & Planning*, *Resource Allocation*, *Continuous Improvement Culture* and *IT Governance* are insufficiently available in MoEHE and thus fell in the moderate level of readiness. This means that it needs more attention and enhanced actions to get improved and raised to the adequate level.
- *Appropriate Team Skills* got the highest readiness ratio indicating that the development team of MoEHE possesses the necessary and suitable skills that enable them to implement the new BI system successfully.
- *Available Data Quality* came in the second rank showing that the available data in MoEHE is considered as a rich data source for the decision-making process and ready to be used in BI system.

- *Resource Allocation* has the lowest readiness ratio which is consistent with the reality that Palestinian government in Gaza is significantly suffering shortage in resources.
- The overall readiness ratio for MoEHE equals 71.4%, which is the critical point between the moderate and the adequate levels. Therefore, there is still some risks and possible future obstacles that may fail the implementation of BI.

6.2 Recommendations

6.2.1 General Practical Recommendations

For a successful BI adoption, organizations should give special attention to the following guidelines during pre-implementation phase:

- Due to the fact that to BI systems have high rate of failure, ranges from 50% to 80%, it is essential for organizations to assess their readiness before investing in BI systems.
- Private, public and academic organizations in Gaza are strongly recommended to use the proposed readiness assessment framework, developed in this study, before starting business intelligence initiative.
- Organizations, targeting BI systems, should take into consideration all the proposed CSFs, included in the proposed framework to reduce risks and to leverage BI adoption benefits.
- The CSFs should be addressed using a business orientated methodology in order to achieve better results. Organizations should align BI system to their vision, strategies, and business needs.
- The CSFs of Business intelligence are similar to the CSFs of other information systems, but they have quite different contextual term issues. Therefore, the readiness of these CSFs cannot be assessed without considering the relevant contextual issues carefully.

- It is highly recommended that BI projects should be implemented through an iterative approach. BI should be broken into smaller modules; each module targets a single business subject area with a specific scope, period and functionality.
- *Top Management Support* and *Vision & planning* are recommended to be in the adequate level before starting BI adoption. Otherwise, serious risks and barriers may raise during the implementation phase leading to system failure.
- The organization top management should be aware that the intangible benefits of BI system especially at its early stages. It is common that such intangible outcome consumes long time to be transformed into tangible benefits and thus usually underestimated by the top management. Therefore, all benefits, tangible and intangible, should be comprised in the BI return on investment (ROI) analysis.

6.2.2 Practical Recommendations for MoEHE

- It is recommended that MoEHE should enhance its readiness *in Vision & Planning, Resource Allocation, Continuous Improvement Culture* and *IT Governance* factors and raise them to the adequate level to minimize obstacles that might arise during the implementation phase.
- Most respondents misbelieved that business leaders have the ability to understand and deal with IT environment and its requirements. Therefore, business managers in MoEHE should trained to improve their IT skills and knowledge, which would increase their ability in determining performance expectations and the required time frame for newly adopted systems.
- The respondents agreed that MoEHE has inadequate resources for implementing BI system. Therefore, MoEHE can depend on the NGOs to adopt this initiative. Many NGOs depend on reports and data of MoEHE to take their donation decisions. BI would help MoEHE and these NGOs to improve their decision-making process.
- The findings present that MoEHE is weak in evaluating information systems. Consequently, it is strongly recommended that MoEHE should improve its evaluation tools and processes to significantly assess the systems performance,

costs, and quality. Feedback from the evaluation process would increase the readiness of the continuous improvement process and IT governance.

6.2.3 Theoretical Recommendations (Future research)

- The framework presented by this study has a strong ability to assess the organizational readiness toward BI initiatives.
- Opportunities exist for future empirical studies to validate the proposed readiness assessment framework by checking the relationship between the proposed CSFs and BI success.
- Future research are recommended to apply the proposed framework in other institutions to confirm and to generalize the findings of this study.
- This study emphases the CSFs of BI as a separate system. Future research are recommended to investigate the CSFs of BI system when implemented as an extension of an ERP system. Applying BI as an extension to ERP may affect the CSFs and its importance weights.
- Time limitation of this study lead researchers to focus only on the top seven factors. The reset of the proposed factors included in the readiness assessment framework, need additional investigation.
- This research studied the CSFs of BI implementation from a singular perspective (neglect the interrelationship among factors), some future work can study these factors with a consideration of their interrelatedness and interdependence.
- This study highlighted the CSFs on pre-implementation phase of BI where the organization needs to assess its readiness toward BI adoption. Other studies may address the post-implementation phase to assess and leverage the maturity level of BI.
- This study could also serve as a base for other studies which investigates the CSFs of BI or evaluates BI's readiness and maturity level in Gaza environment.

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Appendix A: ICT Startups Critical Success Factors Questionnaire

The Islamic University - Gaza
Deanship of Graduate Studies
Faculty of Commerce
Business Administration Department

الجامعة الإسلاميـــة-غزة
عمادة الدراسات العليـــا
كليـــــــة التجـــــارة
قسـم إدارة الأعمـــــال

Business Intelligence Critical Success Factors Questionnaire

Dear Sir/Madam;

The aim of this questionnaire is to identify and Rank the Critical Success Factors (CSFs) for the **Business Intelligence** in Gaza which mainly contribute to the success of these Systems. This questionnaire is the first step in constructing a model for measuring the level of organizational readiness to adopting Business Intelligence system using the (AHP).

In order to achieve this aim, it is highly appreciated if you kindly filled the questionnaire by giving your own opinions of the importance of each factor, knowing that you can add other important factors in your opinion. The accuracy of the results depends on these valuable data.

This research will help managers to measure the level of their organizational readiness for adopting Business Intelligence system then focus on their weaknesses and critical issues to ensure a successful implementation and achieving the excepted benefits. All of the data collected will be guaranteed confidentially and used ONLY for a scientific purpose which the researcher needs for his MBA degree thesis. Thanks in advance for your contribution to an enhancement of scientific research process in the Gaza Strip.

Supervisor
Dr. Khalid A. Dahleez

Researcher
Bader A. Bader

Brief Description for Critical Success Factors

1- ***Vision & Planning (VP)*:** Organization should have a clear vision about the needs, reasons, and benefits that must be achieved by BI investment. Therefore the organization must align BI to organization vision, business needs and strategies.

2- ***Top Management Support (TMS)*:** BI should be business driven with widespread management support. The commitment and involvement of senior management are imperative since this will help in overcoming resistance and manage the change process.

3- ***Resource Allocation (RA):*** There should be adequate funding, hardware, software and human resources.

4- ***Continuous Improvement Culture (CIC):*** adopting continuous improvement culture and empowering all members within an organization to continuously seek opportunities for improvement is considered a significant factor for success of BI implementation.

5- ***User IT & Analytical Culture (ITC):*** Organizations that are accustomed to the use of information, IT technologies and analytical frameworks do better to lever benefits of BI.

6- ***Cross-Organization Collaboration Culture (CC):*** To succeed at BI, an enterprise must nurture a cross-organizational collaborative culture in which everyone grasps and works toward the strategic vision.

7- ***Appropriate Team Skills (ATS):*** Staff in the client organization and external suppliers should have the appropriate knowledge, skills, and experience.

8- ***Presence of Champion (PC):*** a business-centric champion would view the BI system primarily in strategic and organizational perspectives, as opposed to one who might over-focus on the technical issues. it is always important since he will be able to foresee the organizational challenges.

9- ***Project Management & Methodology (PMM)****:* The BI system should be developed iteratively with strong user involvement, evolving towards an effective application set.

10- ***User Involvement (UI):*** Better user participation in the process of change can lead to better communication of their needs, which in turn can help ensure the successful introduction of the system.

11- ***Change Management (CM):*** successful dealing with changes in business environment and reduced user resistance leads to better user acceptance for adopting the new system.

12- ***Available Data Quality (ADQ):*** Operational data sources should be available. Extract, Transform and Load (ETL) tools should ensure data currency, consistency, and accuracy.

13- ***IT Infrastructure (ITI):*** ITI should be of high degree of organizational fit with the BI hardware and software, and be flexible to adapt the emerging and ever-changing business requirements.

General Information

Name: …….. .

Organization: …….. .

Job Title: …….. .

Jawwal: …….. .

E-Mail: …….. .

Put the sign (X) in the suitable selection:

1- Place of work

☐ Public Sector ☐ Private Sector ☐ Academic Sector

☐ Non-Governmental Organizations NGO‘s ☐ Other, Specify ……

2- Experience

☐ 1 – 3 years ☐ 3-7 years ☐ More than 7 years

3- Education

☐ Bachelor (B.Sc.) ☐ Master (M.Sc.) ☐ Doctorate (Ph.D.)

4- Domain of Work

☐ IT ☐ Management ☐ IT & Management

Business Intelligence Critical Success Factors importance table

Domain	CSFs	Very important (5)	Important (4)	Moderately important (3)	Little important (2)	Not important (1)
Organization	1- Vision & Planning					
	2- Top Management Support					
	3- Resource Allocation					
	4- Continuous Improvement Culture					
	5- User IT Culture					
	6- Collaboration Culture					
Process	7- Team Skills					
	8- Presence Of Champion					
	9- Project Management & Methodology					
	10- User Involvement					
	11- Change Management					
Technology	12- Source-Data quality					
	13- IT Infrastructure					

Other important factors suggested by your opinion:

Domain	Factor Name

Kindly accept our greetings, Thank you

Date: …… **Signature: …….**

Information policies &privacy, External Consultant

Appendix B: Business Intelligence Critical Success Factors Pairwise Comparison Questionnaire

The Islamic University - Gaza
Deanship of Graduate Studies
Faculty of Commerce
Business Administration Department

الجامعة الإسلاميـــة-غزة
عمادة الدارسات العليـــا
كليـــــة التجـــارة
قسـم إدارة الأعمـــال

Business Intelligence Critical Success Factors Pairwise Comparison Questionnaire

Dear Sir/Madam;

The aim of this questionnaire is to make the pairwise comparisons of the critical factors, which were identified in the questionnaire (1) and their importance in the process of prioritizing Critical Success Factors that affect the Business Intelligence in Gaza using The (AHP). The questionnaire includes two types of pairwise comparison:

First: Main domain pairwise comparison and their importance in prioritizing CSFs for BI in Gaza.

Second: CSFs pairwise comparison.

In order to achieve this aim, it is highly appreciated if you kindly fill the questionnaire by giving your own opinions of the comparison of the main domain together, and then to the CSFs under each main domain, the accuracy of the results depends dramatically on these valuable data.

This research will help managers to measure the level of their organizational readiness for adopting Business Intelligence system then focus on their weaknesses and critical issues to ensure a successful implementation and achieving the excepted benefits. All of the data collected will be guaranteed confidentially and used ONLY for a scientific purpose that the researcher needs for his MBA degree thesis. Thanks in advance for your contribution to an enhancement of scientific research process in the Gaza Strip.

Supervisor
Dr. Khalid A. Dahleez

Researcher
Bader A. Bader

Filling instructions:
The numbers from (1 – 9) are used for showing the preference or the importance in the comparison as shown in the following table:

Number	Description
1	The criterion (x) is of the **Same Importance** of criterion (y)
3	The criterion (x) is **Moderate Importance** than criterion (y)
5	The criterion (x) is **Strong or Essential Importance** than criterion (y)
7	The criterion (x) is **Very Strong Importance** than criterion (y)
9	The criterion (x) is **Extreme Importance** than criterion (y)
2, 4, 6, 8	Intermediate values between the two adjacent judgments
Reciprocals	If activity the (x,y) comparison has one of the above numbers assigned to It, then (y,x) comparison has the reciprocal value

Illustrative example:

Domain	Organization	Process	Technology
Organization		1	3
Process			1/5
Technology			

1: means that the importance of **"Organization**" factors is the same as the importance of "**Process"** factors.
3: means that the importance of **"Organization"** factors is **Moderate Importance** than **"Technology**" factors
1/5: means that the importance of **"Technology**" is **Essential Importance** than "**Process"** factors

Note: Shaded cells are filled automatically by the reciprocals of its diagonal counterparts.

Expert Name: ……. .

Domains Pairwise Comparison

Domain	Organization	Process	Technology
Organization			
Process			
Technology			

CSFs Pairwise Comparison

1- Organization factors:

CSFs	Vision & Planning	Top Management Support	Resource Allocation	Continuous Improvement Culture	User IT & Analytical Culture	Collaboration Culture	IT Governance
Vision, & Planning							
Top Management Support							
Resource Allocation							
Continuous Improvement Culture							
User IT & Analytical Culture							
Collaboration Culture							
IT Governance							

2- Process Factors:

CSFs	Appropriate Team Skills	Presence Of Champion	Project Management & Methodology	User Involvement	Change Management
Appropriate Team Skills					
Presence Of Champion					
Project Management & Methodology					
User Involvement					
Change Management					

3- Technology Factors:

CSFs	Available Data Quality	IT Infrastructure
Available Data Quality		
IT Infrastructure		

From Your Opinion, write a suitable guidance points to measure the following factors

CSFs	**Guidance Points**
Vision & Planning	
Top Management support	
Resource Allocation	
Continuous Improvement Culture	
User IT & Analytical Culture	
Cross-Organization Collaboration Culture	
IT Governance	

Appropriate Team Skills	
Presence of Champion	
Project Management & Methodology	
User Involvement	
Change Management	
Available Data Quality	
IT Infrastructure	

Kindly accept our greetings, Thank you

Date: …… **Signature: …….**

Appendix C: Experts background and information

Name	Organization	Job Title	Sector	Experience	Education	Domain of work
Issam Al Zinaty	University College Of Applied Sciences	Software Developer	Private	more than 7 years	Master	IT
Osama Younis	General Personnel Council	General Director	Public	more than 7 years	Bachelor	IT & Management
Mazin El- Khatib	Ministry Of High Education	General Director	Public	more than 7 years	Master	IT & Management
Mohamad Elnadeem	Ministry Telecom. & Information Technology	System Department Manager	Public	more than 7 years	Bachelor	IT & Management
Mohammed El-Matrabie	Ministry Telecom. & Information Technology	Projects & Development Manager	Public	3-7 years	Bachelor	IT & Management
Ismael Hamada	Ministry Telecom. & Information Technology	General Director	Public	more than 7 years	Master	IT & Management
Mohammed A. Ghazal	Collage Of Science Of Technology	Assistant Professor	Academic	more than 7 years	Doctorate	IT & Management
Hani Qusa	University College Of Applied Sciences	Vice Rector For External Relations	Academic	more than 7 years	Doctorate	IT & Management
Alaa Saqer	Free Lancer	Product Manager	Private	more than 7 years	Bachelor	IT & Management
Mohammed Nasman	Ministry Of Transport	General Manager	Public	more than 7 years	Master	IT & Management
Akram Radwan	University College Of Applied Sciences	Head Of Admission & Registration	Private	more than 7 years	Doctorate	IT & Management
Rebhi Soliman Baraka	Islamic University Of Gaza	Dean Of Information Technology Faculty	Academic	more than 7 years	Doctorate	IT & Management
Mohamed D. Almadhoun	University College Of Applied Sciences	Assistant Vice Rector For Administrative Affairs	Private	more than 7 years	Master	IT & Management
Emad O. Kehail	Islamic University Of Gaza	Manager Of IS Department	Private	more than 7 years	Master	IT & Management
Alaa El-Halus	Islamic University Of Gaza	Professor	Academic	more than 7 years	Doctorate	IT
Alaa Eddin Almabhouh	University Of Palestine	Senior Lecturer	Academic	more than 7 years	Doctorate	IT

Appendix D: Assess Readiness Toward Business Intelligence Implementation (Measure Critical Success Factors)

Questionnaire

Dear Employee,

The objective of this survey is to measure the readiness of your organization toward business intelligence implementation by measuring the level of existence of critical success factors, which affect the success of business intelligence implementation. More specifically, this study focuses on identifying the potential enhancements in your organization by identifying strengthens and weaknesses toward implementing business intelligence leading to draw a road map for success implementation at Gaza strip environment .

BI is a collection of integration tools for gathering, storing and analyzing internal or external data then manage the resulting knowledge to present complex and useful information to decision makers. Briefly, the objective of BI is to utilize the available data to support the decision-making process.

This research is a mandatory requirement in the Master of Business Administration (MBA) program and is conducted by the researcher to fulfill the requirement of MBA degree.

The researcher is seeking your kind voluntary participation in this survey by carefully reading and accurately and objectively answering questions in the different paragraphs of this questionnaire. Your participation is essential for the successful completion of this study, which aims to shed light on the role played by Business Intelligence Systems to improve decision-making process by analyze the available internal and external data available providing a comprehensive view of your organization environment.

Be assured that all answers you provide are kept in the strictest confidentiality and will only be used for researching purposes.

MS. Bader Bader

Thank you for your sincere cooperation.

Section 1: Will capture required demographic measures

1- Age

- ☐ Less than 30 years
- ☐ More than 30 to 40 years
- ☐ More than 40 to 50 years
- ☐ More than 50 years

2- Gender

- ☐ Male
- ☐ Female

3- Experience in your organization

- ☐ Less than 5 years
- ☐ More than 5 to 10 years
- ☐ More than 10 to 15 years
- ☐ More than 15 years

4- Job Title

- ☐ Undersecretary
- ☐ Assistant Undersecretary
- ☐ Director General and Their Assistant
- ☐ Director
- ☐ Section manager
- ☐ IT Staff

5- Domain Of Work

- ☐ Information Technology
- ☐ Management Domain
- ☐ Finance Domain
- ☐ Others, ----------

6- IT background:

- ☐ Excellent
- ☐ Very Good
- ☐ Good
- ☐ Poor

Section 2: Vision & Planning

To what extent do you agree or disagree with the following paragraphs in relation to your organization vision and planning process? Please put ✓ to indicate the appropriate number based on the scale: 1–strongly disagree, 7–strongly agree

Vision & Planning								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Your organization has a clear, actionable strategy for our business.							
2	Your organization uses an effective managerial tools and business processes that lead to achieving its strategic goals efficiently.							
3	Your organization measures strategically relevant performance factors.							
4	Your leaders and managers are IT savvy.							
5	Your IT leaders and managers are business-savvy.							
6	Your organization derives its IT strategies from Business Strategies.							
7	Your organization's Information systems strongly support the strategic goals of the organization.							
8	Information from all functional areas is collected during constructing your organization strategic IT plans.							
9	Your organization always identifies a clear vision and mission of any new IS system.							
10	Your organization always defines clear performance expectations for adopting any new IS system.							
11	Your organization always determines how much time it will take to implement any new IS system.							
12	Your organization always identifies all resources needed during any new IS system implementation.							

Section 3: Top Management Support

To what extent do you agree or disagree with the following paragraphs in relation to your organization's top management support for BI adoption? Please put ✓ to indicate the appropriate number based on the scale: 1–strongly disagree, 7–strongly agree

Top Management Support								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Your organization's top management is committed to supporting Information Systems because it's key to competitiveness, growth, and operational excellence.							
2	Your organization's top management willing to help surmount rather than create obstacles for BI system.							
3	Your organization's top management will actively encourage users to use BI.							
4	Your organization's top management believe that organization required data analytics and advanced reports to support decision-making.							
5	Your organization's top management considered BI as a strategic tool to achieve goals of the organization.							
6	Your organization's top management is aware of the benefits of BI.							
7	Your organization's top management generally has realistic and achievable expectations of the BI system.							
8	Your organization's top management believe that adoption of BI will lead to significant improvement in managerial decisions and organization performance.							
9	Your organization's top management willingly assign time and resources to the BI system as it's needed.							

Section 4: Resource Allocation

To what extent do you agree or disagree with the following paragraphs in relation to your organization ability to allocation adequate resources for BI adoption? Please

put ✓ to indicate the appropriate number based on the scale: 1–strongly disagree, 7–strongly agree.

Resource Allocation								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Your organization has the equipment needed to implement the BI system.							
2	Your organization has an enough team members to get the work done for the BI system.							
3	Your organization able to allocate adequately fund for the BI system.							
4	Your organization has the technological resources to adopt the BI system.							
5	Your organization has the time needed to implement and complete the BI system.							
6	Your organization able to solve problems of resource requirement with regard to the BI system.							

Section 5: Continuous Improvement Culture

To what extent do you agree or disagree with the following paragraphs in relation to the availability Continuous Improvement Culture in your organization? Please put ✓ to indicate the appropriate number based on the scale: 1–strongly disagree, 7–strongly agree.

Continuous Improvement Culture								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Your leaders are always looking to improve your organization's core business processes.							
2	Your leaders are adept at driving changes to your organization's core business processes to improve performance.							
3	Your organization is conducting an organizational assessment (performance, costs, and ways the quality of work) regularly in order to improve performance.							

Continuous Improvement Culture								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4	Your organization frequently analyze feedback to inform and make rapid changes that foster adoption of best practice.							
5	Your leaders understand that the best practices mature and are replaced over time.							
6	Your organization apply data-driven improvement techniques such as Six Sigma, and/or TQM.							
7	Your organization has a training and /or educational programs to update employees skills.							

Section 6: IT Governance

To what extent do you agree or disagree with the following paragraphs in relation to IT governance process in your organization? Please put ✓ to indicate the appropriate number based on the scale: 1–strongly disagree, 7–strongly agree.

IT Governance								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	The makers of IT strategies and policies, in your organization, understands the business and IT objectives.							
2	IT strategies and policies are enacted in a flexible manner to suit the changes occurring in the enterprise work environment.							
3	Members from all major areas of your organization are involved in the development of IT strategies and policies.							
4	IT strategies and policies are clearly written so that user can understand them.							
5	IT strategies and policies provide user with extensive guidance regard how to manage IT projects.							
6	IT strategies and policies define objectives and expectations of the use of Information systems in your organization, such as accountability and responsibility.							

IT Governance								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7	IT strategies and policies are accessible by all users impacted by IT projects.							
8	Feedback related to the organization's IT strategies and policies are communicated to the makers of IT strategies.							
9	Your organization has an IT projects evaluation , metrics and performance measurement.							
10	Your organization already has rules for data governance, like data retention policies, and privacy.							
11	Your organization's IT rules can guide the new data-driven solutions as big data, analytics, and BI.							

Section 6: Appropriate Team Skills

To what extent do you agree or disagree with the following paragraphs in relation to availability of the needed skills for BI adoption in the development team in your organization? Please put ✓ to indicate the appropriate number based on the scale: 1–strongly disagree, 7–strongly agree.

Appropriate Team Skills								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Your organization's development team has strong data analysis skills.							
2	Your organization's development team has strong skills in query and reporting.							
3	Your organization's development team has strong systems integration skills.							
4	Your organization's development team are up-to-date with recent advances in IT technologies including data analytics, web programming, and open source platforms.							
5	Your organization's development team able to solve the technical problems arose during the BI implementation.							

Appropriate Team Skills								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6	Your organization's development team has the expertise prior experience in large IT projects like ERP,DW, and BI.							
7	Your organization's development team includes cross-functional business members beside technical members.							
8	Your organization's development team knows how to work with business users to design what they see via BI applications.							
9	If Your organization miss needed skills, your organization obtained it either through hiring new employees or by utilizing consultants.							

Section 6: Available Data Quality

To what extent do you agree or disagree with the following paragraphs in relation to quality of the available data in your organization? Please put ✓ to indicate the appropriate number based on the scale: 1–strongly disagree, 7–strongly agree.

Available Data Quality								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Your organization has an accurate data.							
2	Data available in your organization is up-to-date and regularly updated.							
3	Data available in your organization is highly available and easily accessible.							
4	Data available in your organization is clear and easy to understand.							
5	Data available in your organization is valid and reliable.							
6	Data available in your organization is Strongly relevant to your work.							
7	Data available in your organization provide a comprehensive view of your work.							

Available Data Quality								
#	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8	Data available from different sources in your organization is consistency and seamlessly integrated.							
9	Most of your organization data is stored in the central integrated database.							
10	Your organization has already huge data that can be analyzed to support decisions.							

End of Questionnaire

Appendix E: Assess Readiness Toward Business Intelligence Implementation (Measure Critical Success Factors) –Arabic Version

برنامج الماجستير في إدارة الأعمال
كلية التجارة
الجامعة الإسلامية بغزة

استبيان

عزيزي الموظف:

السلام عليكم ورحمة الله وبركاته

الاستبانة المرفقة عبارة عن أداة لجمع البيانات اللازمة لإجراء دراسة بعنوان

قياس مدى جاهزية المؤسسة لتبني وتطبيق نظم ذكاء الأعمال (قياس العوامل المؤثرة على نجاح المشروع)

الهدف من الاستبانة هو قياس مدى جاهزية مؤسستك لتبني وتطبيق نظام ذكاء الأعمال، وذلك من خلال قياس عوامل النجاح المهمة والتي تؤثر بشكل كبير على نجاح المشروع. وتركز هذه الدراسة على تحديد التحسينات الممكنة داخل مؤسستك عن طريق تحديد نقاط الضعف والقوة اتجاه تطبيق نظام ذكاء الأعمال، مما يسهل في رسم خارطة طريق للوصول إلى تطبيق ناجح للنظام في بيئة قطاع غزة.

يقوم الباحث بإجراء هذه الدراسة والتي تعد متطلب إلزامي لإكمال الأطروحة العلمية لنيل درجة الماجستير في إدارة الأعمال. يشكر الباحث منك مشاركتك الطوعية الكريمة في هذه الدراسة من خلال قراءة الأسئلة في الفقرات المختلفة لهذا الاستبيان بعناية والإجابة عليها بدقة وموضوعية. مشاركتك ضرورية لإنجاح هذه الدراسة التي تهدف إلى تسليط الضوء على الدور الذي تلعبه نظم ذكاء الأعمال في تحسين عملية اتخاذ القرار من خلال تحليل البيانات المتوفرة من داخل وخارج المؤسسة لتوفير صورة شاملة لبيئة العمل.

أود التأكيد على أن جميع الأجوبة التي تقدمها ستعامل بسرية تامة وأنها لن تستخدم إلا لأغراض البحث العلمي فقط.

شكرًا جزيلًا لكم على وقتكم ودعمكم

الباحث: بدر احمد عبد الرحمن بدر
جوال : 0598923826

المشرف: د. خالد عبد دهليز

نظام ذكاء الأعمال

التعريف: هو مجموعة متكاملة من البرمجيات التي تعمل على جمع وتخزين وتحليل البيانات - من داخل أو خارج المؤسسة -ثم إدارة المعرفة الناتجة من عملية التحليل لتقديم المعلومات المفيدة لصناع القرار، باختصار إنها تهدف للاستفادة من البيانات المتوفرة للمؤسسة في دعم عملية اتخاذ القرار.

المحور الأول: البيانات الأولية

الرجاء الإجابة على الأسئلة التالية، ضع علامة ✓ في المربع المجاور للفئة المناسبة

العُمر:

☐ أقل من 30 عام ☐ من 30 إلى 39 ☐ من 40 إلى 49 ☐ 50 عام فأكثر

الجنس:

☐ أنثى ☐ ذكر

عدد سنوات الخدمة: كم عدد السنوات التي عملت بها في مؤسستك

☐ أقل من 5 سنوات ☐ من 6 إلى 10 ☐ من 11 إلى 15 ☐ أكثر من 15 سنة

المسمى الوظيفي: اختر من المسمى الوظيفي الذي تحمله حاليا في مؤسستك

☐ وكيل وزارة ☐ وكيل مساعد ☐ مدير عام ونائبه ☐ مدير دائرة

☐ رئيس قسم ☐ مبرمج ومطور نظم ☐ أخرى: ----------

مجال العمل: اختر مجال العمل الأقرب لطبيعة عملك داخل المؤسسة

☐ تكنولوجيا المعلومات ☐ الجانب الإداري ☐ الجانب المالى ☐ أخرى: ----------

الخلفية عن تكنولوجيا المعلومات: كيف تعد نفسك كمستخدم لتكنولوجيا المعلومات؟

☐ خلفية ممتازة ☐ خلفية جيدة ☐ خلفية متوسطة ☐ خلفية ضعيفة

المحور الثاني: رؤية المؤسسة والتخطيط وإدارة الأعمال

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس وضوح رؤية المؤسسة وجودة عملية التخطيط لإدارة الانظمة التكنولوجية داخل مؤسستك؟ (1-غير موافق بشدة ..... 7 موافق بشدة)

#	البند	1	2	3	4	5	6	7
1	مؤسستك لديها استراتيجيات واضحة وقابلة للتطبيق.							
2	مؤسستك تستخدم طرق وعمليات إدارية تساعدها بتحقيق استراتيجياتها بنجاح وبفعالية.							
3	قيادة مؤسستك على وعي كامل بالعوامل البيئية المؤثرة على أداء العمل، مثل القوانين والمنافسة والابتكار.							
4	لدى المدراء في مؤسستك دراية عالية بتكنولوجيا المعلومات.							
5	لدى مدراء تكنولوجيا المعلومات في مؤسستك دراية عالية في مجال عمل المؤسسة.							
6	الخطط الاستراتيجية لتكنولوجيا المعلومات يتم اشتقاقها من الخطط الاستراتيجية للمؤسسة.							
7	أنظمة المعلومات المتوفرة في المؤسسة تساهم في تحقيق الأهداف الاستراتيجية للمؤسسة بشكل فعال.							
8	أثناء بناء الخطط الاستراتيجية لتكنولوجيا المعلومات يتم تجميع المعلومات وتحليلها من جميع الإدارات والأقسام التابعة للمؤسسة.							
9	قبل تطبيق أي نظام معلومات جديد داخل المؤسسة، يتم تحديد الرؤية والاهداف بشكل واضح وقابل للتطبيق.							
10	قبل تطبيق أي نظام معلومات جديد داخل المؤسسة، يتكون لدى المؤسسة توقعات أداء واضحة للنظام.							
11	قبل تطبيق أي نظام معلومات جديد داخل المؤسسة، تقوم مؤسستك بتحديد الفترة الزمنية اللازمة لبرمجته وتطبيقه.							
12	قبل تطبيق أي نظام معلومات جديد داخل المؤسسة، تقوم مؤسستك بتحديد جميع الموارد اللازمة لتطبيقه.							

المحور الثالث: دعم الإدارة العليا (مدير عام فأعلى)

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى ميل الإدارة العليا لدعم وتبني نظام ذكاء الأعمال داخل مؤسستك؟ (1-غير موافق بشدة ..... 7 موافق بشدة)

#	البند	1	2	3	4	5	6	7
1	تدعم الإدارة العليا في مؤسستك نظم المعلومات لأنها سبب رئيسي في زيادة القدرة التنافسية والنمو والتميز في مجال العمل.							
2	تميل الإدارة العليا في مؤسستك لحل المشاكل وتذليل العقبات أثناء تطبيق انظمة المعلومات المعتمدة حديثا مثل نظام ذكاء الأعمال.							
3	تعمل الإدارة العليا في مؤسستك على تشجيع الموظفين على استخدام أنظمة المعلومات المعتمدة حديثا مثل نظام ذكاء الأعمال.							

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى ميل الإدارة العليا لدعم وتبني نظام ذكاء الأعمال داخل مؤسستك؟ (1-غير موافق بشدة ..... 7 موافق بشدة)								
#	البند	1	2	3	4	5	6	7
4	تؤمن الإدارة العليا في مؤسستك بأن المؤسسة بحاجة لتحليل البيانات والتقارير المتقدمة لتساعد في عملية اتخاذ القرارات.							
5	تنظر الإدارة العليا في مؤسستك إلى نظام ذكاء الأعمال بأنه أداة استراتيجية لتحقيق أهداف المؤسسة.							
6	تدرك الإدارة العليا في مؤسستك الفوائد والمزايا الناتجة من تبني نظام ذكاء الأعمال.							
7	الإدارة العليا في مؤسستك لديها توقعات واقعية وأهداف قابلة للتحقيق نتيجة لتبني نظام ذكاء الأعمال.							
8	تؤمن الإدارة العليا في مؤسستك بأن تبني نظام ذكاء الأعمال سوف يؤدي إلى تحسن كبير في القرارات الإدارية وجودة أداء المؤسسة.							
9	تمتلك الإدارة العليا في مؤسستك الرغبة في توفير الوقت والموارد اللازمة للمؤسسة لتطبيق نظام ذكاء الأعمال.							

المحور الرابع: الموارد المتوفرة في المؤسسة								
إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى قدرة مؤسستك على توفير الموارد اللازمة لتبني نظام ذكاء الأعمال؟ (1-غير موافق بشدة ..... 7 موافق بشدة)								
#	البند	1	2	3	4	5	6	7
1	تمتلك مؤسستك (أو قادرة على توفير) المعدات اللازمة لتبني وتطبيق نظام ذكاء الأعمال.							
2	تمتلك مؤسستك (أو قادرة على توفير) كوادر بشرية كافية لإنجاز العمل واستكمال نظام ذكاء الأعمال.							
3	تمتلك مؤسستك القدرة على توفير تمويل كافي يغطي احتياجات تطبيق نظام ذكاء الأعمال.							
4	تمتلك مؤسستك (أو قادرة على توفير) الموارد التكنولوجية (أجهزة – برامج -... الخ) اللازمة لتبني نظام ذكاء الأعمال.							
5	تمتلك مؤسستك الوقت اللازم لتطبيق واستكمال نظام ذكاء الأعمال.							
6	تمتلك مؤسستك القدرة على معالجة جميع المشاكل المتعلقة بتوفير الموارد اللازمة لتبني نظام ذكاء الأعمال.							

المحور الخامس: ثقافة التطوير المستمر

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى اعتماد مؤسستك على حث وتمكين الموظفين على التطوير المستمر والبحث عن الافكار والابتكار في بيئة العمل؟ (1-غير موافق بشدة ..... 7 موافق بشدة)

#	البند	1	2	3	4	5	6	7
1	تسعى الإدارة بشكل دائم إلى تحسين العمليات الإدارية الأساسية للمؤسسة.							
2	المدراء في مؤسستك بارعون في تحقيق التغييرات اللازمة في آليات العمل الأساسية في المؤسسة لرفع كفاءة الأداء.							
3	تعمل مؤسستك على اجراء التقييم المؤسسي (جودة الأداء والتكاليف وطرق العمل) بشكل دوري بغية تحسين الأداء.							
4	تستفيد مؤسستك من المعلومات المتوفرة عن الأداء في السنوات السابقة (التغذية الراجعة) لتحسين الأداء المستقبلي للعمل.							
5	يدرك المدراء في مؤسستك أن أفضل الممارسات في مجال العمل تختلف باختلاف الوقت، لهذا يسعون للتطوير بشكل مستمر.							
6	تعتمد مؤسستك على تقنيات تحسين الأداء المبنية على البيانات مثل التحسين التدريجي المستمر أو إدارة الجودة الشاملة.							
7	تمتلك مؤسستك برامج تدريبية وتعليمية تهدف لتطوير خبرات ومهارات الموظفين.							

المحور السادس: حوكمة تكنولوجيا المعلومات

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى توفر واعتماد مؤسستك على قوانين وسياسات وأنظمة لحوكمة تكنولوجيا المعلومات لضمان فعاليتها ودعمها لأهداف المؤسسة الاستراتيجية؟ (1-غير موافق بشدة ..... 7 موافق بشدة)

#	البند	1	2	3	4	5	6	7
1	يدرك واضعو القوانين والسياسات لتكنولوجيا المعلومات في مؤسستك الاهداف الإدارية والتكنولوجية للمؤسسة.							
2	توضع الاستراتيجيات والقوانين المتعلقة بتكنولوجيا المعلومات بشكل مرن ليلائم التغيرات الحادثة في بيئة عمل المؤسسة.							
3	يشارك أعضاء من كافة الإدارات الرئيسية في المؤسسة في وضع الاستراتيجيات والقوانين المتعلقة بتكنولوجيا المعلومات.							
4	يتم كتابة استراتيجيات وسياسات تكنولوجيا المعلومات بشكل واضح بحيث يمكن للمستخدم فهمها.							
5	قوانين وسياسات تكنولوجيا المعلومات توفر للموظفين توجيهات واسعة النطاق عن كيفية التعامل مع نظم تكنولوجيا المعلومات المتوفرة في المؤسسة.							

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى توفر واعتماد مؤسستك على قوانين وسياسات وأنظمة لحوكمة تكنولوجيا المعلومات لضمان فعاليتها ودعمها لأهداف المؤسسة الاستراتيجية؟ (1-غير موافق بشدة ..... 7 موافق بشدة)

#	البند	1	2	3	4	5	6	7
6	استراتيجيات وسياسات تكنولوجيا المعلومات تحدد الاهداف والتوقعات من استخدام البرامج التكنولوجية داخل المؤسسة. مثل الأنشطة والمسئوليات المتعلقة بالموظف.							
7	استراتيجيات وسياسات تكنولوجيا المعلومات يمكن الوصول إليها وقراءتها من قبل كافة الموظفين المستخدمين لمشاريع تكنولوجيا المعلومات.							
8	يتم الاستفادة من التغذية الراجعة المتعلقة باستراتيجيات وسياسات تكنولوجيا المعلومات في توجيه قرارات اللجنة التوجيهية لتكنولوجيا المعلومات.							
9	تمتلك مؤسستك آليات لتقييم مشاريع تكنولوجيا المعلومات وقياس الأداء لضمان جودة المنتج.							
10	تمتلك مؤسستك قوانين لحوكمة البيانات من خلال سياسات حفظ البيانات وضمان الخصوصية وصلاحيات الوصول.							
11	تمتلك مؤسستك قوانين تعد دليل واضح تستخدم عند تبني المؤسسة لنظم معلومات ضخمة مثل ذكاء الأعمال.							

المحور السابع: مهارات فريق التطوير والبرمجة

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى توفر المهارات والخبرات التكنولوجية لدي فريق التطوير والبرمجة المتوفر في مؤسستك اللازمة لتبني وتطبيق نظام ذكاء الأعمال؟ (1-غير موافق بشدة ..... 7 موافق بشدة)

#	**البند**	1	2	3	4	5	6	7
1	يمتلك فريق التطوير والبرمجة مهارات عالية في تحليل البيانات.							
2	يمتلك فريق التطوير والبرمجة مهارات عالية في الاستعلامات وبناء التقارير.							
3	يمتلك فريق التطوير والبرمجة مهارات عالية في ربط وتكامل البرامج والنظم.							
4	يمتلك فريق التطوير والبرمجة أحدث المعارف والمهارات والتقنيات التكنولوجية، بما في ذلك تحليل البيانات وبرمجة الويب والبرامج مفتوحة المصدر.							
5	يمتلك فريق التطوير والبرمجة القدرة على حل المشاكل التقنية أثناء تنفيذ نظام ذكاء الأعمال.							
6	تتوفر لدى فريق التطوير والبرمجة خبرة سابقة في نظم تكنولوجيا المعلومات الكبيرة مثل الخدمات الالكترونية وذكاء الأعمال.							

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى توفر المهارات والخبرات التكنولوجية لدي فريق التطوير والبرمجة المتوفر في مؤسستك اللازمة لتبني وتطبيق نظام ذكاء الأعمال؟ (1-غير موافق بشدة ..... 7 موافق بشدة)

#	البند	1	2	3	4	5	6	7
7	يتضمن فريق التطوير أعضاء من الادارات والاقسام المختلفة المستفيدة من النظام بجانب الاعضاء التقنيين(المبرمجين).							
8	يمتلك فريق التطوير القدرة على فهم احتياجات الموظفين وتصميم نظام ذكاء الأعمال لملائمة احتياجاتهم.							
9	تسعى مؤسستك لتعيين موظفين جدد أو الاستعانة بمستشارين خارجيين في حال عدم توفر الخبرات الهامة للمشروع							

المحور الثامن: جودة البيانات المتوفرة للمؤسسة

إلى أي مدى تتفق مع الفقرات التالية الخاصة بقياس مدى جودة البيانات المتوفر في بيئة العمل؟ (1- غير موافق بشدة ..... 7 موافق بشدة)

#	البند	1	2	3	4	5	6	7
1	تتسم البيانات المتوفرة في مؤسستك بالدقة العالية.							
2	يتم تحديث البيانات المتوفرة في مؤسستك بشكل مستمر ومنتظم.							
3	يمكن الوصول للبيانات المتوفرة في مؤسستك بسهولة وهي متاحة على مدار الساعة.							
4	تتسم البيانات المتوفرة في مؤسستك بالوضوح وسهلة الفهم.							
5	تتسم البيانات المتوفرة في مؤسستك بالموثوقية ويمكن الاعتماد عليها.							
6	تتسم البيانات المتوفرة في مؤسستك ذات صلة وعلاقة وثيقة بطبيعة عملك.							
7	البيانات المتوفرة في مؤسستك متكاملة وتزودك بنظرة شاملة عن عملك.							
8	تتسم البيانات المتوفرة من مصادر مختلفة في مؤسستك (مصادر داخلية وخارجية) بالاتساق والتناغم ويسهل دمجها.							
9	يتم تخزين معظم البيانات المتوفرة للمؤسسة في قاعدة بيانات مركزية ومتكاملة.							
10	تمتلك مؤسستك بيانات ضخمة (Big Data) يمكن استغلالها وتحليلها لدعم القرارات الإدارية بالمؤسسة.							

انتهى الاستبيان

Appendix F: Questionnaire Evaluation (List of Referees)

#	Name	Title
1.	Dr. Hatem A. Elaydi	Associate Professor, Faculty of Engineering, Islamic University of Gaza.
2	Dr. Mansour M. Alayoubi	Assistant Professor, Business Administration, Palestine Technical College - Deir balah -Gaza.
3	Dr. Nabeel A. Allouh	Human Development Consultant, General Personnel Council – Gaza
4	Dr. Wael Thabet	Assistant Professor, Faculty of Economics and Administrative Sciences, Al-Azhar University
5	Dr. Ramez Bdair	Assistant Professor, Faculty of Economics and Administrative Sciences, Al-Azhar University
6	Dr. Hisham Madi	Assistant Professor, Faculty of Engineering, Islamic University of Gaza.
7	Dr. Khalil Madi	Faculty of Economics and Administrative Sciences, Al-Azhar University
8	Dr. Akram Sammour	Assistant Professor, Faculty of Engineering, Islamic University of Gaza.
9	Dr. Mohammad Ghazal	Assistant Professor, Head of Scientific Research, University College of Science and Technology