UNDERSTANDING THE PERFORMANCE MEASUREMENT OF DATA ANALYTICS-BASED BUSINESS INTELLIGENCE TECHNOLOGY IN FINANCIAL MARKET OF JORDAN

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by

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ASE	Amman Stock Exchange
AVE	Average Variance Extracted
BI	Business Intelligence
BIT	Business Intelligence Technology
BI&A	Business Intelligence and Analytics
CFA	Confirmatory Factor Analysis
CR	Composite Reliability
DQ	Data Quality
DSS	Decision Support Systems
DW	Data Warehouse
DC	Dynamic Capabilities Theory
BDA	Big Data Analytics
EIS	Executive Information Systems
ERP	Enterprises Resources Planning
ETL	Extract, Transform and Load
F^2	Effect Size
FL	Factor Loading
GDP	Gross Domestic Product
GoF	Goodness of Fit
GCI	Global Cybersecurity Index
GEI	Global Entrepreneurship Index
HTMT	Heterotrait-Monotrait Ratio

IoT	Internet of Things
IQ	Information Quality
IS	Information System
ISSM	Information System Success Model
IT	Information Technology
ICT	Information Communications and Technology
JFM	Jordan Financial Market
JSC	Jordan Securities Commission
MICT	Ministry of Information and Communications Technology
MIS	Management Information Systems
MODE	Ministry of Digital Economy and Entrepreneurship
NCSC	National Cybersecurity Centre
OIP	Organizational Information Processing Theory
OLAP	Online Analytical Processing
OLTP	Online Transactional Processing
PLS	Partial Least Squares
Q^2	Predictive Relevance
R^2	Determination Coefficient
RBV	Resource-based View Theory
SEM	Structural Equation Modelling
SPSS	Statistical Package for Social Sciences
SQ	System Quality
SV	Service Quality
TRC	Telecommunications Regulatory Commission
TQ	Training Quality

VIF	Variance Inflation Factor
C_{α}	Cronbach's Alpha

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PEMAHAMAN PENGUKURAN PRESTASI TEKNOLOGI RISIKAN PERNIAGAAN BERASASKAN ANALITIK DATA DALAM PASARAN KEWANGAN JORDAN

ABSTRAK

Kewujudan data raya dan aplikasinya dalam teknologi kecerdasan perniagaan telah menarik banyak perhatian sejak beberapa tahun yang lalu kerana potensi besarnya untuk menghasilkan pelbagai faedah untuk organisasi pada era ekonomi yang dipacu oleh data kini. Sungguhpun syarikat-syarikat yang tersenarai dalam pasaran kewangan di Jordan telah melaburkan jutaan dolar dalam melaksanakan kecerdasan perniagaan berpacukan analisis data, masih wujud kekeliruan dan kekurangan dalam memahami bagaimana syarikat-syarikat tersebut menterjemahkan potensi teknologi-teknologi sedemikian ke dalam nilai organisasi. Sehingga kini, tiada pendekatan yang berkesan untuk para pengurus dan pengamal untuk mengukur faedah-faedah teknologi kecerdasan perniagaan pada peringkat analisis organisasi. Tesis ini bertujuan untuk membantu mengisi jurang penyelidikan ini dan menyediakan model pengukuran bagi faedah-faedah teknologi kecerdasan perniagaan daripada syarikat-syarikat yang tersenarai dalam pasaran kewangan di Jordan. Oleh tu, satu model teoretikal yang berasaskan model DeLone dan McLean telah dibangunkan dalam penyelidikan ini khususnya bagi mengukur faedah-faedah teknologi kecerdasan perniagaan dalam konteks organisasi yang tersenarai dalam pasaran kewangan di Jordan. Model penyelidikan tersebut memformulasikan tiga belas hipotesis yang relevan bagi menyiasat hubungan dalam kalangan lapan konstruk: kualiti sistem; kualiti maklumat; kualiti perkhidmatan; kualiti data; kualiti latihan; faedah tanggapan; kepuasan hati pengguna; dan faedah-faedah terhadap organisasi. Model yang dibangunkan tersebut

telah diuji dengan menggunakan data yang dikumpul daripada kaji selidik lapangan keratan rentas yang melibatkan 114 buah syarikat yang tersenarai dalam pasaran kewangan di Jordan. Responden-responden yang terbabit ialah para pengurus yang menggunakan teknik-teknik kecerdasan perniagaan bagi membuat keputusan strategik, taktikal dan operasi di dalam syarikat-syarikat yang tersenarai dalam pasaran kewangan di Jordan. Dapatan-dapatan tersebut mendedahkan kualiti sistem, kualiti maklumat dan kualiti latihan merupakan peramal yang signifikan bagi kepuasan hati pengguna, tetapi tidak pula bagi faedah tanggapan. Kualiti data didapati menjadi peramal yang kuat bagi faedah tanggapan dan kepuasan hati pengguna, manakala kualiti perkhidmatan pula adalah sebaliknya. Pengaruh faedah tanggapan terhadap kepuasan hati pengguna adalah signifikan, dan kedua-dua faktor tersebut secara positif mempengaruhi faedah-faedah terhadap organisasi. Kebaharuan utama daripada penyelidikan ini adalah bertunjangkan pada model berbilang dimensi yang diusulkan dan diuji bagi memberikan gambaran menyeluruh berkenaan faedah-faedah teknologi kecerdasan perniagaan pada peringkat organisasi berdasarkan model DeLone dan McLean. Pokok pangkalnya, penyelidikan ini memberikan suatu sumbangan yang asli kepada bidang keilmuan dan membawa implikasi teoretikal dan praktikal, khususnya dalam konteks negara-negara membangun seperti Jordan.

UNDERSTANDING THE PERFORMANCE MEASUREMENT OF DATA ANALYTICS-BASED BUSINESS INTELLIGENCE TECHNOLOGY IN FINANCIAL MARKET OF JORDAN

ABSTRACT

The notion of big data and its application in business intelligence technology has attracted enormous attention in recent years because of its great potential to generate organizational benefits in this era of data-driven economy. Even though listed firms in Jordan financial market have spent millions of dollars in implementing data analytics-driven business intelligence, there is still confusion and shortfalls in understanding how firms translate the potential of such technologies into organizational value. To date, no effective approach for managers and practitioners to measure business intelligence technology performance at the organizational level of analysis. The purpose of this thesis is to help fill this research gap and provide a measurement model of business intelligence technology benefits in listed firms Jordan's financial market. Thereby, a theoretical model that builds on the DeLone and McLean model was developed in this research specific to measuring business intelligence technology benefits in the organizational context of listed firms at Jordan financial market. The research model formulated thirteen relevant hypotheses to investigate the relationships between among eight constructs: system quality; information quality; service quality; data quality; training quality; perceived benefit; user satisfaction; and organizational benefits. The developed model was tested using data collected in a cross-sectional field survey of 114 listed firms in Jordan financial Market. The responders were managers who use business intelligence techniques for strategic, tactical, and operational decision-making in listed firms at Jordan financial

market. The findings revealed that system quality, information quality, and training quality are significant predictors of user satisfaction, but not of perceived benefit. Data quality was found to be a strong predictor of both perceived benefit and user satisfaction, whereas service quality does not. The influence of perceived benefit on user satisfaction was significant and both factors positively affect organizational benefits. A key novelty of this research stems from proposing and testing a multidimensional model to provide a holistic picture of business intelligence technology benefits at the organizational level based on DeLone and McLean model. In essence, this research forms an original contribution to knowledge and brings theoretical and practical implications, especially in the context of developing countries such as Jordan.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The measurement of Business Intelligence Technology Systems (hereafter BIT) benefit, success, or performance – all terms used interchangeably in the literature – has puzzled practitioners and researchers since its introduction into the business environment. Given this context, the goal of this thesis is to propose a conceptual model that can be used to measure the BIT benefits in the firms setting of listed enterprises in the Jordan financial market. This opening chapter explains the nature of this study. In the next section, the study backdrop highlights the main issues in the business intelligence domain for performing this study. The third part of the chapter provides the research motivation followed in the fourth section by the problem statement to be resolved in this work. The questions and objectives of this study are then presented in the fifth and sixth sections of the chapter. The study significance is outlined in section six, section seven describes the research scope, while section eight defines the main terms in this study. In the end, the present chapter provides a structure for the entire work and chapter conclusion.

1.2 Research Background

Following the development of transaction-processing and operational Information Systems (IS) or Information Technology (IT) applications, decision systems emerged during the 1970s to support managerial decision-making. Over time, several systems have been used to support individual and organizational decision-making processes (Lizama, 2019). Decision support systems have evolved in terms of

philosophy of support, system scale, level of investment, and potential organizational impact. The pace and nature of globalization has accelerated competitiveness on a global scale. That acceleration makes the world of business a battlefield in which the stronger, the more agile and more intelligent companies will prevail. Firms today face constant environmental volatility and change, which results in the availability of an enormous amount of corporate data. To harness the potential of this change, many organizations now strive to transform large volumes of available data into a genuine understanding of business (Phillips-Wren et al., 2021). However, with a large amount of organizational data available in today's digital business world and volatile economy, traditional decision-making and data interpretation methodologies are insufficient and ineffective (Niu et al., 2021). As a result, there is a growing demand for a new generation of technologies and data visualization techniques to aid businesses in data analytics and extracting usable information to optimize company decisions and operations (Chen & Lin, 2021; Lim & Teoh, 2020).

The evolution of BIT as a data-driven business analytical technique was advocated as a frontier of research and development for innovation and productivity (Lateef & Keikhosrokiani, 2022). The umbrella term BIT is widely used to describe IT-based analytics and reporting tools that support managerial decision-making (Arnott et al., 2017). The powerful improvements in capacity and analytic power of BIT permit organizations to achieve a broader community of users than its predecessors making it one of the highest-demanded systems across industries (Arnott, Gao, Lizama, Meredith, & Song, 2019). Furthermore, BIT enables organizations to continuously scan and monitor external and internal environments for threats and opportunities posed by emerging technologies, competitors, markets, suppliers, distributors, customers, and legal issues (Cheng et al., 2020). This system has been

characterized in research as part of a larger class of systems that are designed to reduce uncertainty in the decision-making process (Stjepić et al., 2021). Further, BIT premise centres around effective support of the decision maker by providing data, information, or knowledge to address decisions about problems specific to the individual decision maker's needs which can then be 'rolled up' to support broader organizational level decision-making (Khatibi et al. 2020; Gottfried et al., 2021). A survey conducted by IBM Institute for Business Value and MIT Sloan Management Review reported that firms are increasingly gaining competitive advantage from analytics (58% of the more than 4500 respondents reported competitive value gains from analytics) (Božič & Dimovski, 2019).

A recent report by Qlik-Gartner-2019 has predicted that by 2020, the amount of data and analytics in enterprises would increase at three times the rate of IT experts, which will put pressure on organizations to rethink their organizational skills and expertise (Ahmad et al., 2020). Activity in all economic sectors in developed and developing countries including agriculture, mining, banking, commerce, healthcare, education, publishing, energy conservation and transportation is becoming fast, flexible, and data intensive (Shakya, 2019). Therefore, firms all over the world must continue to upgrade and spend heavily in BIT to remain competitive and survive in the marketplace (Gottfried et al., 2021). According to Business Wire, the global market for BIT, which is estimated at $22.4 billion in the year 2020, is projected to reach a revised size of $34.5 billion by 2027, growing at a CAGR of 6.4% over the period 2020-2027. In another report issued by Markets and Markets, BIT market was expected to be valued at $33.3 billion by 2025. McKinsey survey have shown that managers from worldwide companies view BIT as a high priority for enhancing their organization's performance (Lizama, 2019). An extensive number of prior studies

reported organizational benefits of BIT such as creating economic value by increasing organizational productivity and efficiency (Dedić & Stanier, 2017), and improving competitive advantage (Peters et al., 2016). In addition, analytical information produced by BIT enables organizations to have real-time identification of trends (Fink et al., 2017), creation of new products and services and improvement in product and service quality and functionality (Hou, 2016). Other BIT benefits reported were the effective management, supplier management e.g., purchasing, or inbound logistics, risk management business process management and increased return on sales and investment (Richards et al., 2019; Arefin et al., 2020; Bani-Hani et al., 2018).

Nonetheless, a considerable corpus of research reveals that organizations have failed to realize organizational benefits from BIT as expected (Torres et al., 2018; Villamarín-García, 2020). A study by Gartner Inc. revealed that more than 87% of organizations have been classified as having a low BIT technology maturity (Gartner, 2019). The literature review revealed that most organizations across the world have complained of BIT that is not in accordance with the expected organizational benefits leading to waste of time and resources (Nuseir, 2021; Villamarín-García, 2020; Božič & Dimovski, 2019; Niño et al., 2020; Torres et al., 2018; Torres & Sidorova, 2019; Choi et al., Lee, 2021; Shapouri, 2020). Even large and global firms such as HP, Apple, Cisco, Ericsson, KFC, and Boeing have struggled to properly apply BIT solutions strategies and reap the benefits (Ramakrishnan et al., 2020). For example, Apple's failure to use BIT efficiency in optimizing its customer service and late shipping its products to its retailers while KFC closed branches as it failed to duly manage and proceed with supply chain-relevant information using data analytics. Likewise, Coca-Cola firm encountered problems in reporting processes because of failure access to real-time business data (Shiau et al., 2022). In a survey of executive managers from

large corporations such as American Express, Ford Motor, General Electric, and Johnson and Johnson, 77% of respondents stated that data analytics initiatives continue to be a significant challenge for their own companies (Choi et al., 2022). In emerging economies, Ahmad et al. (2021) set a failure rate of approximately 80% for BIT projects.

There are high-profile examples of BIT failure to enjoy the same benefits gained from its investment in developing countries like Vietnam (Pham et al., 2016), Peru (Gonzales et al., 2015), Bangladesh (Arefin et al., 2020), Pakistan (Iffat et al., 2015), Nepal (Shakya, 2019), South Africa (Mudzana & Maharaj, 2015), Iran (Rezaie et al., 2017), Malaysia (Lim & Teoh, 2020) and Jordan (Masa'deh et al., 2021). In addressing this failure, BIT benefits evaluation emerges as a precondition for increasing the rate of effectiveness in future BIT efforts. Even though much attention has been dedicated to the problem of BIT performance, there is still disagreement about the elements that are most effective in measuring BIT benefits and effectiveness (Mehta et al., 2021; Jeyaraj, 2020). Evidence from BIT benefits research has been mixed, with some studies showing positive impacts of BIT in organizations, while others have shown nil or detrimental impacts (Mbima & Tetteh, 2023; Popovič et al., 2019; Torres & Sidorova, 2019; Torres et al., 2018; Villamarín-García, 2020; Božič & Dimovski, 2019; Huang et al., 2022; Vugec et al., 2020). These puzzling conclusions from prior BIT effectiveness studies may be caused by flaws in existing models, such as i) insufficient or unsuitable measures of success, ii) absence of theoretical foundation of causal and process models of BIT effectiveness, iii) focus on financial performance metrics, iv) questionnaires employed (e.g., invalid measures) or v) gathering data approach (e.g., asking the wrong responders). Therefore, there is a need for a comprehensive BIT benefits evaluation model in an organization. To overcome

this limitation, the researcher has taken these flaws into account in the current attempt at BIT benefits measurement. From this dissection, the organizations' ability to exploit the benefits offered by effective BIT became the key motivator of this thesis. The second research motivation related to a lack of accepted frameworks or methodologies for BIT benefits at the firm level. The last motivation has been identified from a paucity of research to have investigated the issue associated with BIT benefits within developing countries, and Jordan in particular.

This research intends to present a performance evaluation framework for BIT in the organizational context. More specifically, this study proposes a conceptual model that measures BIT benefits by examining the DeLone and McLean model and extending previous work by considering some new variables in the organizational context of firms listed in the Jordan financial market. This research builds upon the DeLone and McLean model (which is discussed in detail later) to evaluate BIT benefits for several reasons. First, it suggests temporary and casual interrelationships between the specified factors (Božič & Dimovski, 2020). Second, it can be applied at multiple levels of analysis depending on the research purpose (Mehta et al., 2021). Third, it allows for evaluating complex benefits systems such as BIT (Soto and Aponcio, 2008). Fourth, it is a holistic taxonomy that proposes that IS success factors is determined by the positive value and effect it has on a whole organization (Al-Okaily et al., 2022). Fifth, the literature stresses that factors that focus on a technical orientation are more likely to achieve better results in benefits measurement (Gavidia et al., 2021). Finally, it received much empirical validation to measure IT from both individual and organizational viewpoints.

1.2.1 Overview of the Jordanian Financial Market

In the early thirties, public shareholding companies such as Arab bank, Jordan tobacco company and Jordan electric power company were set up and their shares were traded long before the setting up of the Jordanian financial market (Jordan Securities Commission [JSC], 2022). Since that time, the Jordanian public has been subscribing and dealing in the shares of these companies. In 1978 there were (66) public shareholding companies (JSC, 2022). The first corporate bond was issued in the early sixties. In the absence of an organized trading market in securities, the dealing thereof was handled by non-specialized offices or, in the so-called literature on financial markets, the unorganized market. An organized Market was a necessity since the number of public shareholding companies increased, the government issuance of public debt instruments expanded, and the successive development plans called for such a market (JSC, 2022). This was followed by considerable efforts and several studies, which resulted in the establishment of the Amman or Jordan financial market (Haddad et al., 2017). The Jordan Financial Market (JFM) began operations as an organized Market in Securities in 1978. Its central role acting as a regulator and as a stock exchange in the capital market is to develop national savings through investing in securities and directing savings to serve the national economy as well as regulating and monitoring the issuance of securities and dealing therein in a manner that ensures the soundness, easiness, and swiftness of such dealing.

In light of globalization and its results in the world, the great progress in the revolution of communication and information and the collapse of barriers between the countries of the world, in addition to the commitment of many countries to apply international standards in various fields, has led to the emergence of major challenges for the countries of the world, especially developing ones to re-evaluate and arrange

conditions under such new conditions and circumstances (JSC, 2022). This has led most of these countries to implement intensive programs to restructure their economies and to carry out legislative and structural reforms to cope with these changes and to realize developments around the world. Jordan, realizing the challenges of this stage from the beginning, committed itself to globalization, to liberalize and to integrate into the global economy. It began taking important steps, the most important of which was the issuance of several economic legislations and the implementation of many procedures and decisions to enhance the economy and the institutions of the country. In February 2017, Amman Stock Exchange (ASE) was established as a public shareholding business wholly controlled by the government with the legal and factual authority to administer the securities, commodities, and derivatives markets inside and beyond Jordan (Amman Stock Exchange [ASE], 2021).

Like other financial markets in developing countries, it witnessed a noticeable decline in its performance indicators and its market capitalization due to the impact of coronavirus Covid-19. The trading volume decreased during the year 2020 to JD1.0 billion, or 33.9% compared to JD1.6 billion for the year 2019. The price index weighted by market capitalization of free float shares has also decreased to 1,657.2 points by the end of 2020, compared to 1,815.2 points marked by the end of 2019, thus being subject to a decrease of 8.7% (ASE, 2021). Regarding the performance indicators, the trading value for the year 2019 decreased by 31.6% compared with the previous year, reaching JD1.6 billion. The firms free float general index decreased by 4.9%, compared to 2018 closing to settle at 1815.2 points. The market capitalization of listed firms at the JFM decreased by 7.5% to JD14.9 billion, representing 49.7% of the Gross Domestic Product (GDP) (ASE, 2019). In 2020, shares of 185 listed companies in JFM were traded in which the prices of 90 companies marked an

increase, while the shares of 87 companies decreased, and the prices of 8 companies remained unchanged. The trading value decreased to JD1049 million or 33.9% compared to 2019 (ASE, 2020). The number of traded shares decreased by 8.4% and the number of executed transactions decreased by 16.3% compared with 2019. It is worth mentioning that the trading value includes block trades executed during 2020, which amounted to JD43.8 million (ASE, 2020).

The number of listed firms on JFM was 171 in the first quarter of 2022 fall into three sectors: financial, service and industry, which are further categorized into 23 sub-sectors. First, banks, insurance, diversified financial services and real estate are classified under the financial sector. Second, health care services, educational services, hotels and tourism, transportation, technology and communication, media, utilities and energy and commercial services are classified under the service sector. Third, pharmaceutical and medical industries, chemical industries, food and beverages, tobacco and cigarettes, mining and extraction industries, engineering and construction, electrical industries textiles, leathers and clothing are classified under the industrial sector. These firms play an important role in contributing a major part to the economy in Jordan (Alshirah et al., 2021). However, these firms have encountered significant difficulties because of financial crises, which have placed their performance in serious jeopardy in terms of insufficient liquidity, reduced returns on equity, and low profitability, resulting in the cessation and suspension of trading in some firms shares (Almarayeh et al., 2022; Alodat et al., 2021). This issue emphasizes the significance of identifying important elements that influence the success of listed firms in JFM because the Jordanian economy depended in the listed firms to provide jobs, support the gross domestic product, reduce the difference in indebtedness, and decrease the country's public debt.

In this respect, these firms can get many benefits from BIT tools to collect, analyse, and present data in a relevant way. For example, when decisions are based on correct facts and insights, they frequently result in superior outcomes and performance. It can also aid in the identification of operational inefficiencies, bottlenecks, and areas where resources can be better deployed. Firms can cut costs, streamline procedures, and enhance overall efficiency by improving operations. It can also detect market trends, customer preferences, and sales patterns. Firms can utilize this data to create more successful marketing strategies, target the correct audience, and launch products or services that are more in line with client wants, resulting in revenue growth. Moreover, BIT assists businesses in reducing wasteful expenditures by finding cost-saving possibilities and areas where spending can be reduced. This has the potential to have a direct impact on profitability and performance. BIT enables businesses to obtain a better understanding of their customers. This comprehension can lead to higher customer engagement, better customer service, and satisfaction. Customers that are satisfied are more likely to stay loyal and make repeat purchases. BIT can assist in more effectively identifying and assessing risks. Firms can respond to possible issues proactively, manage risks, and plan for contingencies to protect their performance and profitability. meanwhile. BIT delivers insights into the most successful marketing and sales methods. This enables businesses to better allocate resources, target the correct audience, and adjust marketing strategies for better outcomes. Based on data-driven insights, BIT enables businesses to build and alter long-term strategies. This enables firms to adjust to changing market conditions while also ensuring that their strategy stays relevant and effective.

1.2.2 Overview of Intelligence Technologies in Jordan

The Information Communications and Technology (ICT) sector in Jordan is one of the fastest growing sectors in Jordan's economy, accounting for 3.8% of gross GDP with total annual revenue exceeding USD 2.3 billion (Ministry of Digital Economy and Entrepreneurship [MODE], 2018). Despite the challenging economic environment, the ICT sector continues to stand as one of Jordan's greatest strengths, witnessing growth of 6% during the pandemic. Digital transformation is a top priority, with a move towards e-government services. Additionally, technological innovation is an area of focus as the country is taking measures to position itself as a regional digital hub. Jordan is considered to have a high rate of entrepreneurship initiatives compared to other countries in the region and enjoys the availability of affordable technical talent, geopolitical stability, good infrastructure, a liberalized telecom sector, proximity to key regional markets, and government support (Telecommunications Regulatory Commission [TRC], 2021). There are more than 900 active companies in the sector that directly employ an estimated 26,000 employees (Jordan Times, 2022). With Jordan's population representing 3% of the MENA region, it constitutes 27% of the region's tech entrepreneurs. The Kingdom now ranks 49th on the Global Entrepreneurship Index (GEI) and has more than 25 business incubators, accelerators, and creative centres. It is estimated that 98% of ICT companies in Jordan are SMEs.

The cybersecurity law was enacted in 2019, providing a blueprint for the country's cyber defence capabilities, including the establishment of a National Cybersecurity Centre (National Cybersecurity Centre [NCSC], 2022). The current local legislative and regulatory system regarding cybersecurity has helped Jordan move up three spots on the Global Cybersecurity Index (GCI), coming in 71st place out of a total of 193 countries (NCSC, 2022). In addition, 5G is currently an area of

focus with the government recently signing agreements with telecom operators to introduce 5G services by 2024. The Jordanian government launched a comprehensive development plan, called Jordan 2025, setting economic, social, and environmental goals aimed at achieving sustainable performance development in public and private sectors (Reboredo & Sowaity, 2022). The Jordanian government recognizes the leading role of intelligent digital technologies such as Artificial Intelligence (AI) applications in the development of a sustainable digital-led economy (MODE, 2020a). To achieve the desired benefit from development in AI, the Jordanian government vision is to harness new technology that based on AI as an essential element to increase the effectiveness and performance of public and private sectors with the aim of developing Jordan's position in the region as a leading country pursuing AI advantages and preventing its potentially negative consequences (MODE, 2020a).

The strategy of AI is also closely related to data, as data is an important and indispensable component in the search, development and implementation of solutions based on AI, as governmental and non-governmental data is considered a valuable economic asset that opens new horizons to complement the national economy with new investments, improve government performance and reduce government spending by using data processing and analysis techniques and deriving insights from them in an accelerated manner. The importance of data analytics has become apparent with the proliferation of big data in various forms and the need to analyse and derive insights from it. Data analytics techniques have evolved rapidly in recent times, especially with the maturity of BIT and the expansion of the use of AI to enable advanced analytics, improve data exploration processes of various kinds, and automate various aspects of data management. These technologies are now capable of providing descriptive,

diagnostic, predictive and directional analytics using solutions with different capabilities that can be applied in different domains.

The advancement of AI has resulted in the expansion of the boundaries of business process and practices, necessitating the use of BIT to optimize corporate decisions and operations (Niu et al., 2021; Arefin et al., 2020). Business intelligence and data analytics play a very important role in improving the organizational performance of Jordanian firms to generate economic stability and sustainability. The adoption of BIT in developing countries such as Jordan is not limited to industries (Al-Okaily et al., 2022). There are a wide variety of industries in the country that have adopted BIT. Some of these industries include banking, communications, services, healthcare, tourism, manufacturing, and education (Alzeaideen, 2019; Daradkeh & Al-Dwairi, 2018; Masa'deh, Obeidat, Maqableh, & Shah, 2021; Al-Eisawi, Serrano, & Koulouri, 2021; Hamad et al., 2020). However, it is interesting to indicate that adoption of BIT in Jordan is still restricted to large organizations such as Jordanian listed firms which include services, manufacturing, and financial firms. This is due to the financial capabilities of these industries and the technical expertise required in the operation of new technologies such as BIT (Al-Okaily et al., 2021). Meanwhile, more than 75 companies' work focus is on utilizing business intelligence and data analysis (Hayajneh & Harb, 2023). Furthermore, in the academic sector, several public and private universities are offering degree programs in the fields of business intelligence and analytics. Thus, it is evident that the presence of BIT in Jordan is not a new phenomenon.

1.3 Problem Statement

The failure of BIT to accomplish desired business benefits or value is a major source of anxiety for enterprises' top management. The most important reason for measuring BIT benefits is to prove that it is worth the investment (Popovič et al., 2010). The literature review revealed that most organizations across the world have complained of BIT that is not in accordance with the expected organizational benefits leading to waste of time and resources (Nuseir, 2021; Villamarín-García, 2020; Božič & Dimovski, 2019; Niño et al., 2020; Torres et al., 2018; Torres & Sidorova, 2019; Choi et al., Lee, 2021; Shapouri, 2020). The big data-driven economy has placed more pressure on firms in Jordan that suffer from low profitability, poor performance and asset quality in a competitive environment. This resulted in the creation of a significant opportunity for BIT usage in various Jordanian business sectors to improve analytical and reporting functions to aid decision-makers in a faster and more reliable manner in a market that is becoming increasingly global and technological (Masa'deh et al., 2021; Al-Eisawi et al., 2020). Despite their substantial investment in BIT, many Jordanian firms have failed to successfully implement it and realize the anticipated benefits of BIT deployment (Masa'deh et al., 2021). This failure produces problems within firms such as waste of resources, time, and costs of opportunity of invested capital, as well as creating a major hurdle for firms to increase the value of their data assets and exploit implemented technology to its full extent (Hayajneh & Harb, 2023). The substantial investments and failure rate of BIT investment have amplified the importance of systematic measurement of BIT benefits at the firm level (Khaddam et al., 2023).

A crucial question that remains unanswered is whether or not BIT is effective in bringing organizational value and benefit. The academic literature provides limited

normative guidance on the most appropriate and advantageous uses of BIT for practitioners seeking to maximize the return on their BIT investments (Paradza & Daramola, 2021). For example, some empirical research in this field that studied the impact of BIT on organizational benefit found a significant impact whereas other researchers cite incidences in which organizations have realized little benefit (Torres et al., 2018; Bhatiasevi & Naglis, 2020; Huang et al., 2022; Vugec et al., 2020). The inconsistency of the results may be due to a lack of agreement among the academic community on how to gauge the organizational benefits of BIT, which can be evaluated using subjective and objective measures, where the subjective indicators capture the perception of the businesses whilst the objective metrics capture the numerical data of a business's financial nature (Huang et al., 2022; Yang et al., 2022; Arefin et al., 2020; Khan et al., 2020). This can be largely attributed to gaps in our theoretical understanding of the mechanisms through which BIT enable organizational benefits (Torres & Sidorova, 2019). Furthermore, BIT research has often been criticized for lack of theoretical grounding resulting in the inconsistent use of IS theoretical constructs, noncomparability across studies and an inability to build on a common theoretical base (Ansari & Ghasemaghaei, 2023). Given this, there is consensus on the need for appropriate evaluation of BIT organizational benefits perspective to help organisations to measure the return on their investments in this system (Magaireah et al., 2017; Farzaneh et al., 2018).

A number of theoretical perspectives have been adopted for BIT organizational outcomes and benefits measurement in the literature (Kamble & Gunasekaran, 2020). For example, organizational information processing theory was commonly used in investigations of the role of BIT in firms which is concerned with human information processing and postulates a relationship between problem space characteristics and

information processing needs (Isik, 2018; Oliveira & Handfield, 2019). However, it has informed several BIT studies that examine the link between BIT and organizational benefits from a decision-making perspective, it does not directly deal with the issue of overall organizational benefits (Torres et al., 2018). Thus, studies grounded in this perspective typically do not extend beyond the benefits of BIT such as improved decision-making. The resource-based view theory of the firm is among the most theoretical perspectives informing BIT research that explicitly includes organizational benefits as a dependent variable (Perdana et al., 2022). It is an organizational-level theory of firm competitive that suggests that resources are heterogeneously distributed across the market and that organizations imbued with resources that are valuable, rare, inimitable, and non-substitutable enjoy competitive benefits (Wamba et al., 2019). However, it is not without criticism as this theory is tautological in nature, because firm value is derived from resources that are themselves valuable. It is also argued that the definition of resources is too broad, making it difficult to adequately operationalize and test the tenets of the theory. In addition, this theory is criticized as a static theory, in which resources are characterized as difficult and expensive to create or to transfer among firms. The most dominant theoretical model used to measure BIT benefits is DeLone and McLean model (Ain et al., 2019). This model conceptualizes BIT benefits or success from six multidimensional and interrelated: system quality, information quality, service quality, system use, user satisfaction, and net benefits (individual and organizational) (DeLone & McLean, 2003).

Early relevant studies used this model to evaluate the BIT benefits (Gonzales & Wareham 2019; Gaardboe et al., 2017; Gonzales et al., 2015; Mudzana & Maharaj, 2015). This study argues that this model is the most promising in BIT benefits measurement for its comprehensiveness, emphasis on quality, user-centric approach,

focus on individual and organizational benefits, adaptability, empirical validation, and practical application (Božič & Dimovski, 2020; Madhala et al., 2022). Nonetheless, past studies are based on the work of DeLone and McLean referred to above which was done to assess the individual benefit and neglect the organizational benefit thus creating an obvious gap in the BIT literature. This is a gap that has been recognized in calls for theoretically grounded research based on DeLone and McLean about BIT benefits at the firm level (Gonzales & Wareham 2019; Gaardboe et al., 2017; Torres et al., 2018). To fill this gap, this research used and extended DeLone and McLean model as a theoretical background to measure BIT organizational benefits. The issue of BIT failure is deemed more challenging because the determinants responsible for BIT success in receiving firm-level benefits are still unknown (Mousavi & Santos, 2021; Torres & Sidorova, 2019). Given the creating the benefits of BIT is a complex and dynamic process involving technical factors and a multidimensional value-creating mechanism (Oesterreich et al., 2022). Therefore, it is crucial for firms to comprehend BIT implementation success factors and thus realize actual benefits. However, there is little information available to assist firms regarding the critical success factors to minimize the risk of BIT failure in the context of Jordan (Jaradat et al., 2022). The literature claims that the most prominent causes of BIT failure in developing countries resulted from technical issues such as poor of system quality, information quality, service quality, data quality, and training quality (Daradkeh & Al-Dwairi, 2018; Jaradat et al., 2022; Nuseir, 2021; Hayajneh & Harb, 2023).

A well-designed and constructed system is a prerequisite to deriving organizational benefits such as cost reduction and enhanced business process efficiency (Akter et al., 2017). Inversely, a system that is not well developed and built is likely to run into occasional function failures, which will be damaging to business

processes and bring about increased costs to the firm (Khan et al., 2022). Poor data quality can result in inaccurate reports and errors in analysis, which can have negative effects on business decisions, thus compromising the system's dependability and credibility (Passlick et al., 2023; Wang et al., 2023). The data must be of sufficient quality and dependability for organizational decision-makers to rely on it to make informed decisions and reports (Trieu, 2023). Equally, poor information quality can have detrimental effects on the success of a BIT, including inaccurate reporting, missed opportunities, quality of decision making, a poor customer experience, and a loss of credibility (Choi et al., 2021). Otherwise, high information content quality can result in substantial organizational outcomes in terms of enhanced business process efficiency, market information support, and effective decision-making (Morales-Serazzi et al. 2023). Likewise, poor service quality can have a significant effect on the performance of BIT and bring business processes to a complete halt (Gonzales & Wareham 2019). A lack of technical competence and responsiveness on the part of the IT supporting unit can result in decreased adoption, decreased productivity, inaccurate or insufficient data, increased costs, and, ultimately, lead to a miserable failure (Torres & Sidorova, 2019). In this situation, firms must prioritize service quality to ensure that users can access and utilize the system effectively, leading to improved decisions and outcomes.

Training quality also represents one of the BIT failure issues identified in the literature (Zheng & Khalid, 2022). It has been observed in several studies that imparting appropriate training to the employees of the firms concerning any new technology is considered a vital condition for a successful BIT solution (Olszak, 2022). The users must have the ability to operate the BIT successfully for which they need to have proper training (Luo, 2023). In failure, the system output will be poor and

inappropriate training for the users will render them incapable of handling the BIT resulting in the adoption of inappropriate data solutions (Hindle & Vidgen, 2018). The perceived benefit of BIT tools influences the organizational benefits gained from their deployment (Haverila et al., 2023). In a nutshell, when users realize the value of BIT, it encourages widespread adoption, resulting in better-informed decisions, increased productivity, and more efficient resource allocation (Verma et al., 2018). The sense of utility also motivates users to actively explore cost-cutting possibilities and adapt promptly to market changes, giving them a competitive advantage (Verma et al., 2017). Furthermore, it increases customer and staff happiness, as well as innovation, all of which contribute to overall organizational performance and success. Plus, user satisfaction with BIT technologies is vital for firms' organizational advantages (Akter et al., 2017). In this case, when users are satisfied with their BIT, it promotes better decision-making, user productivity, and data quality (Wamba et al., 2019). As a result, more adoption, engagement, and proactive problem resolution occur, resulting in cost savings, competitive advantage, and new solutions (Ji-fan Ren et al., 2017). Further, users who are satisfied contribute to increased customer satisfaction, which improves overall organizational benefits and effectiveness.

Even though these factors have been studied individually as highlighted earlier, studies of BIT have achieved inconclusive findings. Meanwhile, most studies that have involved the exploration of these issues have been undertaken within developed countries, while studies conducted within developing countries are rare and limited. To address the existent gap in understanding and knowledge regarding that issue, a theoretical model based on DeLone and McLean model and the extant literature to evaluate BIT benefits in the organizational context of listed firms in JFM was proposed in this research. The decision to choose the listed firms in JFM as a

context for this research has been made for many reasons. First, these firms have high investments in BIT applications. Second, these firms play an important role in contributing a major part to the national economy and are considered the largest firms operating in Jordan. Third, successful implementation of BIT improves these firms' performance and avoids waste of time and resources. Finally, there is no agreed approach or model for BIT benefits evaluation in these firms. On this footing, eight dimensions, which are system quality, information quality, service quality, data quality, training quality, perceived benefit, user satisfaction and organizational benefits were determined for this purpose. This research assumed that quality factors, namely system, information, service, data, and training affect both perceived benefit and user satisfaction. In turn, perceived benefits affect user satisfaction with BIT, and eventually, both perceived benefits and user satisfaction affect organizational benefit of BIT among listed firms in JFM. To the researcher's knowledge, no previous work has empirically tested this issue in a similar manner or context or combined all of the dimensions utilized in this study into a single model. It is believed that the conducting of this investigation in Jordan has the potential to generate substantial findings that can be used to close the identified gaps in this research subject matter and provide recommendations to enhance the performance of these firms which eventually and ultimately boost the national economy.

1.4 Research Questions

To address the aforementioned issues, this research seeks to answer the following questions posed:

1. Do system quality, information quality, service quality, data quality, and training quality influence BIT perceived benefit among listed firms in JFM?

2. Do system quality, information quality, service quality, data quality and training quality influence BIT user satisfaction among listed firms in JFM?

3. Does perceived benefit influence BIT user satisfaction among listed firms in JFM?

4. Do perceived benefit and user satisfaction influence BIT organizational benefits among listed firms in JFM?

1.5 Research Objectives

The main goal of the current research is to measure BIT organizational benefit in the context of listed firms in JFM. To achieve this task, the present research attempts to achieve the following objectives:

1. To examine the influence of system quality, information quality, service quality, data quality, and training quality on BIT perceived benefit among listed firms in JFM.

2. To examine the influence of system quality, information quality, service quality, data quality, and training quality on BIT user satisfaction among listed firms in JFM.

3. To examine the influence of perceived benefit on BIT user satisfaction among listed firms in JFM.

4. To examine the influence of perceived benefit and user satisfaction on BIT organizational benefits among listed firms in JFM.

1.6 Research Scope

The research scope aids in establishing the delimitation to be explored in the study and specifies the parameters within which the study will be operating to make it more manageable and comprehensible to the reader. As recommended by Seddon et al. (1999) it is necessary to have clear answers to the seven questions adopted from Cameron and Whetten (1983) before seeking to evaluate an IS effectiveness or success. To illustrate this study scope, the approach of Cameron and Whetten (1983) has been used in several IS effectiveness studies (Shang & Seddon, 2002; Chang & King, 2005). The left-hand column of Table 1.1 shows these seven questions whereas the right-hand column contains their answers pertinent to this study. In this respect, Cameron and Whetten's (1983) first and second questions are concerned with the domain of activity and the frame employed. This study focuses on years after the business intelligence goes live and consequently focuses on post-implementation effectiveness in Jordanian listed firms that have already adopted it. As a basic requirement, the firms should be those that have already implemented BIT for at least one year to ensure that it has stepped into the post-implementation. This is due to fact that the results of some studies suggest that the full effects of IS for firms do not surface until after a considerable time-lag of at least one year (Zhu et al., 2010; Rouhani et al., 2016). The response to the third question is that the purpose of the evaluation is mainly to evaluate the organizational impact and benefits of BIT post-implementation among Jordanian listed firms.

The fourth question related to *"Against which referent is effectiveness to be judged?"*. This research used and extended the DeLone and McLean model (2003) because it has been tested and proven in the BIT context. As DeLone and McLean (2003) pointed out, because system performance is a multidimensional concept, its measurement should involve measures that are suitable to the research objective and level of analysis. The IS benefits can be evaluated at multiple analysis levels including organizational, consumer, and individual, according to DeLone and McLean (2003). Regarding the fifth and sixth questions, *"What is the level of analysis?"* and *"What types of data are to be used?"*, the answers are level of analysis at the organizational level and subjective data. To realize returns of BIT, mere use is insufficient; it is essential to create an organizational benefit for its implementation to be successful (Popovič et al., 2019). Effective measuring of the organizational benefit of BIT is still challenging for both practitioners and scholars (Al-Okaily et al., 2023). This is because it can be evaluated using subjective data based on users' and managers' views or objective indicators capturing the firm's financial data (Torres & Sidorova, 2019). Given the challenge of obtaining objective data and the intangible nature of BIT benefits, the present investigation relied on subjective data, also known as perceptual data, based on senior managers' perceptions (Arefin et al., 2020; Popovič et al., 2019).

To address the last question "*From whose perspective is effectiveness being judged?*", this paper seeks to develop a BIT benefits model that considers benefits from the point of view of what it calls middle and senior managers. In evaluating the BIT benefits, the researchers determined that the most knowledgeable respondents are managers such as IT and business executives who use BIT for overall organizational decision-making (Işık et al., 2013; Božič, & Dimovski, 2019), as they are regularly

using IS in their tasks and are thus ideally suited in the assessment of IS sucess and / or how it affects their organizations (Migdadi & Abu Zaid, 2016; Ifinedo, 2011).

Table 1.1 Determine Scope of Research

No	Question	Answer
1	What is the domain of activity?	Business intelligence
2	What time frame is employed?	Post-implementation
3	What is the purpose of evaluation?	Organizational benefits
4	Against which referent is effectiveness to be judged?	DeLone and McLean model
5	What is the level of analysis?	Organizational level
6	What types of data are to be used?	Subjective data
7	From whose perspective is effectiveness been judged?	Managers viewpoint

1.7 Research Significance

The measurement of BIT performance has become an emerging and appealing research field as the lack of knowledge regarding the factors of BIT success symbolizes not only an important shortage in the literature but also a significant problem for enterprises. Therefore, it is become necessary to evaluate BIT benefits to provide researchers and practitioners insight into this vital theme. In agreement with Rosemann and Vessey (2008) views, the current research endeavours to be rigorous and applicable to both theory and practice. The next sections outline the theoretical and practical significance in this endeavour.

1.7.1 Theoretical Significance

A critical task of many organizations is measuring BIT benefits to justify its investment, but it remains a challenging task for practitioners and researchers. The BIT success model suggested in this research project contributes to the information systems