A Literature Review Based Prioritisation of the Success Factors of Business Intelligence Systems

Merin Mathew

A dissertation submitted to
Auckland University of Technology
in partial fulfilment of the requirements for the degree of
Master of Business (MBus)

2021

Business Information Systems
Faculty of Business, Economics and Law

Abstract

In present times, organisations around the world use business intelligence (BI) systems for strategic and operational advantages. However, the successful implementation of BI is an increasingly complex endeavour. A coherent understanding and prioritisation of the critical success factors (CSFs) for successful BI implementation is crucial. Even though CSFs for successful BI implementation are studied earlier extensively, not enough emphasis has been given to prioritise these CSFs. The primary objective of this research is to prioritise the CSF themes for BI implementation success.

The prioritisation of the CSF is based on a systematic literature review. Thematic analysis is used for the prioritisation of the CSF themes. Based on the results of the study, an integrated framework is developed that includes the top three prioritised CSFs for six primary industries: namely, public sector, financial services sector, manufacturing companies, Engineering Asset Management organisations (EAMO), BI solutions, and health sector. The findings of this research show that the top three most vital CSFs for the successful BI implementation are data quality, management support, and clear vision and BI strategy. The integrated framework presented in this study has contributed to narrowing the gap by providing the prioritisation of the CSFs for six primary industries. The framework developed from this research would facilitate BI researchers, practitioners, and stakeholders to better comprehend the prioritisation of CSFs responsible for the success of BI implementation.

Table of Contents

List of Figures

List of Tables

List of Appendices

Attestation of Authorship

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning."

Signature: Date: 1 February 2021

Acknowledgements

"Commit to the LORD whatever you do, and your plans will succeed." Proverbs 16:3

First and foremost, I give glory and praise to God Almighty for his infinite mercy, love, and grace throughout my research to complete this dissertation.

I am incredibly grateful to Dr. Ranjan Vaidya, my primary supervisor, for his invaluable guidance, advice, and support during my research. Thank you for all your constructive feedback, despite your hectic schedule of work. I want to extend my sincere thanks and appreciation to Associate Professor Harminder Singh, my supervisory mentor, and Professor Antonio Diaz Andrade, for their exceptional support during my research. My special thanks to Ms. Sue Knox who guided me with the formatting of the dissertation.

Finally, special thanks to my parents, spouse, and kids for their motivation, understanding, love, and prayers. Thank you all for always being there for me. This dissertation would never have been possible without your constant inspiration and moral support.

"But thanks be to God! He gives us the victory through our Lord Jesus Christ." 1 Corinthians 15:57

Chapter 1: Introduction

The current rapidly developing world of business has witnessed numerous advanced breakthroughs in Information and Communication Technology (ICT). Business intelligence (BI), data analytics, and big data have become significant fields of research nowadays (Magaireah, 2019). The effectiveness and quality of data evaluations and decisions are becoming increasingly important for all phases of business (Alabaddi et al., 2020). Hence, information is a strategic organisational resource (Nasab et al., 2015). Large organisations manage their information using BI systems (Mazreati & Radfar, 2017). BI is a comprehensive collection of technologies, applications, and processes that enterprises use to convert their massive raw information into useful knowledge (Adjie Eryadi & Nizar Hidayanto, 2020). BI systems enable enterprises to achieve business success and develop shareholder value and sustainability (Dawson & Van Belle, 2013). BI systems are conceptualised as layered systems that have a data layer that represents the systems that store information (Juan-Verdejo et al., 2014).

Nonetheless, the implementation of a BI system is an intricate endeavour (Presthus et al., 2012). Therefore, Critical Success Factors (CSFs) are the vital ingredients required for obtaining the competitive advantage of organisations and attaining their business objectives (Presthus et al., 2012). A thorough comprehension of the CSFs allows BI shareholders to focus their efforts and limited resources on these vital factors which are responsible for BI implementation success (Yeoh & Koronios, 2010). Within the domain of information management, it becomes crucial to study these key success factors. This thesis seeks to understand and prioritise the CSFs for the BI system implementation within the organisations.

1.1 Chapter Overview

This dissertation seeks to understand and prioritise the CSFs for BI systems within organisations. This chapter is organised into six sections. The first section of the chapter

presents an overview of BI. The second section discusses data warehouse as an essential aspect of a BI system. The third concisely explains CSFs and its importance. The relationship between BI and CSFs is examined in the fourth section. The section on research gap follows this. Finally, an overview of the dissertation structure is discussed.

1.2 Overview of BI

These days, organisations are involved in numerous business activities and hence, gather and generate massive volumes of complex information (Nasab et al., 2015). As stated by Popovič et al. (2012), a better quality of data content results in higher utilisation of data for business purposes. Since raw data is an organisation's most valued resource, a proficient information system such as BI is crucial to gain maximum advantage from the complex data, thus ensuring business success (Mazreati & Radfar, 2017; Nasab et al., 2015). Therefore, BI ensures easier and faster access to the right knowledge at the correct time to make appropriate decisions, thus building stakeholder value and sustainability (Dawson & Van Belle, 2013).

Organisations belonging to diverse industries and sectors use BI systems these days, and BI has immensely gained popularity since the 2000s (Harison, 2012; Nguyen et al., 2018). It is essential to understand BI in-depth to examine the various phases of BI growth; namely, BI 1.0, 2.0, and 3.0 (Olszak, 2016). BI 1.0 is the first phase of BI, which was between the 1970s to 1980s and is associated with EIS (Executive Information Systems), DSS (Decision Support Systems), and Management Information Systems (MIS) (Olszak, 2016). BI 2.0 is the second phase of the evolution of BI, which was between the 1990s and 2005 and is related with the growth of web and internet technology, data mining, Online Analytical Processing (OLAP) techniques, and data warehouses (Olszak, 2016). BI 3.0 is the third phase in BI progress and is linked to intelligent business applications and networks (Olszak, 2016). Cloud computing, augmented analytics, and big data are also gaining significance in present times (Huttunen et al., 2019).

The literature has defined BI in numerous different ways. Table 1 shown below provides a few definitions of BI from existing literature. BI is a broad umbrella notion concerning intelligence which amalgamates IT and business technologies, applications, and tools with the purpose of gathering, integrating, automating, and evaluating data from diverse data sources for better decision-making (Lönnqvist & Pirttimäki, 2006; Presthus et al., 2012; Ranjan, 2008). BI is a continuously developing architecture that ensures easy access to company data, and hence facilitates the organisation to achieve business success through well-informed and strategic decisions (Jamaludin & Mansor, 2011; Moss & Atre, 2003).

Table 1: Summary of the definitions of BI

Study	Definition
Lonnqvist and Pirttimaki (2006)	"BI refers to a managerial philosophy and a tool used to help organisations manage and refine business information with the objective of making more effective business decisions" (p. 32)
Olbrich, Poppelbuß and Niehaves (2012)	"BI is concerned with the effective deployment of organizational practices, processes, and technology to create a knowledge base that supports the organization" (p. 4149)
Presthus et al. (2012)	"BI is a broad category of applications and technologies for gathering, storing, analysing, sharing and providing access to data to help enterprise users make better decisions" (p. 35)
Mazreati and Radfar (2017)	"The business intelligence system is an integrated set of tools, technologies and products that are planned to be used to collect, coordinate, analyse and make data available" (p. 65)
Ranjan (2008)	"BI is the conscious, methodical transformation of data from any and all data sources into new forms to provide information that is business-driven and results-oriented. It will often encompass a mixture of tools, databases, and vendors in order to deliver an infrastructure that not only will deliver the initial solution, but also will incorporate the ability to change with the business and current marketplace." (p. 461)
Jamaludin and Mansor (2011)	BI is "a constantly evolving strategy, vision and architecture that continuously seek to align an organisation's operations and direction with its strategic business goals" (p. 24)
Moss and Atre (2003)	BI system is "an architecture and a collection of integrated operational as well as decision-support applications and databases that provide the business community easy access to business data" (p. 4)

Note. Adapted from Olszak, C. M. (2016). Toward better understanding and use of Business Intelligence in organizations. *Information Systems Management, 33(2),* 105-123.

1.2.1 Advantages of BI

BI makes data accessible for making improved, insightful, and strategic business decisions and for reporting in a useful manner to maximise business success. BI revolutionises a data-reactive business environment to a proactive one (Ranjan, 2008). An intelligent BI system, therefore, facilitates users and enterprises to lower the response time, recognise opportunities and risks, and reduce costs (Presthus et al., 2012). Thus, BI systems improve an organisation's business opportunities, practices, performance, and transparency (Magaireah, 2019; Olszak & Ziemba, 2012). Furthermore, BI systems ensure longstanding stability, competitive market advantage, and the achievement of business goals (Pham et al., 2016; Presthus et al., 2012). BI system implementation boosts profitability and productivity by preventing process duplication and increasing the efficiency of processes (Adjie Eryadi & Nizar Hidayanto, 2020; Magaireah, 2019). Moreover, BI provides valuable insights into customer-related aspects and the internal operations and state of affairs of the enterprise (Jamaludin & Mansor, 2011).

1.2.2 Architecture of BI

BI systems utilise two kinds of tools; namely, database management tools to evaluate massive operational databases, and competitive intelligence tools to support companies in decision-making (Sangar & Iahad, 2013). Generally, BI frameworks consist of an architecture which includes three levels; namely, data layer, logic layer, and the presentation layer (Juan-Verdejo et al., 2014). The data layer stores both unstructured and structured information derived from operational systems, whereas the logic layer executes various evaluations on the data (Juan-Verdejo et al., 2014). The access layer or the presentation layer allows BI users to easily access the advanced data that they require (Juan-Verdejo et al., 2014).

1.3 BI and Data Warehousing

BI is conceptualised in forms of three levels; namely, the data level, the analytics level and the presentation level (Juan-Verdejo et al., 2014). The essential component of the data layer is a data warehouse. According to Wixom and Watson (2001), data warehousing is the outcome of technological developments and business requirements. A data warehouse is a collection of physical and shared IT resources which offer the base that empowers current and upcoming business applications (Wixom & Watson, 2001). Therefore, the competence of an ideal data warehouse infrastructure influences the business outcomes positively by providing crucial support to the vital business processes (Wixom & Watson, 2001). Data warehousing has an immense influence on enterprises as it facilitates the transfer of data ownership from operational areas to a centralised unit and moves data access responsibilities from IS employees to end-users (Wixom & Watson, 2001).

Additionally, data warehousing alters the user's task performance because of warehouse data access and modifies business processes (Wixom & Watson, 2001). Thus, data warehousing is a significant part of BI, and there is a crucial link between Data warehouse and BI (Arnott, 2008; Gaardboe & Svarre, 2018; Olszak & Ziemba, 2012). Wixom and Watson (2001) evaluated 7 CSFs of successful data warehousing; namely, champion, management support, team skills, development technology, source systems, user participation, and resources.

1.4 Critical Success Factors (CSFs)

CSFs are the primary activity areas which require a meticulous and constant focus of the senior management to accelerate the achievement of the organisational objectives along with a profitable business and BI system implementation success (Rockart, 1979; Yeoh et al., 2006). Failing to attain satisfactory outcomes in these areas would be a pivotal impediment to realising business goals and success (Rockart, 1979; Yeoh et al., 2006).

Various studies have conversed about CSFs using diverse synonyms such as strategic factors, readiness factors, critical value factors, and key success factors (Magaireah, 2019). The literature provides numerous definitions for CSFs. However, one of the earliest and the most widely quoted definition is stated by Rockart (1979), who explained CSFs as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organisation" (p. 85). CSF is a notion for recognising significant performance goals for the organisation's information technology (IT) and business investments (Peffers et al., 2003). CSFs are most crucial for an establishment's success, and hence, it enables the recognition and prioritisation of strategic systems prerequisites and performance requirements on which the organisation success depends (Naderinejad et al., 2014; Peffers et al., 2003). CSFs prove beneficial for numerous purposes such as comprehension of information requirements, information systems (IS) planning, and performance assessments (Peffers et al., 2003).

Consequently, an understanding of CSFs helps in the better financial management of the BI implementation (Adamala & Cidrin, 2011). Studies suggest that the understanding of CSFs helps in decreasing the obstacles to entry, especially for small-scale enterprises, and protects them from liquidation (Adamala & Cidrin, 2011). CSFs for BI implementation vary from those for other information systems ventures (Adamala & Cidrin, 2011). CSFs are extensively utilised in several disciplines and can vary for each organisation and industry (Magaireah, 2019; Rockart, 1979). Variations in growth phases, strategies, and geographic locations can also result in varied CSFs, even in the same industry or organisation (Pham et al., 2016; Rockart, 1979).

1.5 BI and CSFs

Successful BI implementation is challenging as it requires infrastructural support, employee capacity building and training, licenses, and expensive software applications (Gaardboe et al., 2017; Lautenbach et al., 2017). Furthermore, BI requires extensive

integration of different processes, and varieties of data and systems (Gaardboe et al., 2017; Lautenbach et al., 2017). Hence, managing the complexity associated with BI systems requires an in-depth comprehension of the factors critical for BI success (Grublješič & Jaklič, 2015; Hou, 2012). Therefore, the success of BI implementation is related to the understanding of the CSFs (Zaied et al., 2018b). CSFs have a significant favourable influence on the performance of an enterprise (Zaied et al., 2018b). The understanding of the CSFs also helps the organisations to eliminate the risks related to accruing the benefits of BI (Yeoh & Popovič, 2016). A thorough comprehension of the CSFs allows BI shareholders to focus their efforts and limited resources on these vital factors which would support successful BI implementation (Yeoh & Koronios, 2010). The lack of understanding of CSFs and its effect on BI success may cause the failure of BI implementation (Isik et al., 2011). Moreover, organisations either cannot understand the potential BI benefits or underrate the effort and time needed to collect, clean, and categorise data into a utilisable form (Gaardboe et al., 2017; Lautenbach et al., 2017).

1.6 Research Gap

The prioritisation of CSFs is crucial to determine, consolidate, and assign necessary resources to those determinants which need to be analysed for BI implementation (Nasab et al., 2015). Insights related to CSF prioritisation would enable organisations to manage complications associated with BI implementation in the best manner (Nasab et al., 2015). Furthermore, focusing on these factors would enhance the possibility of implementing a successful and efficient BI system, thus leading to informed decisions, strategic planning, and profitable business for the organisation (Nasab et al., 2015).

Although extensive prior studies regarding CSFs for BI implementation success are present, there are no studies to the knowledge of the researcher that has prioritised the CSFs. Moreover, no research has focussed on the CSF prioritisation for different industries considering all the dimensions such as organisation, process, technology, and

environment. Therefore, the purpose of this dissertation is to identify and evaluate the CSFs responsible for successful BI implementation from existing BI literature and to achieve a coherent insight into the prioritisation of these CSFs across six primary industries.

The above discussions and the identified gap in the existing literature enabled the construction of the research question for this study, that is:

'What is the prioritisation of critical success factors for the implementation of business intelligence systems?'

Since this study aims to answer the research question mentioned above and consequently bridge the research gap, the researcher conducted a systematic literature review of forty-six research studies. The details of the literature review method are presented in the Research Method chapter. There are no ethical concerns that require consideration in this research since this study is based on secondary data resources alone. Furthermore, there are no participants or interviewees involved, and hence, informed consent from them is also not required.

1.7 Dissertation Structure

This dissertation is organised as follows: the second chapter examines the research method utilised to investigate the research question, thus giving direction to this study. A chapter on the background literature on BI and CSFs follows this. The chapter on findings and discussion presents the overall and industry-wise prioritisation of CSFs. Finally, the conclusions are presented.

Chapter 2: Literature Review

2.1 Chapter Overview

This chapter presents the major themes on CSFs discussed by previous researchers. The major themes include organisation and people, BI user satisfaction, technology, process, and environment and culture (Adjie Eryadi & Nizar Hidayanto, 2020; Gaardboe & Svarre, 2018; Mesaros et al., 2016; Nasab et al., 2017; Yeoh & Koronios, 2010). The sub-sections below discuss each of the thematic groups.

2.2 Thematic Groups

2.2.1 Organisation and People

The organisation and people theme is related to the organisational or the human-related element of CSFs. Yeoh and Koronios (2010) recognised that the organisational component of CSFs is composed of a well-established business case and a clear vision, and a committed management sponsorship and support. Similarly, Yeoh, Koronios, et al. (2008) concluded similar factors concerning organisation aspect as Yeoh and Koronios (2010), along with business-driven methodology, project management as additional factors.

Additionally, Olszak and Ziemba (2012) identified similar factors as Yeoh and Koronios (2010). The authors emphasised that from an organisational viewpoint, clear business plan and vision, senior management support, sufficient budget, and proficient BI project leadership are crucial for BI implementation (Olszak & Ziemba, 2012). Likewise, Nasab et al. (2015), as well as Nasab et al. (2017), articulated identical factors responsible for the success of BI implementation in public sector enterprises, in the same way as Yeoh and Koronios (2010). However, the additional factors regarding organisation are comprised of resource allocation and BI strategy (Nasab et al., 2015).

Meanwhile, Eder and Koch (2018) identified that the most significant CSFs in the organisational perspective are management support, project manager and team, BI

organisational unit, user inclusion and acceptance, and definition of standards, terms, and key performance indicators. In contrast, Naderinejad et al. (2014) discovered that the organisation factor is composed of management support and leadership, IT and business coincidence, human and financial resources, along with strategy, goals, and perspective.

In a recent study, Adjie Eryadi and Nizar Hidayanto (2020) evaluated that the most vital factor for the organisational element is top management support followed by a well-established business case and a clear vision, and BI strategic alignment with business goals. Moreover, Lautenbach et al. (2017) believed that top management support is a critical factor relating to the organisation theme in the Technology-Organisation-Environment (TOE) framework, which is accountable for BI implementation success. Furthermore, Zaied et al. (2018a) reviewed the BI literature, in the same way as Adjie Eryadi and Nizar Hidayanto (2020). The authors discovered that the organisational category contained the same factors as mentioned under the corresponding element of Adjie Eryadi and Nizar Hidayanto (2020) along with an added factor; namely, adequate resources (Zaied et al., 2018a). Additionally, Zaied et al. (2018b) identified similar categories and CSFs, as concluded by Zaied et al. (2018a). These factors that play a significant role in successful BI implementation are complex and crucial to any enterprise (Zaied et al., 2018b).

In a current research, Alkraiji (2020) identified that the organisational context CSFs of BI is comprised of decentralised and centralised management, management style, management filter, and compatibility. Moreover, Ravasan and Savoji (2014) scrutinised the organisational component of success factors for BI system implementation to include top management support, business and BI strategy alignment, clear goals for business and system, clear vision, and adequate resources. The authors further explained that the human resources component contained change management, end-user participation, user support and training, and user expectation management (Ravasan & Savoji, 2014).

Additionally, Sangar and Iahad (2013) outlined the CSFs belonging to the managerial dimension that are significant for successful BI system implementation. These factors include top management support, committed stakeholder involvement, well-defined objectives and goals, efficient project management, and user training and education (Sangar & Iahad, 2013).

Furthermore, Grublješič and Jaklič (2015) examined the effect of organisational factors on the acceptance of the BI system. The authors acknowledged that macro-environmental characteristics, social characteristics, organisational factors, technological characteristics, and individual characteristics are the vital organisational factors that play a significant role towards the acceptance of BI systems (Grublješič & Jaklič, 2015).

According to Mesaros et al. (2015), seven factors are responsible for successful BI implementation in organisations. The authors have merged the organisational and people dimensions to discuss similar factors. The authors further stated that the people and organisational dimension is composed of factors such as active involvement of a strong sponsor, organisation-wide solution scope, and tight partnership between professional IT staff and BI users (Mesaros et al., 2015). The authors also included a right group of experienced BI users as additional people/organisational CSF (Mesaros et al., 2016). Also, Mesaros et al. (2016) found that organisation/people, technology, and process dimensions are interdependent on one another.

As stated by Olszak (2016), the factors belonging to the people dimension, that enable establishments to realise BI success include top management leadership and support, and appropriate resources (intellectual and financial). Meanwhile, Gaardboe and Svarre (2018) examined the CSFs responsible for successful BI system implementation and found that the people construct included user expectations, trust, visibility, peer support, attitudes toward change, subjective norms, and technology experience.

2.2.2 BI User Satisfaction

Regarding the BI user satisfaction theme, few researchers have examined the influence that CSFs have on user satisfaction concerning the implementation of BI (Magaireah, 2019). However, Isik et al. (2011) examined the association between user satisfaction and effective BI capabilities. They discovered the CSFs that influence BI user satisfaction, such as information source quality, information quality, system interaction, risk management support, information reliability, flexibility, and user access (Isik et al., 2011). Similarly, Işık et al. (2013) summarised similar CSFs, as mentioned by Isik et al. (2011), concerning the decision environment and BI capabilities. Moreover, Popovič et al. (2012) analysed CSFs accountable for BI system maturity and discovered that the maturity of BI influences data access quality and data content quality, which eventually leads to BI system implementation success. They also concluded that data integration, analytical decision-making, and analytical capabilities are the additional CSFs of BI maturity for successful information utilisation in BI processes (Popovič et al., 2012).

Additionally, Gaardboe et al. (2017) examined the correlation between the CSFs, that is, system quality, data quality, individual impact, intention to use, and user satisfaction. Similarly, Mudzana and Maharaj (2017) concluded identical CSFs for BI implementation success, in the same way as Gaardboe et al. (2017), besides service quality and user quality.

Similarly, Harison (2012) obtained several constructs/categories responsible for BI implementation success; namely, individual impact, data quality, user satisfaction, service quality, intention to use, and system quality. Furthermore, the author found that these constructs are comprised of CSFs such as infrastructure, strategy and purpose, resources, measurement, education/training, information technology, activities/processes, and motivational aids (Harison, 2012). Meanwhile, Hou (2012) investigated the influence that user satisfaction had on individual performance and system

usage concerning BI systems. He found that the CSFs of computing satisfaction of the BI system end-users are timeliness, ease of use, format, accuracy, and contents, regarding individual performance and system usage (Hou, 2012).

2.2.3 Technology

The technology theme is correlated to the technological and technical determinant of CSFs. Yeoh and Koronios (2010) concluded that the technological component of CSFs is composed of sustainable data integrity and quality, along with flexible, business-driven, and scalable technical framework. Similarly, Yeoh, Koronios, et al. (2008) recognised comparable factors regarding technology aspect as Yeoh and Koronios (2010), together with sustainable data quality and governance framework as added factors. However, Eder and Koch (2018) determined that the vital CSFs in the technological perspective are data quality and integrity, and BI system performance.

Similarly, Olszak and Ziemba (2012), Nasab et al. (2015) as well as Nasab et al. (2017) recognised identical technological factors as Yeoh and Koronios (2010). Also, Olszak and Ziemba (2012) discovered that, from a technological viewpoint, the CSFs crucial for successful BI implementation are system integration, system usability, and appropriate tools and technology. Similarly, the additional factors concerning technology included user access, BI team skill, user skill (Nasab et al., 2015), and technical skills (Nasab et al., 2017).

Meanwhile, Mesaros et al. (2015) found that the technological dimension included factors such as BI competence centre, encouraging active utilisation of tools, useful quality source information, and appropriate analytical tools. Additionally, Mesaros et al. (2016) identified that the technology-related dimension involved flexible BI and architectural implements. Similarly, Naderinejad et al. (2014) revealed that the technology factor contained data quality, training and support, suitable technology and infrastructure, application capability, and knowledge and technology transfer speed.

In another study, Gaardboe and Svarre (2018) evaluated forty-three works of BI literature and concluded that the technology construct was the most used, followed by the enterprise structure, people, and task constructs. The authors also discovered that the technology construct is composed of factors mentioned by Gaardboe et al. (2017), together with service quality and net benefit (Gaardboe & Svarre, 2018). Similarly, Schieder and Gluchowski (2011) analysed similar CSFs as those included in the technology construct of Gaardboe and Svarre (2018), in conjunction with organisational maturity, technical sustainability, and functional coverage.

Furthermore, Lautenbach et al. (2017) identified that data-related infrastructure competencies are a vital CSF concerning the technology theme in the TOE framework responsible for BI implementation success. However, Adjie Eryadi and Nizar Hidayanto (2020) recognised that the most significant success factor for the technological element is system reliability, flexibility, and scalability along with data integrity, accuracy, and quality, and integration between BI and other systems. On the other hand, Olszak (2016) concluded that the CSFs related to the metrics and technology dimension included education and training regarding knowledge management and BI, together with business performance measurement.

Additionally, Zaied et al. (2018a) found that the technological category is comprised of similar factors as stated in the equivalent element of Adjie Eryadi and Nizar Hidayanto (2020), accompanied by several additional factors; namely, compatibility, relative advantage, and complexity. However, Sangar and Iahad (2013) investigated the CSFs associated with the technological dimension, which are vital for BI system implementation success. These factors include data integrity and accuracy, system ability to learn, legacy system and IT infrastructure, perceived usefulness, system flexibility and reliability, and software and hardware suitability (Sangar & Iahad, 2013).

On the other hand, Ravasan and Savoji (2014) analysed the success factors for the implementation of BI systems. The authors found that the technical component consisted of data and application management, reliable and adequate technical architecture, data warehouse organisation creation, user-specific requirements and issue identification, and appropriate tool and technology selection (Ravasan & Savoji, 2014). Additionally, the authors outlined factors related to the project management component which is composed of project team management, risk management, IT and business counterpart collaboration, responsive and flexible change management, technical skills, and IT knowledge (Ravasan & Savoji, 2014). In contrast, Khojasteh et al. (2013) scrutinised the effect of technical factors on the successful implementation of BI systems. The authors concluded that BI system integration, appropriate tools and technology, system and data quality, and extensible technical framework (hardware and software) are the most significant technological factors that influence BI systems implementation success (Khojasteh et al., 2013).

2.2.4 Process

The process theme is associated to the process element of CSFs. Following Yeoh and Koronios (2010), the process component of CSFs included business-driven and interactive development approach, user-oriented change management, and balanced team composition and business-centric championship. Yeoh (2011), as well as Yeoh and Popovič (2016), identified similar process-related CSFs, as mentioned by Yeoh and Koronios (2010). Similarly, Pham et al. (2016) as well as Yeoh, Koronios, et al. (2008) concluded identical CSFs as stated by Yeoh and Koronios (2010).

In contrast, Eder and Koch (2018) determined that the crucial CSFs in the process perspective are practice-oriented and lightweight processes along with change management. Similarly, Naderinejad et al. (2014) concluded that the process factor is composed of change management, process documentation, process maturity,

methodology, change management, project team combination, and frequent development model.

Meanwhile, Olszak and Ziemba (2012), Nasab et al. (2015) as well as Nasab et al. (2017) evaluated similar process-related factors as Yeoh and Koronios (2010). Additionally, Olszak and Ziemba (2012) asserted that the significant success factors from a process viewpoint are clear user expectations and altering the BI solution following the user expectations. Furthermore, the added factors related to process consisted of IT and business units coordination, user involvement, and external consultant (Nasab et al., 2017; Nasab et al., 2015).

On the contrary, Adjie Eryadi and Nizar Hidayanto (2020) discovered that the critical factor for the process element is efficient project management accompanied by business champions, change management, and user training and involvement. Moreover, Zaied et al. (2018a) identified that the process category included similar factors in line with the correspondent element of Adjie Eryadi and Nizar Hidayanto (2020), together with added factors such as balanced team composition and skills. Similarly, Olszak (2016) stated that the CSFs belonging to the process dimension are comprised of clearly stated business processes, along with an incentive scheme to motivate information collection and analysis along with knowledge sharing.

2.2.5 Environment and Culture

The environment and culture theme is linked to the environmental and cultural aspect of CSFs. Various studies focussing on BI implementation success mentioned the significance of organisational culture as a vital CSF (Adjie Eryadi & Nizar Hidayanto, 2020; Alkraiji, 2020; Gaardboe & Svarre, 2018; García & Pinzón, 2017; Harison, 2012; Mesaros et al., 2015; Naderinejad et al., 2014; Nasab et al., 2017; Nasab et al., 2015; Sangar & Iahad, 2013).

Meanwhile, Lautenbach et al. (2017) recognised that external market impact is a significant CSF concerning the environment theme in the TOE framework, which is accountable for successful BI implementation. However, Adjie Eryadi and Nizar Hidayanto (2020) concluded that the critical factor for the environmental element is the selection of a vendor, together with competitive pressure. Also, Zaied et al. (2018a), as well as Zaied et al. (2018b), identified similar environmental CSFs, like those recognised by Adjie Eryadi and Nizar Hidayanto (2020). Furthermore, Gaardboe and Svarre (2018) recognised that the task construct points out to task compatibility as the significant success factor that describes BI success.

Furthermore, Gaardboe and Svarre (2018) analysed the CSFs accountable for BI implementation success. The authors determined that the structure construct is comprised of the external environment, management processes, organisational culture, organisational size, third-party interaction, developer skill, IS governance, expert domain knowledge, IT infrastructure, and organisational competence (Gaardboe & Svarre, 2018). Additionally, the authors also included the factors of voluntariness, project management skills, user involvement, development approach, management support, enterprise structure, development of competences, and vision and strategy (Gaardboe & Svarre, 2018).

2.3 Other Categories

This section focusses on the categories that are not covered earlier. Hackney et al. (2015) focussed on the CSFs for the implementation of BI systems regarding system and information quality. The authors found that the CSFs for system quality (SQ) consisted of reliability SQ and integration flexibility SQ meanwhile the CSFs for information quality (IQ) included intrinsic IQ, accessibility IQ, and representational IQ (Hackney et al., 2015). Moreover, Hawking and Sellitto (2010) recognised three aspects of CSFs: namely, temporal, application, and solution. The authors explored various CSFs in ERP

system's perspective that are associated to BI system; such as, source systems, data quality, management support, change management, championship, project scope, team skills, development technology, resources, and user participation (Hawking & Sellitto, 2010).

In a current research, Alkraiji (2020) identified factors of BI that are classified into contexts other than organisational and technological; namely, decision and BI capability. The decision context contained the dubiety of decision making and the kind of decision making, whereas the BI capability context included BI system capability and data capability (Alkraiji, 2020).

Moreover, Adeyelure et al. (2018) categorised various CSFs having the utmost priority during BI implementation into vendor factors, entrepreneur competences factors, compatibility, and security factors. These CSFs include enterprise success, top management support, information security policy, data privacy, internal IT infrastructure, information utilisation, financial resources, and customer needs (Adeyelure et al., 2018).

2.4 CSFs Without Categories

Authors have also analysed the CSFs holistically without linking them to specific categories of factors such as organisation or technology. For instance, Presthus et al. (2012) analysed ten CSFs that confirm successful BI implementation; namely, BI vision incorporating company initiatives, top-management sponsorship and support, project champion, and project planning that includes pilot system approach and incremental delivery. The authors have also included the factors of interactive formal user training and user involvement, balanced team composition and skills, effective communication, data and infrastructure issues, and BI effort timing (Presthus et al., 2012). Additionally, Mazreati and Radfar (2017) categorised several CSFs into integration factors, project planning and management factors, expectations and requirements, and management factors.

Furthermore, Yeoh et al. (2006) concluded that the CSFs for BI implementation success consisted of top-management sponsorship and support, balanced team composition and skills, scope definition and project planning, building incremental change and a pilot system, and presence of a champion. Additionally, the authors have also included the factors of modelling of metadata and dimensional data, interactive and formal user involvement, reliable sources and data quality, adequate and formal user training, and proper selection of technology and development tools (Yeoh et al., 2006). Similarly, Yeoh, Gao, et al. (2008) determined user-oriented change management, committed management championship and support, business vision, planning of a project, team constitution and skills, and infrastructure and data-related issues as the CSFs.

Moreover, Magaireah (2019) concluded seven CSFs significant for successful BI implementation, especially in public sector enterprises; namely, top management support, strategic planning and clear vision, user access and development technology, team skills, user participation, and enterprise structure. On the other hand, Arnott (2008) articulated that the ten CSFs for all phases of BI implementation consisted of extensive management support, informed and committed executive sponsor, adequate resources, suitable technology, appropriate team, and well-defined business objectives. The factors also included development of project scope enterprises, evolutionary management, well-defined systems and information requisites, and effective data management (Arnott, 2008).

Likewise, Dawson and Van Belle (2013) conducted an extensive analysis using Decision Making Trial and Evaluation Laboratory Model (DEMATEL). The authors outlined the significant CSFs for successful implementation of BI systems into the categories of business vision, committed top management support, business champion, business case, data quality, user involvement, and IT impact on business unit strategy (Dawson & Van Belle, 2013). Additionally, García and Pinzón (2017) derived thirteen CSFs that affect

the success of BI systems from the review of prior studies, namely, directives and top management, clear vision and strategy, professional networks, and organisational culture. The CSFs also consisted of business linking, project leader or championship, project management, change management, environment, metrics, talent teams, skills and learning, suitable technologies, useful information, and appropriate resources (García & Pinzón, 2017).

Besides, Adamala and Cidrin (2011) recognised that the CSFs for BI implementation are strategic BI vision, management sponsorship and support, well-established business needs and benefits, business-driven BI initiatives, user training and education, reliable resources, data quality, scope and planning definition, and tools and technology development. Additionally, the factors also included technical framework, BI expertise, external consultants, project schedule, incremental delivery approach adoption, meta-data and dimensional data modelling, BI system usability and functionality, source systems, team skills, adequate resources, and user support, participation, and satisfaction (Adamala & Cidrin, 2011).

In a new study, Alabaddi et al. (2020) identified twenty-one CSFs of BI system implementation success that are identical to the factors described by Zaied et al. (2018a). The authors mentioned a few additional factors such as planning, user analytical and IT culture, continuous improvement culture, IT Infrastructure, resource allocation, user involvement, and team skills (Alabaddi et al., 2020). Furthermore, Eckerson (2005) evaluated the CSFs responsible for successful BI implementation. The author found that the CSFs included extensible and robust platform, integrated BI unit support, rapid development support, actionable information, operational and desktop application integration, and user work method conformity (Eckerson, 2005).

Moreover, Nguyen et al. (2018) described twenty-three CSFs for the success of BI implementation that are similar to the CSFs determined by Nasab et al. (2017).

Additionally, the authors also found several other factors such as BI characteristics factors, BI function factors, information quality factors, organisational maturity, perceived BI usefulness, BI effort timing, and balanced team composition and skill (Nguyen et al., 2018). The CSFs further included effective communication, user training, change management, effective project management, well-defined system and information requirements, adequate resources, and appropriate tools and technology (Nguyen et al., 2018).

Therefore, as understood from the deliberated studies in this chapter, one distinct theme of CSFs consists of discussions that are related to the organisational culture and processes, the information technology used by the organisations, and the organisational factors. Within the technological factors, data quality, presence of technical frameworks and data governance frameworks are essential elements of the success factors (Dawson & Van Belle, 2013; Yeoh & Koronios, 2010; Yeoh & Popovič, 2016). In organisational process, the vital components of CSFs are project management, change management, business champion, and balanced team composition (Nasab et al., 2015; Yeoh et al., 2006; Zaied et al., 2018a). Moreover, the most significant factors for the organisational construct are clear business plan and vision, top management support, and organisational culture (Eder & Koch, 2018; Harison, 2012; Naderinejad et al., 2014; Nasab et al., 2017; Yeoh & Koronios, 2010; Yeoh & Popovič, 2016).

The literature offers a plethora of researches concentrating on the CSFs for BI implementation aimed at empowering stakeholders to utilise their resources and overcome potential implementation issues and hindrances efficiently (Magaireah, 2019; Yeoh & Koronios, 2010). Focussing on these vital success factors would cause a more competitive and successful business both in public and private sectors (Magaireah, 2019; Yeoh & Koronios, 2010). However, the CSFs for the success of BI implementation would change between contexts, and hence the organisations who wish to learn from these

studies should carefully examine these factors and implement the best practices which are best suited to their organisation (Magaireah, 2019; Yeoh & Koronios, 2010).

2.5 Chapter Conclusion

This chapter starts with a review of the key themes deliberated by previous studies focusing on the CSFs for successful BI system implementation. The next chapter investigates the findings together with a detailed discussion concerning the results.

Chapter 3: Research Method

3.1 Chapter Overview

This chapter discusses the research method undertaken to investigate the research question. The researcher divides the chapter into three sections. The first section discusses qualitative research design. The second section presents the methods used for the identification of the literature, the inclusion criteria of the research studies, along with a description of the systematic literature review method. The last section presents an overview of the data analysis method, that is, thematic analysis.

3.2 Qualitative Research Design

This section outlines the research design utilised in this study. Research design enables the fundamental elements to coexist in harmony and facilitates a successful and efficient method of collecting and analysing data, thus providing an effective means to find the solution to the research question (Maxwell, 2012). The researcher's viewpoints regarding how the theory should be utilised affects the preference of the research method; that is, deductive or inductive approach (Gray, 2004).

The two principal research methodologies are quantitative and qualitative (Bernard, 2013). Quantitative research is concerned with gathering and computing data as numbers (Bernard, 2013; Morgan, 2018). In contrast, the purpose of qualitative research is to analyse and communicate perceptions and concepts, discovering the more profound meaning hidden in the data (Bernard, 2013; Morgan, 2018). Qualitative research design is concerned with moving backwards and forward within the various phases and elements of the design to evaluate the interactions and relations between one another (Maxwell, 2012).

In this study, the researcher applies a qualitative approach to investigate the CSFs responsible for the successful implementation of BI systems.

3.3 Identification of Literature

3.3.1 Systematic Literature Review

The primary objective of a critical review or systematic reviews is to crucially scrutinize the previous studies on a comprehensive subject to uncover disagreements, discrepancies, or shortcomings (Paré et al., 2015). Critical review is suitable for this study over other types of literature review such as descriptive review or narrative review because the highlight of a critical review is in its capability to focus on issues, inconsistencies, or sections where the current understanding regarding a subject is unreliable (Paré et al., 2015). Critical reviews can enlighten other academics constructively and reinforce new knowledge by providing a direction and focus to research for future enhancements (Paré et al., 2015).

This research utilises a systematic literature review to answer the research question. A literature review signifies the foundation for research studies and aims at advancing knowledge (Xiao & Watson, 2019). The researcher can understand the extent of studies done to date regarding a topic by assessing existing relevant works and hence recognise limitations and gaps to investigate further (Xiao & Watson, 2019). There are many categories of literature reviews for various purposes, such as critical reviews, extending reviews, testing reviews and descriptive reviews (Xiao & Watson, 2019). Even though literature reviews differ in procedures, Xiao and Watson (2019) evaluated that all reviews adhere to eight steps that start with the research question and conclude with the documentation of the results. Table 2 shown below presents each of these steps, a brief description, and the chapter where each step is discussed in this dissertation:

Table 2: Steps of Literature Review Used in This Dissertation

Systematic literature review steps	Description	Dissertation chapter
Articulating the research question	After the researcher identifies the research gap in the	Chapter 1 – Introduction

	literature, the research question for this dissertation is presented	
Creating and justifying the review procedure	The researcher provides a synopsis of the qualitative research design, systematic literature method, identification of the literature and the data analysis method	Chapter 3 – Research Method
Examining the literature	The researcher analyses the shortlisted studies using thematic analysis	Chapter 2 – Literature Review
Checking for inclusion	The researcher explains the inclusion and exclusion criteria of the research studies	Chapter 3 – Research Method
Quality evaluation	The researcher describes the measures undertaken to ensure the high quality of manuscripts for this research	Chapter 3 – Research Method
Data extraction	The researcher discusses the thematic groups and the CSFs belonging to these groups, that emerged during the literature review	Chapter 2 – Literature Review
Scrutinising and interpreting information	The researcher presents a comprehensive insight of the CSF prioritisation for six primary industries along with an integrated framework	Chapter 4 – Findings and Discussion
Documenting results	The researcher reports the significant findings regarding CSFs and themes of various industry types systematically	Chapter 4 – Findings and Discussion

Note. Adapted from Xiao, Y., & Watson, M. (2019). Guidance on conducting a systematic literature review. *Journal of Planning Education and Research, 39*(1), 93-112.

Other researchers have also suggested similar steps for the systematic literature review method (for example, Nightingale (2009)). A literature review is an iterative process to ensure extraction and analysis of high-quality data, thus leading to new or enhanced knowledge (Xiao & Watson, 2019).

3.3.2 Literature Identification Process

After the researcher articulated the research question, the next step in the systematic literature review is to initiate a review process. The reviewing step involves the identification of the literature. During this step of literature identification, studies related to BI and CSFs were collected. Preference in selection was given to manuscripts specifying one or more industries so that multiple perspectives on CSFs could be obtained. Identification of literature was accomplished by searching the research databases. *Appendix B* includes a list of all the databases searched.

For retrieving relevant papers, the researcher started with the combinations of the keywords “business intelligence” and “critical success factors”. Later, the researcher refined the search by using synonyms for critical such as “effective” and “influential”. After identifying an initial set of studies, the researcher shortlisted them based on the relevance to the research topic. For example, if the title indicated that the document discussed BI and success factors, the details of the document such as the author, year of publication, title, and database were noted in an excel spreadsheet and shortlisted for evaluation later. *Appendix A* consists of the list of articles used for the literature review.

3.3.3 Exclusion and Inclusion Criteria

BI has grown to be a crucial component of the IT department in numerous enterprises from the 2000s by facilitating the process of decision-making (Nguyen et al., 2018). Hence, this critical literature review considers literature published between 2001 and 2020. To ensure the eligibility and quality of the manuscripts for this research; journal articles, books, and book sections were considered as high-quality literature, and hence were incorporated in the literature review. Other manuscripts, such as conference proceedings, thesis, periodicals, and reports were excluded as these are less scrutinised or peer reviewed as compared to journal articles, books, and book sections. Literature written in languages other than English was also excluded. It was also noted that after the

first two-hundred documents from the search results for each search term; the results generated were least relevant to the research topic for this dissertation. Table 3 shown below encapsulates the results of the searches for various search terms:

Table 3: Search Term Results

Search terms	Number of relevant manuscripts found
business intelligence + success factors	32
business intelligence + critical factors	29
business intelligence + critical success factors	27
business intelligence + influential factors	2
business intelligence + effective factors + implementation	18
business intelligence + key factors + implementation	9

At this phase, out of the overall 117 studies identified from the above searches, sixty-two studies were recognised after excluding all duplicate documents. Eight studies out of these sixty-two were again excepted as the full-text versions were not found. Thus, the next phase is comprised of fifty-four studies of which full-text versions were downloaded. Subsequently, the researcher scrutinised the abstracts and conclusions of the shortlisted fifty-four studies to determine its pertinence to the topic of research for this dissertation, that is, prioritisation of the success factors of BI systems. Therefore, three studies were eliminated as they did not contain relevant information that supported the research topic. Thus, fifty-one studies were shortlisted for further evaluation.

Later, out of the selected fifty-one studies, five studies were considered as support documents as even though they did not give a detailed account on the CSFs responsible for successful BI implementation, they contained valuable information related to BI or CSFs. Therefore, the researcher ended up with forty-six studies for the next phase, that is, data analysis.

3.4 Data Analysis Method

The best suitable research method for this study would be thematic analysis as proposed by Braun and Clarke (2006). Thematic analysis is a method of recognising, scrutinising, and providing a detailed description of the patterns of information (themes) which emerge from the literature that is examined (Braun & Clarke, 2006). Moreover, a theme is the crucial crux of the data concerning the research question at issue, that additionally signifies a meaningful pattern in the data that is studied (Braun & Clarke, 2006). Braun and Clarke (2006) summarise the key stages that are involved in the thematic analysis as follows:

- reading, selecting, and condensing data
- assigning relevant data abstracts to initial codes
- categorising initial codes into prospective themes
- evaluating, interpreting, and naming themes
- making the final analysed report in consideration of the research data and question.

Likewise, Braun (2009) explains the six phases of thematic analysis in the same way as Braun and Clarke (2006). Braun and Clarke (2006) recognised various advantages of this method; namely, the flexibility of usage, comparatively easy and a quick method to study and practise, appropriate for encapsulating vital characteristics of a massive data quantity, richly explaining the data set including its differences and similarities, and produces unexpected insights. Thematic analysis offers researchers a methodical and theoretically informed research framework to enhance the rigor and depth of their perception concerning people, processes, and organisations (Boyatzis, 1998; Lin, 2019). Hence, thematic analysis empowers meaning-making and generates coherent and contextualised understanding regarding several characteristics of the research topic (Lin, 2019).

3.4.1 Inductive Thematic Analysis

The researcher implemented an inductive thematic analysis approach to recognise themes from the shortlisted literature. An inductive or 'bottom-up' thematic analysis approach signifies a data-driven process in which concepts, models, and ideas develop from the data (Braun & Clarke, 2006; Gray, 2004). In contrast, deductive or 'top-down' thematic analysis approach shows an analyst-driven process in which the concepts or theoretical models offer a comprehensive analysis of the significant data (Braun & Clarke, 2006; Gray, 2004).

3.4.2 Thematic Analysis

Thematic analysis is a data analysis approach utilised for converting qualitative data into themes which would further result in new or increased knowledge concerning the research question (Braun & Clarke, 2006; Vaismoradi et al., 2013). Furthermore, the researcher engaged in the six stages of thematic data analysis, as mentioned below:

In the first stage, after downloading the full-text versions of the forty-six shortlisted studies, the researcher repeatedly read the selected literature several times to become familiar with the information (Braun, 2019; Vaismoradi & Snelgrove, 2019). Additionally, reading the chosen literature again and again enabled the researcher to get a comprehensive and more in-depth understanding of each manuscript (Braun, 2019; Vaismoradi & Snelgrove, 2019).

As part of the second stage, the researcher discovered initial codes by identifying the dominant ideas from each manuscript, which were significant concerning the research question and highlighted them (Braun, 2019; Vaismoradi et al., 2013).

In the third stage, the initial codes discovered earlier having identical meaning were categorised together. This stage is comprised of an iterative technique to recognise underlying themes from these categories, which provided a meaningful and comprehensive explanation regarding the research question by proceeding front and back

within the manuscripts (Braun, 2019; Vaismoradi & Snelgrove, 2019). Additionally, five new columns; namely, industry, industry type, country, themes, and CSFs, were added into the excel spreadsheet. The researcher entered the identified themes and CSFs wherever applicable in the excel spreadsheet for each of the forty-six studies.

The fourth stage re-evaluated, compared, and filtered all emergent themes and resultant categories to one another with the research question in mind. The excel spreadsheet mentioned above facilitated the reviewing of the categories and themes and thus ensured the accomplishment of recognising coherent but distinct themes (Vaismoradi et al., 2013). Subsequently, the fifth stage described and named the recognised themes utilising a suitable grouping of words (Braun, 2019). Finally, in the sixth stage, the researcher documented the identified themes from the manuscripts using a methodical approach (Braun, 2019).

The Findings and Discussion chapter of this dissertation showcases the identified categories and themes. The researcher has utilised word clouds for a better understanding of the CSFs and themes.

3.5 Chapter Conclusion

The chapter began with an explanation of the research method for this dissertation. Subsequently, literature identification which concisely described the critical literature review method, and the exclusion and inclusion criteria was deliberated. Furthermore, the data analysis method, that is, thematic analysis was described at length. The next chapter presents the background literature on BI and CSFs.

Chapter 4: Findings and Discussion

4.1 Chapter Overview

This chapter aims to present the findings derived from the data analysis of the shortlisted studies using thematic analysis. The detailed steps of the data collection and thematic analysis processes were explained in the Research Method chapter. The researcher summarised the findings from the shortlisted studies into *Appendix A* including the industry type and industry name (as previously mentioned in the Research Method chapter), along with the key observations unique to those studies. The researcher observed that most of the selected studies have directed their data collection for the research design based on the business or industry type that their participants are involved in, whether it was a qualitative or quantitative research method. Several studies included participants from multiple industries whereas others concentrated on respondents from a specific industry alone. Therefore, the research studies analysed in this dissertation discussed the CSFs differently, i.e., some research studies analysed the CSFs from a multiple-industries perspective, while other studies examined the CSFs from a single-industry viewpoint. Hence, the researcher concluded that a single vs multiple industry analysis would be more appropriate and essential to analyse the CSFs in this research. In this chapter, the researcher presents the CSF prioritisation from single and multiple industries standpoints. The chapter is divided into three sections. The first section of the chapter presents the overall findings from the literature review. The second section provides a general analysis of all industries considered in this dissertation. Finally, the researcher discusses the prioritisation of CSFs for six primary industries, and an integrated framework on CSF prioritisation. Furthermore, word clouds are used to enhance the comprehension of CSFs and themes.

4.2 Overall Findings

The researcher made many noteworthy observations during the data analysis. Various studies emphasised that the organisational CSFs are more important than the technological CSFs, even though all dimensions are relevant, based on the research methods that they undertook (Eder & Koch, 2018; Naderinejad et al., 2014; Yeoh et al., 2008; Yeoh & Popovič, 2016). The BI teams in several organisations also believe organisational CSFs are more critical than technological CSFs (Yeoh et al., 2008). Furthermore, many IT experts perceive organisational aspect to be ranked higher than the technological aspect in a subjective point of view (Eder & Koch, 2018). The possibility of realising a successful BI implementation is higher when the organisational requirements are set before the technical needs in an establishment (Yeoh & Popovič, 2016).

Moreover, many studies state that top management support is the most vital CSF (Eder & Koch, 2018; Ravasan & Savoji, 2014; Zaied et al., 2018a). Top management support is also the most recurring CSF across the studies. Committed management sponsorship and support facilitate the allocation of essential resources for providing software, hardware, financial, and human prerequisites (Ravasan & Savoji, 2014). Besides, support from senior management helps to minimise employee resistance in the enterprise (Ravasan & Savoji, 2014).

There is a positive association between successful BI implementation and CSFs (Zaied et al., 2018b). CSFs have a significant favourable influence on the performance of an enterprise (Zaied et al., 2018b). Moreover, the interrelationship between the CSFs is a crucial topic and is of great importance as the understanding of these interactions have a vital role in BI implementation success (Gaardboe et al., 2017; Hackney et al., 2015; Hou, 2012; Isik et al., 2011; Işık et al., 2013; Mudzana & Maharaj, 2017; Popovič et al., 2012; Presthus et al., 2012). CSFs do not function when segregated, and certain CSFs are

considered more critical than others depending on the several aspects such as type of industry, organisation, growth stages, and geographic locations (Pham et al., 2016; Presthus et al., 2012; Rockart, 1979). Another important observation is that numerous studies offer a ranking of the CSFs, which proves significant for ensuring BI implementation success (Adeyelure et al., 2018; Khojasteh et al., 2013; Naderinejad et al., 2014; Nasab et al., 2015; Yeoh et al., 2008).

The researcher found that out of the forty-six studies shortlisted studies, forty studies specified one or more industries within which the research was conducted. However, the remaining six studies were literature reviews or had not mentioned the industries in which the study was done. It was also found that out of the forty-six shortlisted studies, most of the studies investigated the CSFs using a qualitative approach. However, nineteen studies used a quantitative research approach, and five studies used a mixed-method approach. *Appendix C* comprises a list of studies that used a quantitative or mixed-method approach.

4.3Findings Related to:

4.3.1 Single Industries

Firstly, the researcher scrutinised the CSFs of studies focusing on a single industry in an excel spreadsheet. Table 4 shown below consists of eighteen CSFs common across the studies concentrating on a single industry, along with the count for each factor. Hence, Table 4 enabled the prioritisation of the factors based on the number of occurrences of the CSFs. Figure 1 shows the word cloud for the CSFs of studies concerned with only a single industry in this research.

Table 4: CSFs of Studies Dealing With a Single Industry

Single Industry CSFs	Count
Information/data quality	22
Management support	21
Clear strategic BI vision	14
Business-centric championship	14

Strong sponsor	12
Resources (economic, intellectual, and technological)	12
Organisational business culture	11
BI system integration	11
Appropriate technology and tools	11
Well-established business case	10
Change management	10
Balanced team skills and composition	10
User training	8
Project management	6
BI strategy	6
IT infrastructure	6
User satisfaction	4
System quality	3

Figure 1: CSFs Word Cloud (Single Industries)

The findings suggest that, across all industries considered in this research, information/data quality is the most significant CSF for successful BI system implementation, followed by management support. Tables 4, 5, and 6 and Figures 1, 2, and 3 show these findings. These findings contrast to previous research studies that have stated that top management support is the most crucial CSF (Eder & Koch, 2018; Ravasan & Savoji, 2014; Zaied et al., 2018a). Considering the CSFs of researches involving a

single industry, the findings indicate that the succeeding three significant CSFs are clear strategic BI vision, business-centric championship, and a strong sponsor. Table 4 and Figure 1 demonstrate these findings.

4.3.2 Multiple Industries

Secondly, the researcher examined the CSFs of studies dealing with multiple industries in an excel spreadsheet. Table 5 shown below compose of fifteen CSFs common across the studies evaluating multiple industries along with the count for each factor. Thus, Table 5 shown below facilitated prioritising the factors based on the number of occurrences of the CSFs. Figure 2 illustrates the word cloud for the CSFs of researches regarding only multiple industries considered in this study.

Table 5: CSFs of Studies Dealing with Multiple Industries

Multiple Industry CSFs	Count
Information/data quality	7
Management support	6
BI system integration	5
Change management	4
Resources (economic, intellectual, and technological)	4
Clear strategic BI vision	3
Organisational business culture	3
Business-centric championship	3
Appropriate BI technology	3
Balanced team skills and composition	2
User training	2
BI strategy	2
Strong sponsor	1
Project management	1
Well-established business case	1

Figure 2: CSFs Word Cloud (Multiple Industries)

Regarding the CSFs of studies dealing with multiple industries alone, the findings validate that the subsequent three fundamental CSFs are BI system integration, change management, and resources (economic, intellectual, and technological). Table 5 and Figure 2 illustrate these findings.

4.3.3 All Industries

Thirdly, the researcher analysed the total CSFs of all industries considered in this dissertation taken together in an excel spreadsheet. *Appendix D* includes the analysis processes of the CSFs and the themes. Table 6 below presents eighteen CSFs common across all industries deliberated in this dissertation, along with the count for each factor. Therefore, Table 6 shown below helped to prioritise the factors based on the number of occurrences of the CSFs. Figure 3 illustrates the word cloud for the total CSFs of all industries considered in this dissertation.

Table 6: Total CSFs of All Industries

Total CSFs	Count
Information/data quality	32
Management support	31
Clear strategic BI vision	20
Organisational business culture	19
Business-centric championship	18

BI system integration	17
Appropriate technology and tools	17
Change management	16
Strong sponsor	14
Balanced team skills and composition	13
Project management	12
User training	12
BI strategy	9
IT infrastructure	9
Well-established business case	9
Resources (economic, intellectual, and technological)	8
System quality	6
User satisfaction	6

Figure 3: CSFs Word Cloud (All Industries)

In view of the CSFs from studies across all industries considered in this dissertation, the researcher observed that the next three significant CSFs are a clear strategic BI vision, organisational business culture, and business-centric championship. Table 6 and Figure 3 demonstrate these findings.

Another noteworthy observation across Tables 4, 5, and 6 is that the common seven CSFs that appear within the top ten CSFs are information/data quality, management support, clear strategic BI vision, and organisational business culture. The CSFs also include

business-centric championship and BI system integration, along with appropriate tools and technology.

4.4Industry-Wise Prioritisation of CSFs

Having a coherent insight about the CSFs is vital for effective BI system implementation (Yeoh & Koronios, 2010). The chances for BI implementation success are higher when distinctive business requirements of an industrial sector are recognised at the onset and utilised to drive the implementation venture (Yeoh, 2011; Yeoh & Koronios, 2010). Some factors have a more massive effect on BI implementation success compared to others based on the specific market conditions, type of enterprise, and industry (Dawson & Van Belle, 2013; Mesaros et al., 2016). Even though BI has a favourable impact on the process management in an organisation, the conditions for successful BI implementation are distinct for each business (Mesaros et al., 2015). Therefore, CSFs may not be the same for every organisation (Mesaros et al., 2015).

Furthermore, CSFs that are vital in the initial phases of the implementation process may be different from the later phases of implementation (Hawking & Sellitto, 2010). Therefore, as emphasised by Rockart (1979), investigation of CSFs based on specific industries is essential. This dissertation scrutinises the prioritisation of CSFs, which would impact the successful implementation of BI systems for various industries.

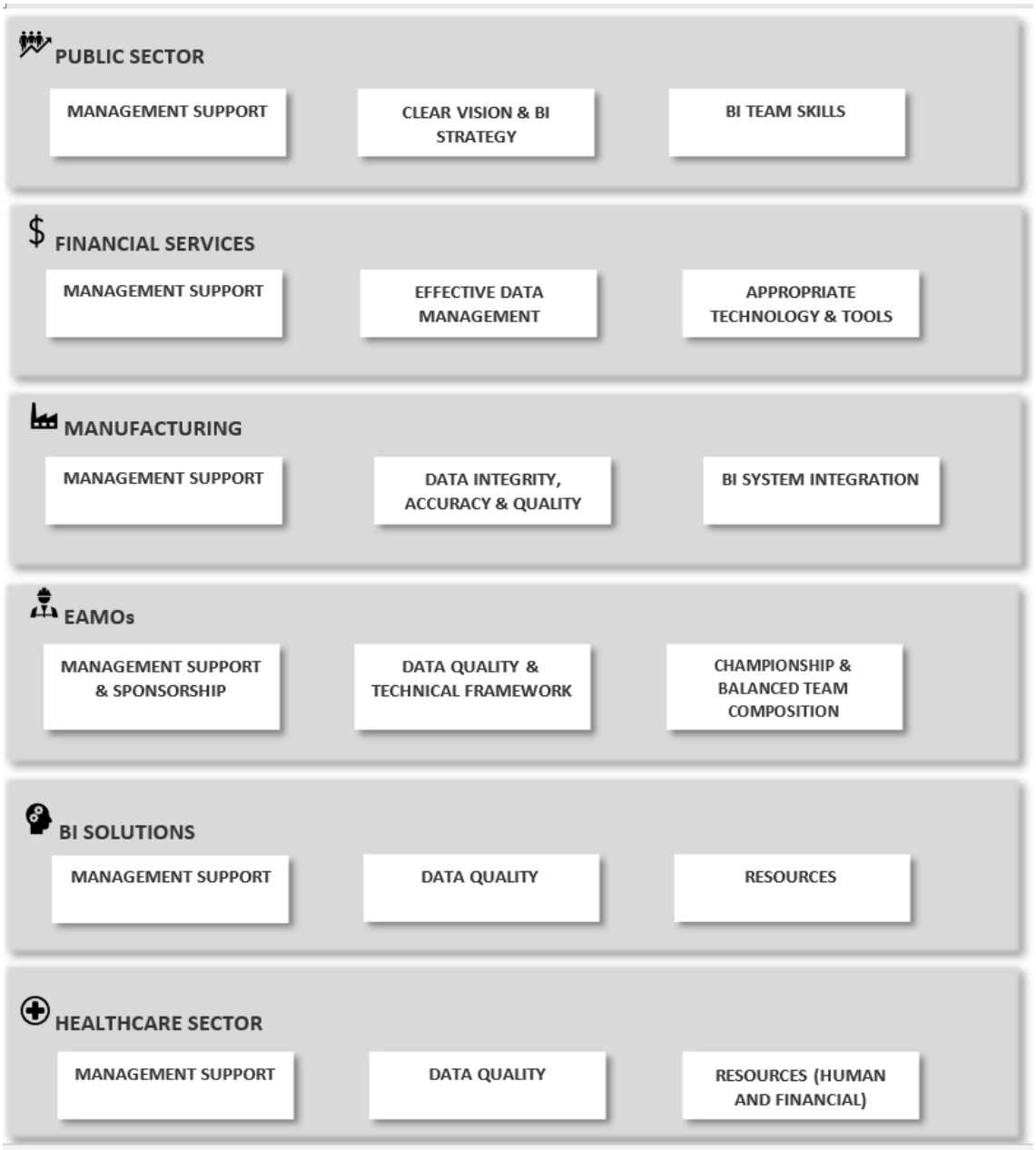
Organisations belonging to different industries implement BI systems (Harison, 2012). The six primary industries that the researcher focussed on in this dissertation are listed below:

1. Public Sector,
2. Financial Services Sector,
3. Manufacturing Companies,
4. Engineering Asset Management Organisations (EAMO),
5. BI Solutions,

6. Health.

These six industries were chosen as primary as they were the most recurring in the shortlisted studies for this research. For each of these industries, the CSFs were shortlisted from the respective articles. This shortlisting produced a comprehensive list of CSFs for each industry. Since some CSFs were common amongst the studies, the most occurring three CSFs were selected within each industry. The process was repeated for each of the six primary industries to determine the four most significant and recurrent CSFs responsible for successful BI implementation. Figure 4 summarises the top three CSFs for each industry.

Figure 4: Integrated Framework



Regarding the public sector organisations, the findings are consistent with those of Magaireah (2019), Nasab et al. (2017) as well as Nasab et al. (2015). The top three significant CSFs for the public sector are continuous management support, clear vision and BI strategy, and BI team skills (Magaireah, 2019; Nasab et al., 2017; Nasab et al., 2015). In contrast, the findings confirm that committed top management support, effective data management capabilities, and appropriate technology and tools are the top three CSFs that need to be focused on during BI system implementation for financial

services organisations (Arnott, 2008). Additionally, these results are in line with the findings of Dawson and Van Belle (2013) and Olszak and Ziemba (2012).

Moreover, when we consider manufacturing companies, top management support, data integrity, accuracy, and quality, and integration between BI and other systems are the most recurring three CSFs for successful BI implementation (Adjie Eryadi & Nizar Hidayanto, 2020). These findings reinforce the work of other researchers in this domain, including those carried out by Eder and Koch (2018), Lautenbach et al. (2017) as well as Popovič et al. (2012), where the majority of participants for the studies were from manufacturing industries. On the other hand, concerning EAMOs, committed management support and sponsorship; flexible, business-driven and scalable technical framework along with sustainable data integrity and quality, and balanced team composition and business-centric championship are the most significant three CSFs for BI implementation success (Yeoh & Koronios, 2010). Additionally, these vital CSFs broadly supports the work of other researchers such as Yeoh (2011) and Yeoh and Popovič (2016).

Furthermore, for the BI solutions industry, the most frequently occurring top three CSFs for BI implementation success comprise management support, data quality, and resources (García & Pinzón, 2017; Hawking & Sellitto, 2010). These results strengthen other research studies in this field, including those done by Mudzana and Maharaj (2017) as well as Mazreati and Radfar (2017), where either all or majority of participants involved in the studies were from BI companies. On the contrary, regarding the healthcare sector, ongoing top management support, data quality, and resources (human and financial) are the three most crucial CSFs accountable for successful BI implementation (Naderinejad et al., 2014; Nguyen et al., 2018). Additionally, these findings corroborate other related studies in the health sector, including those conducted by Gaardboe et al. (2017) and

Alabaddi et al. (2020), where the participants involved in the studies were from the healthcare sector, hospitals, or pharmaceutical companies.

4.5Chapter Conclusion

Apart from analysing the CSFs from the shortlisted research studies across all industries considered in this dissertation, the researcher has also examined the themes that emerged from these studies. Figure 5 illustrates the word cloud for the themes. Table 7 shown below includes the nineteen themes and the count for each theme. Consequently, Table 7 helped prioritise the themes based on their number of occurrences.

Table 7: Themes

Themes	Count
Technology	24
Organisation	21
Process	14
BI User Satisfaction	7
Environment	5
People	4
Culture	4
Information Quality	2
System Quality	2
Structure	1
Task	1
Project Management	1
Service Quality	1
BI Capability	1
Human Resources	1
Individual Impact	1
Compatibility	1
Decision	1
Security	1

Figure 5: Theme Word Cloud

Furthermore, concerning the themes that emerged from all chosen studies, taking together all industries considered in this dissertation, the findings from Table 7 and Figure 5 show that technology is the most significant theme for BI system implementation success, which is followed by organisation. These findings are contrary to prior research studies which have proposed that the organisational CSFs are more significant than the technological CSFs (Eder & Koch, 2018; Naderinejad et al., 2014; Yeoh et al., 2008; Yeoh & Popovič, 2016). When all themes belonging to all industries considered in this dissertation are examined, Table 7 and Figure 5 show that the following three significant themes are process, BI user satisfaction and environment.

In summary, this chapter started with presenting the overall findings derived from the literature review of the shortlisted research studies. Following this, the chapter presented a comprehensive evaluation of all industries. Finally, the researcher provided a coherent understanding of the CSF prioritisation for six primary industries, including an integrated framework on the prioritisation of the CSFs modelled from the findings.

Chapter 5: Conclusion

This chapter provides a summary of the findings and contributions of this study. The previous chapters have discussed the prioritisation of the CSFs for BI implementation, the success for six primary industries, and an integrated framework on the prioritisation of the CSFs. This chapter presents a reflection on the key findings and limitations of this research.

The use of data in organisations is replete with challenges and obstacles. (Naderinejad et al., 2014). BI is a factor that facilities the ideal use of data for improved decision-making, gaining competitive advantage, and building stakeholder value (Dawson & Van Belle, 2013; Presthus et al., 2012). To ensure that the risks and obstacles are solved, it is vital to identify, prioritise, and manage the CSFs responsible for the success of BI implementation (Mesaros et al., 2015). Past studies have discussed the CSFs for successful BI implementation from different viewpoints (Magaireah, 2019). This study adds to this knowledge further as it discusses the industry-wise prioritisation of CSFs. To the author's knowledge, there are no studies that discuss the industry-wise prioritisation of the BI-related CSFs. Furthermore, the prioritisation is also discussed across the various thematic groups such as organisation, process, technology, and environment. Therefore, to answer the proposed research question, the top three most recurrent and significant CSFs for six primary industries were prioritised. The six primary industries that this research concentrated on were public sector, financial services sector, manufacturing companies, Engineering Asset Management organisations (EAMO), BI solutions and health sector. The top three CSFs for the six primary industries are depicted in Figure 4 in chapter 4. These factors influenced the success of BI implementation the most. The findings of this study show that the most significant CSFs include management support, data quality, clear vision and BI strategy, resources, appropriate tools and technology, BI system integration, and balanced team composition and championship.

The findings of this research also revealed that across all industries, information/data quality is the most vital CSF accountable for BI system implementation success, followed by management support. Raw data is the unprocessed and unstructured information, which should be logically structured and assigned to specific environments (Marshall & De la Harpe, 2009). After that, the data can be converted into meaningful knowledge that can be evaluated and used by BI users (Marshall & De la Harpe, 2009). BI provides the setting through which BI stakeholders obtain appropriate, timely, user-friendly, and understandable data (Debbarma et al., 2013; Vasile & Mirela, 2008). The data should also be complete, reliable, valid, and accurate (Debbarma et al., 2013). Decision-making authorities rely on this data to make informed decisions that effectively promote the business strategy of the enterprise to achieve business success and competitive advantage (Marshall & De la Harpe, 2009; Vasile & Mirela, 2008).

Data quality could be enhanced by taking various significant measures such as utilising a logical application to incorporate data mining for data validation purposes, conducting constant data checks, evaluating data architecture and business processes continuously, and creating a team for data quality (Vasile & Mirela, 2008). The underlying determinants that influence information quality are availability, understandability, consistency, and accuracy (Marshall & De la Harpe, 2009). Vendor satisfaction, sales, availability, and waste are the principal actions which are directly influenced by information quality (Marshall & De la Harpe, 2009).

Low data quality may cause unwise decisions which could negatively affect customer and vendor relations and satisfaction, and enterprise reputation, performance, costs, and revenues (Marshall & De la Harpe, 2009). Furthermore, inadequate quality of information and the resultant incorrect judgements could lead to a reduction in internal productivity, decrease in employment reliability and satisfaction for staff members, and unnecessary waste of effort and time of the resources (Debbarma et al., 2013; Marshall & De la Harpe,

2009). Improved data quality could be achieved through user acceptance testing, documentation, and complete data integration (Marshall & De la Harpe, 2009). Along with data integration, data cleansing and data transformation also have critical roles in creating consistent, meaningful data in the ETL (extract, transform and load) processes in a data warehouse setting (Vasile & Mirela, 2008). Moreover, a data profiling technique could be used where there are chances of information quality being compromised (Debbarma et al., 2013). Data profiling would prove beneficial for the enterprise over time, as it would minimise the cost and effort for future maintenance and enhances decisions (Debbarma et al., 2013).

There is a positive correlation between system use and data quality, and also between data quality and system quality (Torres & Sidorova, 2019). Besides, there is a close relation between transparent user interaction with the BI system and data quality (Torres & Sidorova, 2019). Additionally, user experience with the BI system also has a significant implication on information quality (Torres & Sidorova, 2019). The present study adds further to this knowledge as it conforms to the idea that data quality is a CSF across all industries, and therefore should be the focus of BI implementation.

The findings and the integrated framework presented in this study contribute to the existing literature and also assists enterprises in several ways. The framework provides the prioritisation of the CSFs responsible for BI implementation success for six primary industries. Further empirical studies can be conducted to confirm this framework. Additionally, the integrated framework offers BI practitioners and academics with significant comprehensions regarding a prioritised list of the top three CSFs that require continuous focus and attention during BI implementation for six primary industries (Yeoh & Popovič, 2016). The research findings, including the framework, would assist senior management to evaluate and prioritise the CSFs belonging to various thematic groups, thus enhancing the efficiency and success of the BI implementation process.

Furthermore, the findings of this research would facilitate BI stakeholders in enterprises to focus their efforts and limited resources (financial and human) on the industry-specific CSF areas to achieve utmost benefits from its BI funding and the BI system itself (Adjie Eryadi & Nizar Hidayanto, 2020; Hou, 2012; Nasab et al., 2015). Most of the previous studies cited in this dissertation are from BI experts (Grublješič & Jaklič, 2015). Hence the CSFs confirmed by the scholars and practitioners increases the authenticity of the present study.

One limitation of this research is that it focusses only on six primary industries. The integrated framework developed in this research may be expanded to include other industries and sectors. Therefore, further investigation could be carried out to verify if the findings of this research apply to other industries (Hou, 2012). Future empirical studies in other unexplored industries may pave ways to not only understand the priority of CSFs in those industries but also may lead to the discovery of new CSFs for successful BI implementation. The relevance of the findings to different countries should also be investigated as each country has a unique market and culture (Hou, 2012).

Another limitation of the framework is that it does not show the degree of impact that each of the top three CSFs have on each industry considered in chapter 4. Empirical research could be conducted in this direction to determine the magnitude of influence that each CSF has on the success of BI implementation in each industry.

Also, human factors such as gender, age, work tenure, level of education and designation of the BI users influence BI implementation (Gaardboe & Svarre, 2018). Additionally, more studies are needed that discuss the structural aspects (structure and culture) of human factors.

References

Adamala, S., & Cidrin, L. (2011). Key success factors in Business Intelligence. *Journal of Intelligence Studies in Business, 1*(1), 107-127. https://doi.org/10.37380/jisib.v1i1.19

Adeyelure, T. S., Kalema, B. M., & Bwalya, K. J. (2018). Deployment factors for mobile business intelligence in developing countries small and medium enterprises. *African Journal of Science, Technology, Innovation & Development, 10*(6), 715.

Adjie Eryadi, R., & Nizar Hidayanto, A. (2020). Critical Success Factors for Business Intelligence Implementation in an Enterprise Resource Planning System Environment Using DEMATEL: A Case Study at a Cement Manufacture Company in Indonesia. *Journal of Information Technology Management, 12*(1), 67-85.

Alabaddi, Z. A., Rahahleh, A. H., Alali, H., Muflih, M. A., & Sana'a, N. A. N. (2020). The relative importance of the critical success factors of business intelligence (BI) systems implementation in Jordanian pharmaceutical companies. *Journal of Theoretical and Applied Information Technology, 98*(12).

Alkraiji, A. I. (2020). Weighting the challenges to the effectiveness of business intelligence systems in organisations: an empirical study of government organisations in Saudi Arabia. *Journal of Decision Systems*, 1-26. https://doi.org/10.1080/12460125.2020.1770436

Arnott, D. (2008). Success factors for data warehouse and business intelligence systems. *ACIS 2008 Proceedings*, 16.

Bernard, H. R. (2013). *Social research methods : qualitative and quantitative approaches* (Edition 2. ed.). SAGE Publications.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. sage.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101.

Braun, V., Clarke, V., Hayfield, N. & Terry, G. (2019). Thematic Analysis. In P. Liamputtong (Ed.), *Handbook of Research Methods in Health Social Sciences* (pp. 843-860). Springer.

Dawson, L., & Van Belle, J. P. (2013). Critical success factors for business intelligence in the South African financial services sector. *South African Journal of Information Management, 15*(1), 1-12.

Debbarma, N., Nath, G., & Das, H. (2013). Analysis of data quality and performance issues in data warehousing and business intelligence. *International Journal of Computer Applications, 79*(15).

Eckerson, W. W. (2005). The keys to enterprise business intelligence: Critical success factors. *The Data Warehousing Institute. Retrieved October, 2*, 2011.

Eder, F., & Koch, S. (2018). Critical Success Factors for the Implementation of Business Intelligence Systems. *International Journal of Business Intelligence Research, 9*(2), 27.

Gaardboe, R., Nyvang, T., & Sandalgaard, N. (2017). Business intelligence success applied to healthcare information systems. *Procedia computer science, 121*, 483-490.

Gaardboe, R., & Svarre, T. (2018). Business intelligence success factors: A literature. *Journal of Information Technology Management, 29*(1), 1.

García, J. M. V., & Pinzón, B. H. D. (2017). Key success factors to business intelligence solution implementation. *Journal of Intelligence Studies in Business, 7*(1), 48-69. https://doi.org/10.37380/jisib.v7i1.215

Gray, D. E. D. (2004). Theoretical perspectives and research methodologies. In *Doing Research in the Real World* (pp. 15-34). SAGE Publications.

Grublješič, T., & Jaklič, J. (2015). Business Intelligence Acceptance: The Prominence of Organizational Factors. *Information Systems Management, 32*(4), 299-315. https://doi.org/10.1080/10580530.2015.1080000

Hackney, R., Dooley, P., Levvy, Y., & Parrish, J. (2015). Critical value factors in business intelligence systems implementation success: An empirical analysis of system and information quality.

Harison, E. (2012). Critical Success Factors of Business Intelligence System Implementations: Evidence from the Energy Sector. *International Journal of Enterprise Information Systems, 8*(2), 1.

Hawking, P., & Sellitto, C. (2010). Business Intelligence (BI) critical success factors.

Hou, C. K. (2012). Examining the effect of user satisfaction on system usage and individual performance with business intelligence systems: An empirical study of Taiwan's electronics industry. *International Journal of Information Management, 32*(6), 560-573.

Huttunen, J., Jauhiainen, J., Lehti, L., Nylund, A., Martikainen, M., & Lehner, O. M. (2019). Big Data, Cloud Computing and Data Science Applications in Finance and Accounting. *ACRN Oxford Journal of Finance & Risk Perspectives, 8*, 16-30.

Isik, O., Jones, M. C., & Sidorova, A. (2011). Business intelligence (BI) success and the role of BI capabilities. *Intelligent systems in accounting, finance and management, 18*(4), 161-176.

Işık, Ö., Jones, M. C., & Sidorova, A. (2013). Business intelligence success: The roles of BI capabilities and decision environments. *Information & management, 50*(1), 13-23.

Jamaludin, I. A., & Mansor, Z. (2011). The Review of Business Intelligence (BI) Success Determinants in Project Implementation. *International Journal of Computer Applications, 33*(8), 24-27.

Juan-Verdejo, A., Surajbali, B., Baars, H., & Kemper, H. G. (2014). Moving business intelligence to cloud environments.

Khojasteh, N., Ansari, R., & Abadi, H. R. D. (2013). A study of the influencing technological and technical factors successful implementation of business intelligence system in internet service providers companies. *International Journal of Academic Research in Accounting, Finance and Management Sciences, 3*(2), 125-132.

Lautenbach, P., Johnston, K., & Adeniran-Ogundipe, T. (2017). Factors influencing business intelligence and analytics usage extent in South African organisations. *South African Journal of Business Management, 48*(3), 23-33. https://doi.org/10.4102/sajbm.v48i3.33

Lin, F. L. Y. (2019). Using Thematic Analysis to Facilitate Meaning-Making in Practice-Led Art and Design Research. *International Journal of Art & Design Education, 38*(1), 153-167. https://doi.org/10.1111/jade.12177

Lönnqvist, A., & Pirttimäki, V. (2006). The measurement of business intelligence. *Information Systems Management, 23*(1), 32.

Magaireah, A. I. (2019). Identifying the Most Critical Factors to Business Intelligence Implementation Success in the Public Sector Organizations. *The Journal of Social Sciences Research, 5*(2), 450-462.

Marshall, L., & De la Harpe, R. (2009). Decision making in the context of business intelligence and data quality. *South African Journal of Information Management, 11*(2), 1-1.

Maxwell, J. A. (2012). *Qualitative research design: An interactive approach* (Vol. 41). Sage publications.

Mazreati, H., & Radfar, R. (2017). Determining the factors affecting the evaluation of Business Intelligence systems with an emphasis on the integrity of Organizational resources. *Journal of Industrial Strategic Management, 2*(3), 64-82.

Mesaros, P., Carnicky, S., & Mandicak, T. (2015). Key Factors and Barriers of Business Intelligence Implementation. *US-China Law Review, 12*(2), 220-232.

Mesaros, P., Carnicky, S., Mandicak, T., Habinakova, M., Mackova, D., & Spisakova, M. (2016). Model of key success factors for Business Intelligence implementation. *Journal of Systems Integration, 7*(3), 3-15.

Morgan, D. L. (2018). Living within blurry boundaries: The value of distinguishing between qualitative and quantitative research. *Journal of Mixed Methods Research, 12*(3), 268-279.

Moss, L. T., & Atre, S. (2003). *Business intelligence roadmap: the complete project lifecycle for decision-support applications*. Addison-Wesley Professional.

Mudzana, T., & Maharaj, M. (2017). Toward an Understanding of Business Intelligence Systems Success: A South African Study. *Electronic Journal of Information Systems Evaluation, 20*(1), 24.

Naderinejad, M., Tarokh, M. J., & Poorebrahimi, A. (2014). Recognition and Ranking Critical Success Factors of Business Intelligence in Hospitals - Case Study: Hasheminejad Hospital. *arXiv preprint arXiv:1405.4597*.

Nasab, S. S., Jaryani, F., Selamat, H. B., & Masrom, M. (2017). Critical success factors for business intelligence system implementation in public sector organisation. *International Journal of Information Systems and Change Management, 9*(1), 22-43. https://doi.org/10.1504/IJISCM.2017.086210

Nasab, S. S., Selamat, H., & Masrom, M. (2015). A delphi study of the important factors for BI system implementation in the public sector organizations. *Jurnal Teknologi, 77*(19).

Nguyen, Q., Meredith, R., & Burstein, F. (2018). A Comparative Study of Critical Success Factors for General and Healthcare Business Intelligence Systems.

Olszak, C. M. (2016). Toward better understanding and use of Business Intelligence in organizations. *Information Systems Management, 33*(2), 105-123.

Olszak, C. M., & Ziemba, E. (2012). Critical success factors for implementing business intelligence systems in small and medium enterprises on the example of upper Silesia, Poland. *Interdisciplinary Journal of Information, Knowledge, and Management, 7*(2), 129-150.

Peffers, K., Gengler, C. E., & Tuunanen, T. (2003). Extending critical success factors methodology to facilitate broadly participative information systems planning. *Journal of management information systems, 20*(1), 51-85.

Pham, Q. T., Mai, T. K., Misra, S., Crawford, B., & Soto, R. (2016). Critical Success Factors for Implementing Business Intelligence System: Empirical Study in Vietnam. *Computational Science & Its Applications -- ICCSA 2016 (9783319420912)*, 567.

Popovič, A., Hackney, R., Coelho, P. S., & Jaklič, J. (2012). Towards business intelligence systems success: Effects of maturity and culture on analytical decision making. *Decision Support Systems, 54*(1), 729-739.

Presthus, W., Ghinea, G., & Utvik, K. R. (2012). The More, the Merrier? The Interaction of Critical Success Factors in Business Intelligence Implementations. *International Journal of Business Intelligence Research, 3*(2), 34.

Ranjan, J. (2008). Business justification with business intelligence. *VINE, 38*(4), 461-475. https://doi.org/10.1108/03055720810917714

Ravasan, A. Z., & Savoji, S. R. (2014). An Investigation of BI Implementation Critical Success Factors in Iranian Context. *International Journal of Business Intelligence Research, 5*(3), 41.

Rockart, J. F. (1979). Chief executives define their own data needs. *Harvard Business Review, 57*(2), 81-93.

Sangar, A. B., & Iahad, N. B. A. (2013). Critical factors that affect the success of business intelligence systems (BIS) implementation in an organization. *intelligence, 12*(2), 14-16.

Torres, R., & Sidorova, A. (2019). Reconceptualizing information quality as effective use in the context of business intelligence and analytics. *International Journal of Information Management, 49*, 316-329.

Vaismoradi, M., & Snelgrove, S. (2019). Theme in Qualitative Content Analysis and Thematic Analysis. *Forum: Qualitative Social Research, 20*(3), 1-14. https://doi.org/10.17169/fqs-20.3.3376

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & health sciences, 15*(3), 398-405.

Vasile, G., & Mirela, O. (2008). Data quality in business intelligence applications. *ANALELE UNIVERSITĂŢII DIN ORADEA*, 1359.

Wixom, B. H., & Watson, H. J. (2001). An empirical investigation of the factors affecting data warehousing success. *MIS Quarterly: Management Information Systems, 25*(1), 17-41. https://doi.org/10.2307/3250957

Xiao, Y., & Watson, M. (2019). Guidance on conducting a systematic literature review. *Journal of Planning Education and Research, 39*(1), 93-112.

Yeoh, W. (2011). Business intelligence systems implementation: Testing a critical success factors framework in multiple cases. *International Journal of Business Information Systems, 8*(2), 192-209. https://doi.org/10.1504/IJBIS.2011.041791

Yeoh, W., & Koronios, A. (2010). Critical success factors for business intelligence systems. *Journal of computer information systems, 50*(3), 23-32.

Yeoh, W., Koronios, A., & Gao, J. (2006). Critical Success Factors for the Implementation of Business Intelligence System in Engineering Asset Management Organisations. *Engineering Asset Management*, 344.

Yeoh, W., Koronios, A., & Gao, J. (2008). Managing the implementation of business intelligence systems: a critical success factors framework. *International Journal of Enterprise Information Systems (IJEIS), 4*(3), 79-94.

Yeoh, W., & Popovič, A. (2016). Extending the Understanding of Critical Success Factors for Implementing Business Intelligence Systems. *Journal of the Association for Information Science & Technology, 67*(1), 134-147.

Zaied, A. N. H., Grida, M. O., & Hussein, G. S. (2018a). Evaluation of critical success factors for business intelligence systems using fuzzy AHP. *Journal of Theoretical and Applied Information Technology, 96*(19), 6406-6422.

Zaied, A. N. H., Grida, M. O., & Hussein, G. S. (2018b). Factors influencing the successful implementation of BIS. *International Journal of Engineering Trends and Technology (IJETT), 60*(2), 102-108.

Nightingale, A. (2009). A guide to systematic literature reviews. *Surgery (Oxford), 27*(9), 381-384.

Olbrich, S., Poppelbuß, J., & Niehaves, B. (2012). Critical contextual success factors for business intelligence: A Delphi study on their relevance, variability, and controllability. In *2012 45th Hawaii International Conference on System Sciences* (pp. 4148-4157). IEEE.

Paré, G., Trudel, M. C., Jaana, M., & Kitsiou, S. (2015). Synthesizing information systems knowledge: A typology of literature reviews. *Information and Management, 52*(2), 183-199. https://doi.org/10.1016/j.im.2014.08.008

Schieder, C., & Gluchowski, P. (2011). Towards a consolidated research model for understanding business intelligence success.

Yeoh, W., Gao, J., & Koronios, A. (2008). Towards a critical success factor framework for implementing business intelligence systems: A Delphi study in engineering asset management organizations. In *Research and Practical Issues of Enterprise Information Systems II* (pp. 1353-1367). Springer.

Appendices

Appendix A: List of Articles Used for the Literature Review

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Magaireah, A. I.	2019	Identifying the Most Critical Factors to Business Intelligence Implementation Success in the Public Sector Organisations	Google Scholar	Single	Public sector organisations	Jordan	Organisation, Process, and Technology	Top management support, strategic planning and clear vision, user participation, team skills, user access and development technology, and organisational structure
Dawson, L., & Van Belle, J.P.	2013	Critical success factors for business intelligence in the South African financial services sector	DOAJ	Single	Financial services organisation	South Africa	Organisation, Process, and Technology	Business vision, committed top management support, business champion, business case, data quality and user involvement, and influence of IT on business unit strategy
Adjie Eryadi, R., & Nizar Hidayanto, A.	2020	Critical Success Factors for Business Intelligence Implementation in an Enterprise Resource Planning System Environment Using DEMATEL: A Case Study at a Cement Manufacture Company in Indonesia.	DOAJ	Single	Cement manufacture company	Indonesia	Organisation, Process, Technology, and Environment	**Organisation** - Top management support, well-established business case and a clear vision, BI strategic alignment with business goals and understanding organisational culture, **Process** - Effective project management, change management, business champions and user training and involvement, **Technology** - System reliability, flexibility, and scalability; data integrity, accuracy and quality, and integration between BI and other systems, **Environment** - Selection of a vendor, competitive pressure

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Arnott, D.	2008	Success factors for data warehouse and business intelligence systems	AIS eLibrary	Single	Financial services - insurance company	Australia	Organisation, Process, and Technology	Widespread management support, informed and committed executive sponsor, adequate resources, appropriate technology, appropriate team, clear link with business objectives, effective data management, well-defined systems and information requirements, evolutionary management and development of project scope enterprises
Olszak, C. M., & Ziemba, E.	2012	Critical success factors for implementing business intelligence systems in small and medium enterprises on the example of upper Silesia, Poland	Scopus	Single	Commerce, services, and consulting enterprises - SMEs	Upper Silesia, Poland	Organisation, Process, and Technology	**Organisation** - Adequate budget, competent BI project manager (leadership) and skilled (qualified) sufficient staff/team/managers, past experience and cooperation with a BI supplier, **Process** - Well defined users' expectations (information requirements) and adjusting the BI solution to users' business expectations (requirements), **Technology** - Integration between BI system and other systems (e.g., ERP), appropriate technology and tools and "user friendly" (usability) BI system
Yeoh, W., Koronios, A., & Gao, J.	2008	Managing the implementation of business intelligence systems: a critical success factors framework	IGI Global	Single	Engineering asset management organisations - public utilities (such as electricity, gas, water, and waste management) and infrastructure-intensive enterprises such as telecommunications, rail companies and transportation	Australia	Organisation, Process, and Technology	Committed management support and sponsorship, business user-oriented change management, clear business vision and well-established case, business-driven methodology and project management, business-centric championship and balanced project team composition, strategic and extensible technical framework, sustainable data quality and governance framework

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Gaardboe, R., & Svarre, T.	2018	Business intelligence success factors: A literature	Google Scholar	not applicable	Systematic Literature Review	Denmark - Place of Author	Task, People, Structure, and Technology	**Technology** - User satisfaction, service quality, intention to use, information quality, net benefit and system quality, **Structure** - External environment, management processes, organisational culture, organisational size, third-party interaction, developer skill, IS governance, expert domain knowledge, IT infrastructure, organisational competence, voluntariness, project management skills, user involvement, development approach, management support along with organisational culture, organisational structure, development of competences and vision and strategy, **People** - User expectations, trust, visibility, peer support, attitudes toward change, subjective norms and technology experience, **Task** - Task compatibility
Mesaros, P., Carnicky, S., Mandicak, T., Habinakova, M., Mackova, D., & Spisakova, M.	2016	Model of key success factors for Business Intelligence implementation	DOAJ	Single	IT software and consulting companies	Slovakia	Organisational/People and Technology	**Technology** - Flexible BI and architectural implements and useful quality source information, **Organisational** and **People** - Right group of experienced and qualified BI users, organisation-wide solution scope, tight collaboration, strong sponsor, and amenable business culture

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Yeoh, W., & Koronios, A.	2010	Critical success factors for business intelligence systems	Scopus	Single	Engineering asset management organisations - Electricity, gas, water utilities, telecommunications, rail infrastructure and fleets, municipal utilities. Public transportation authority, energy utilities, logistic transportation company	Australia	Technology, Process, and Organisation	**Technology** - Sustainable data integrity and quality along with flexible, business-driven and scalable technical framework, **Process** - Business-driven and interactive development approach, business-centric championship and balanced team composition and user-oriented change management, **Organisation** - Well-established business case and a clear vision, and a committed management sponsorship and support
Yeoh, W., & Popovič, A.	2016	Extending the Understanding of Critical Success Factors for Implementing Business Intelligence Systems	Scopus	Single	Engineering asset management organisations such as electricity, gas, water utilities, and railway companies	Australia	Technology, Process, and Organisation	**Organisation -** Committed management support and sponsorship, clear business vision and well-established case, **Process -** Business-centric championship and balanced project team composition, business-driven and iterative development approach, user-oriented change management, **Technology** - Business-driven, scalable and flexible technical framework, sustainable data quality and integrity
García, J. M. V., & Pinzón, B. H. D.	2017	Key success factors to business intelligence solution implementation	Scopus	Multiple	BI solutions industry, Media (communications), electronics manufacture and export	Colombia	Organisation, Process, and Technology	Directives and top management, business linking, project leader or "champion" set up, business strategy, change management, BI project deployment, people and human talent teams, learning and skills, information and technologies, professional networks, resources - economic, intellectual, and technological; metrics, environment

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Eder, F., & Koch, S.	2018	Critical Success Factors for the Implementation of Business Intelligence Systems	Scopus	Multiple	software IT company, sales, beverage, manufacturer, insurance	Austria	Organisation, Technology, and Process	**Organisation** - Definition of terms/standards/KPIs, organisational unit dedicated to BI, business needs, project team, management support, user acceptance and inclusion, project objectives/vision, consult a consultancy/external company, training of employees, project budget, resources, project manager/CIO, **Technology** - Performance of the BI system, independent from other systems, BI system must fit into the IT landscape, data quality, compatibility to other systems, data integration/source systems, framework/architecture, **Process** - Cooperation with the domain departments, usability, understanding about the business processes in the company, lightweight processes/prototyping, problem definition, change management, quality assurance/testing
Presthus, W., Ghinea, G., & Utvik, K.R.	2012	The More, the Merrier? The Interaction of Critical Success Factors in Business Intelligence Implementations	IGI Global	Single	Norway Post provides traditional mail and parcel delivery along with services such as delivery, banking, logistics, and electronic services	Norway	Organisation, Process, and Technology	Top management support and sponsorship, project champion from the business side, formal interactive user involvement and user training, project planning with incremental delivery and pilot system approach, balanced team skills and composition, infrastructure and data issues, BI vision integrated with company initiatives, effective communication, timing of BI effort and, human factor

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Mudzana, T., & Maharaj, M.	2017	Toward an Understanding of Business Intelligence Systems Success: A South African Study	EBSCO	Single	Various BI vendors, BI consulting companies, BI vendor user groups and JSE-listed companies	South Africa	BI User Satisfaction	System quality, information quality, user quality, individual impact, service quality, user satisfaction
Harison, E.	2012	Critical Success Factors of Business Intelligence System Implementations: Evidence from the Energy Sector	Scopus	Single	Gas energy sector	Dutch	**BI User Satisfaction -** Information quality, System quality, Service quality, Use/intention to use, Individual impact, Organisational impact	Management/leadership/support, culture, organisational infrastructure, processes/activities, motivational aids, resources, training/education, HRM, information technology, measurement, strategy and purpose
Hawking, P., & Sellitto, C.	2010	Business Intelligence (BI) critical success factors	AIS eLibrary	Single	BI solution (SAP partners or user groups)	Europe, USA, and Australia	Solution, Application and Temporal aspects	Management support, champion, resources, user participation, team skills, source systems, development technology, project scope, performance, methodology, business content, governance, reporting strategy, interaction with SAP, testing, data quality, training, involvement of business and technical, change management, implementation partners, identification of KPIs, technical
Schieder, C., & Gluchowski, P.	2011	Towards a consolidated research model for understanding business intelligence success	AIS eLibrary	not applicable	Literature Review		Technology	Functional coverage, technical sustainability, organisational maturity, information quality, system quality, service quality, intention to use, user satisfaction, perceived net benefit

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Nasab, S. S., Jaryani, F., Selamat, H. B., & Masrom, M.	2017	Critical success factors for business intelligence system implementation in public sector organisation	Scopus	Single	Public sector organisation - two agencies under Malaysia Ministry of Finance	Malaysia	Organisation, Process, Technology, and Culture	**Organisation** - 1) Committed management support and sponsorship a) continuous management support b) resource allocation 2) clear vision and well-established business case a) well-established business case b) clear vision and BI strategy, **Process** - 1) Business-centric championship and balanced team composition a) business champion b) coordination between it and business units c) external consultant 2) system development related factor a) iterative and incremental approach b) user involvement, **Technology** - 1) Business-driven, scalable and flexible technical framework a) scalable and flexible system b) integration with other system c) user access 2) sustainable data quality and integrity a) data source quality b) integrated data 3) technical skills a) BI team skill b) user skill, **Culture** - 1) Organisational culture a) learning and development b) participative decision-making c) power-sharing d) support and collaboration

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Adamala, S., & Cidrin, L.	2011	Key success factors in Business Intelligence	DOAJ	Single	Private sector	Poland	Organisation, Process, and Technology	Management support and sponsorship, adequate resources, management decision quality, user education and training, user satisfaction, user support, strategic BI vision, team skills, source systems, technical framework, development of technology and tools, system functionality, tools, BI cost, BI system usability, data quality and reliable resources, modelling of dimensional data and meta-data, information area readiness, user participation, user commitment, user support, well-established business case, clearly defined business need, measurable business benefits, business-driven BI initiatives, planning and scope definition, adoption of incremental delivery approach, project schedule, external consultants, business domain committed expertise

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Yeoh, W.	2011	Business intelligence systems implementation: Testing a critical success factors framework in multiple cases	Scopus	Single	Engineering organisations - Rail transport and network access, Electricity and gas utilities, Shipbuilder and maintainer; Water, sewage, recycled water utilities	Australia	Technology, Process, and Organisation	**Organisation** - 1) Committed management support and sponsorship a) the involvement of senior management in information steering committee b) business-side sponsorship c) amendment of organisational structure and roles and responsibilities, 2) clear business vision and well-established case, **Process** - 3) Business-centric championship and balanced project team composition a) cross-functional team composition b) use of external consultants, 4) business-driven and iterative development approach a) business-driven project scoping b) using an incremental delivery ('iterative') approach, 5) user-oriented change management a) interactive user involvement b) consistent maintenance support, **Technology** - 6) Business-driven, scalable and flexible technical framework, 7) sustainable data quality and integrity a) high-quality data derived from source systems
Grublješič, T., & Jaklič, J.	2015	Business Intelligence Acceptance: The Prominence of Organisational Factors	Scopus	Multiple	Water supply, sewerage, waste management, and remediation activities, wholesale and retail trade, arts, entertainment, and recreation		Organisation	Individual characteristics, technological characteristics, organisational factors, social characteristics, and macro-environmental characteristics

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Sangar, A. B., & Iahad, N. B. A.	2013	Critical factors that affect the success of business intelligence systems (BIS) implementation in an organisation	Research Gate	not applicable	Literature Review	Malaysia	Organisational/managerial, Technology, and Culture	**Managerial** - Top management support, clear goals and objectives, effective project management, culture of the organisation, user education and training, stakeholder's active involvement, **Technological** - Data and information accuracy and integrity, enterprise IT infrastructure and legacy system, suitability of hardware and software, system reliability and flexibility, and system perceived usefulness and learnability
Yeoh, W., Gao, J., & Koronios, A.	2008	Towards a critical success factor framework for implementing business intelligence systems: A Delphi study in engineering asset management organisations	Springer Link	Single	Engineering asset management organisations (EAMOs) included public utilities (such as electricity, gas, water, and waste management) and infrastructure-intensive enterprises such as telecommunications and rail companies	Australia	Organisation, Process, and Technology	Committed management support and championship, user-oriented change management, business vision, project planning, team skills and composition, infrastructure-related issues, data-related issues
Pham, Q. T., Mai, T. K., Misra, S., Crawford, B., & Soto, R.	2016	Critical Success Factors for Implementing Business Intelligence System: Empirical Study in Vietnam	Springer Link	Multiple	Import, wholesale, retail and distribution, E-commerce, Digital content	Vietnam	Organisation, Process, and Technology	Committed management support and sponsorship, clear vision and a well-established business case, business-centric championship and balanced team composition, business-driven and iterative development approach, user-oriented change management, business-driven, scalable and flexible technical framework, sustainable data quality and integrity

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Yeoh, W., Koronios, A., & Gao, J.	2006	Critical Success Factors for the Implementation of Business Intelligence System in Engineering Asset Management organisations	Springer Link	Single	EAMOs include public utilities, such as electricity, gas, water, and waste management, and infrastructure-intensive enterprises such as telecommunications and railway companies	Australia	Organisation, Process, and Technology	Top management support and sponsorship, balanced team skill and composition, project planning and scope definition, building a pilot system and incremental change, modelling of dimensional data and metadata, formal and interactive user involvement, data quality and reliable sources, formal selection of development tools and technology, formal and adequate user training, presence of a champion
Zaied, A. N. H., Grida, M. O., & Hussein, G. S.	2018	Evaluation of critical success factors for business intelligence systems using fuzzy AHP	Google Scholar	not applicable	not mentioned	responses obtained from BI experts work in Egypt, United Arabic Emirates, Saudi Arabia, China, Hong Kong, and Brazil	Organisation, Process, Technology, and Environment	**Organisation** - Top management support, well-established business case and clear vision, resource availability, organisational culture, align BIS with business strategy, **Process** - User-oriented change management, champion and balanced team composition, project management, **Technology** - Data quality, scalable and flexible system, complexity of BI, relative advantage, compatibility, integration between business intelligence systems and other systems, **Environment** -Vendor selection, competitor's pressure
Lauterbach, P., Johnston, K., & Adeniran-Ogundipe, T.	2017	Factors influencing business intelligence and analytics usage extent in South African organisations	DOAJ	Multiple	Manufacturing, financial and insurance activities sectors	South Africa	Technology, Organisation, and Environment	Data-related infrastructure capabilities, top management support, external market influence

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Adeyelure, T. S., Kalema, B. M., & Bwalya, K. J.	2018	Deployment factors for mobile business intelligence in developing countries small and medium enterprises	Scopus	Single	SMEs	South Africa	Organisational factors, Security factor, Environmental factors, Compatibility, Entrepreneur competences factors, Technological characteristics, Vendor factors	Top management support, organisation success, information security policy, financial resources, information utilisation, in-house IT infrastructure, data privacy, customer needs

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Ravasan, A. Z., & Savoji, S. R.	2014	An Investigation of BI Implementation Critical Success Factors in Iranian Context	IGI Global	not applicable	not mentioned	Iran	Organisational, Technology/Technical, Human resources, and Project management	**Organisational** - Ensure senior management support, well-defined vision and clear goals for system and business, adequate resources including budgetary and human resources, BI and business strategy alignment, **Human resources** - User support, participation end users, change management, user training, managing users' expectations, **Project management** - Strong project management, avoid deviation from the initial goals of the project, risk management, project team management, being flexible and responsive to change, strong partnership between the business and IT counterparts, IT knowledge and technical skills of the project team, **Technical** - Creating the data warehouse organisation, data management, strong applications management in the organisation, identify user's specific issues and requirements, appropriateness of technology with organisation, adequate and reliable technical architecture, select the appropriate tools
Eckerson, W. W.	2005	The keys to enterprise business intelligence: Critical success factors	Google Scholar	not applicable	no context mentioned	not mentioned	Process and Technology	Support all users via integrated BI suites, conforms to the way users work, integrates with desktop and operational applications, delivers actionable information, foster rapid development; provide a robust, extensible platform

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Zaied, A. N. H., Grida, M. O., & Hussein, G. S.	2018	Factors influencing the successful implementation of BIS	Research Gate	Multiple	IT, Industrial, Services, banking, Telecommunications, Retail and wholesales	Egypt	Organisation, Technology, Environment, and Process	**Organisation** - Top management support, clear vision, adequate resource, organisational culture, BI strategic alignment, **Technology** - Data quality, integration between BI system and other systems, scalable and flexible system, compatibility, complexity, relative advantage, **Environment** - Selection of vendors, competitive pressure, **Process** - Champion and balanced team skills and composition, user-oriented change management, project management
Nguyen, Q., Meredith, R., & Burstein, F.	2018	A Comparative Study of Critical Success Factors for General and Healthcare Business Intelligence Systems	AIS eLibrary	Single	Healthcare	Australia	Organisation, Process, Culture, and Technology	Ongoing top management support and sponsorship, clear link with business objectives, adaptive, evolutionary development approach, user training, appropriate team skills, appropriate technology and tools, adequate resources, data quality and integrity, well-defined information and system requirements, scalable and flexible technical framework, effective project management, integration of BI and other systems, change management, effective communication, balanced team skill and composition, human factor, timing of BI effort, perceived BI usefulness, organisational maturity, organisational culture, information quality factors, BI function factors, BI characteristics factors

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Naderinejad, M., Tarokh, M. J., & Poorebrahimi, A.	2014	Recognition and Ranking Critical Success Factors of Business Intelligence in Hospitals - Case Study: Hasheminejad Hospital	AIS eLibrary	Single	Hospitals	Iran	Organisation, Process, and Technology	**Organisation** - Perspective, goals, and strategy; financial resources, human resources, organisation culture, leadership, coincidence of business and IT, management support, **Process** - Process maturity, methodology, change management, frequent development model, process documentation, project team combination, **Technology** - Technology and knowledge transfer speed, data quality, suitable infrastructure and technology, application capability, training and support
Mesaros, P., Carnicky, S., & Mandicak, T.	2015	Key Factors and Barriers of Business Intelligence Implementation	HeinOnline	not applicable	not mentioned	Slovakia - place of authors	Technology, People, and Culture	Active involvement of a strong sponsor, BI competence centre, high quality of source data, close cooperation between solution users and the team of professional IT staff, enterprise-wide solution scope, corporate culture opened to change; properly selected analytical tools, and promoting active use of available tools
Mazreati, H., & Radfar, R.	2017	Determining the factors affecting the evaluation of Business Intelligence systems with an emphasis on the integrity of Organisational resources	Google Scholar	Single	IT companies in the field of intelligence	Tehran	Organisation, Process, and Technology	Organisational factors, project management and planning factors, technical and technological factors, expectations and requirements management factors, integration factors

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Popovič, A., Hackney, R., Coelho, P. S., & Jaklič, J.	2012	Towards business intelligence systems success: Effects of maturity and culture on analytical decision making	ScienceDirect	Multiple	Medium and large-size business organisations - Agriculture, hunting and forestry, **Manufacturing**; Electricity, gas and water supply; Construction, Wholesale and retail trade, hotels and restaurants; transport, storage and communication; Financial intermediation; Real estate, renting and business activities	Slovenia	BI User Satisfaction	Analytical capabilities, BIS maturity, data integration, information content quality, information access quality, use of information in business processes, analytical decision-making culture
Olszak, C. M.	2016	Toward better understanding and use of Business Intelligence in organisations	Taylor & Francis	Multiple	Service sector - Telecommunication, Consulting, Banking, Insurance, Marketing agencies	Poland	People, Process; and metrics and Technology	Management leadership and support, corporate culture, expressed by effective information resources management, clearly stated strategy and objectives, and use of appropriate BI technologies, clearly defined business processes, business performance measurement, an incentive system to encourage collecting and analysing information and knowledge sharing, appropriate resources (financial, intellectual), and training and education on BI and knowledge management

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Nasab, S. S., Selamat, H., & Masrom, M.	2015	A Delphi study of the important factors for BI system implementation in the public sector organisations	Research Gate	Single	Public sector organisations	Malaysia	Organisation, Process, Technology, and Culture	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 systems, data quality and integration, user skill, BI team skill, organisation culture
Khojasteh, N., Ansari, R., & Abadi, H. R. D.	2013	A study of the influencing technological and technical factors successful implementation of business intelligence system in internet service providers companies	Google Scholar	Single	Internet service providers companies	Iran	Technology	Extensible technical framework (software and hardware), data and system quality, appropriate technology/tools, integration between business intelligence systems with other systems
IşıK, Ö., Jones, M. C., & Sidorova, A.	2013	Business intelligence success: The roles of BI capabilities and decision environments	ScienceDirect	Multiple	Randomly selected organisations - Manufacturing, Insurance/real estate/legal, Medical/health, Transportation/utilities, Wholesale/retail/distribution, Banking, Data processing services, Education, Business service/consultant	United States	BI User Satisfaction	**Technological BI** - Data quality, integration with other systems, user access, **Organisational BI** - Flexibility, risk management support, **Decision Environment** - Decision types, information processing needs

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Isik, O., Jones, M. C., & Sidorova, A.	2011	Business intelligence (BI) success and the role of BI capabilities	EBSCO	Multiple	Manufacturing, Insurance/real estate/legal, Medical/health, Transportation/utilities, Wholesale/retail/distribution, Banking, Data processing services, Education, Business service/consultant	Online survey -The firms were randomly selected	BI User Satisfaction	Data quality, data source quality, data reliability, integration with other systems, user access, flexibility, risk management support
Hou, C.K.	2012	Examining the effect of user satisfaction on system usage and individual performance with business intelligence systems: An empirical study of Taiwan's electronics industry	ScienceDirect	Single	Electronics industry	Taiwan	BI User Satisfaction	End-user computing satisfaction (contents, accuracy, format, ease of use, timeliness), system usage, individual performance
Hackney, R., Dooley, P., Levvy, Y., & Parrish, J.	2015	Critical value factors in business intelligence systems implementation success: An empirical analysis of system and information quality	Google Scholar	Single	Financial institutions in banking, pension finance, and brokerage services; organisations providing systems services	not mentioned	System Quality (SQ), Information Quality (IQ)	**SQ** - Integration flexibility SQ, reliability SQ, **IQ** - Representational IQ, accessibility IQ, intrinsic IQ
Gaardboe, R., Nyvang, T., & Sandalgaard, N.	2017	Business intelligence success applied to healthcare information systems	ScienceDirect	Single	Public healthcare sector	Denmark	BI User Satisfaction	System quality, information quality, use, user satisfaction, individual impact

Author	Year	Title	Database	Industry Type	Industry	Country	Themes	CSFs
Alabaddi, Z. A., Rahahleh, A. H., Alali, H., Muflih, M. A., & Sana'a, N. A. N.	2020	The relative importance of the critical success factors of business intelligence (BI) systems implementation in Jordanian pharmaceutical companies	Google Scholar	Single	Pharmaceutical companies	Jordan	Organisation, Process, Culture, and Technology	Top management support, data quality, vision and planning, team skills, IT infrastructure, user involvement, project management, change management, resource allocation, presence of champion, organisation collaboration culture, user IT & analytical culture, scalable & flexible system, continuous improvement culture, competitive pressure, integration between BI system and other systems, compatibility, relative advantage, complexity, selection of vendors, BI strategic alignment
Alkraiji, A.I.	2020	Weighting the challenges to the effectiveness of business intelligence systems in organisations: an empirical study of government organisations in Saudi Arabia	Taylor & Francis	Single	Government organisations	Saudi Arabia	BI capability, Decision, Technological, and Organisational	**BI capability** - BI system capability, information capability, **Decision** - Nature of decision making, uncertainty of decision making, **Technological** - IT capability, data integration, data quality, **Organisational** - Culture, compatibility, management filter, management style, centralised and decentralised management

Appendix B: List of All Databases Searched

Databases
SpringerLink
DOAJ (Directory of Open Access Journals)
ScienceDirect
Google Scholar
HeinOnline
ResearchGate
Business Source Complete (EBSCO)
Taylor & Francis
Emerald Insight
AIS eLibrary
IGI Global
Scopus

Appendix C: List of Studies That Used Quantitative or Mixed-Method Approach

Methodology	Author	Year	Title
Quantitative	Adjie Eryadi, R., & Nizar Hidayanto, A.	2020	Critical Success Factors for Business Intelligence Implementation in an Enterprise Resource Planning System Environment Using DEMATEL: A Case Study at a Cement Manufacture Company in Indonesia.
Quantitative	Mesaros, P., Carnicky, S., Mandicak, T., Habinakova, M., Mackova, D., & Spisakova, M.	2016	Model of key success factors for Business Intelligence implementation
Quantitative	Mudzana, T., & Maharaj, M.	2017	Toward an Understanding of Business Intelligence Systems Success: A South African Study
Quantitative	Adamala, S., & Cidrin, L.	2011	Key success factors in Business Intelligence
Quantitative	Zaied, A. N. H., Grida, M. O., & Hussein, G. S.	2018	Evaluation of critical success factors for business intelligence systems using fuzzy AHP
Quantitative	Lautenbach, P., Johnston, K., & Adeniran-Ogundipe, T.	2017	Factors influencing business intelligence and analytics usage extent in South African organisations
Quantitative	Ravasan, A. Z., & Savoji, S. R.	2014	An Investigation of BI Implementation Critical Success Factors in Iranian Context
Quantitative	Zaied, A. N. H., Grida, M. O., & Hussein, G. S.	2018	Factors influencing the successful implementation of BIS
Quantitative	Naderinejad, M., Tarokh, M. J., & Poorebrahimi, A.	2014	Recognition and Ranking Critical Success Factors of Business Intelligence in Hospitals - Case Study: Hasheminejad Hospital
Quantitative	Mazreati, H., & Radfar, R.	2017	Determining the factors affecting the evaluation of Business Intelligence systems with an emphasis on the integrity of Organisational resources
Quantitative	Popovič, A., Hackney, R., Coelho, P. S., & Jaklič, J.	2012	Towards business intelligence systems success: Effects of maturity and culture on analytical decision making
Quantitative	Nasab, S. S., Selamat, H., & Masrom, M.	2015	A Delphi study of the important factors for BI system implementation in the public sector organisations

Quantitative	Khojasteh, N., Ansari, R., & Abadi, H. R. D.	2013	A study of the influencing technological and technical factors successful implementation of business intelligence system in internet service providers companies
Quantitative	IşıK, Ö., Jones, M. C., & Sidorova, A.	2013	Business intelligence success: The roles of BI capabilities and decision environments
Quantitative	Isik, O., Jones, M. C., & Sidorova, A.	2011	Business intelligence (BI) success and the role of BI capabilities
Quantitative	Hou, C.K.	2012	Examining the effect of user satisfaction on system usage and individual performance with business intelligence systems: An empirical study of Taiwan's electronics industry
Quantitative	Gaardboe, R., Nyvang, T., & Sandalgaard, N.	2017	Business intelligence success applied to healthcare information systems
Quantitative	Alabaddi, Z. A., Rahahleh, A. H., Alali, H., Muflih, M. A., & Sana'a, N. A. N.	2020	The relative importance of the critical success factors of business intelligence (BI) systems implementation in Jordanian pharmaceutical companies
Quantitative	Alkraiji, A.I.	2020	Weighting the challenges to the effectiveness of business intelligence systems in organisations: an empirical study of government organisations in Saudi Arabia
Mixed method	Magaireah, A. I.	2019	Identifying the Most Critical Factors to Business Intelligence Implementation Success in the Public Sector Organisations
Mixed method	Dawson, L., & Van Belle, J.P.	2013	Critical success factors for business intelligence in the South African financial services sector
Mixed method	Adeyelure, T. S., Kalema, B. M., & Bwalya, K. J.	2018	Deployment factors for mobile business intelligence in developing countries small and medium enterprises
Mixed method	Nguyen, Q., Meredith, R., & Burstein, F.	2018	A Comparative Study of Critical Success Factors for General and Healthcare Business Intelligence Systems
Mixed method	Hackney, R., Dooley, P., Levvy, Y., & Parrish, J.	2015	Critical value factors in business intelligence systems implementation success: An empirical analysis of system and information quality

Appendix D: Analysis Processes of the CSFs and the Themes

The total CSFs of all industries were copied onto a separate excel sheet named ‘Total CSFs’. Similarly, CSFs of studies dealing with multiple industries and single industries were also copied onto separate excel sheets named ‘Multiple industry CSFs’ and ‘Single industry CSFs’ respectively. Each of these lists of CSFs was split into multiple columns of factors from a single column using the text to columns function in Excel. This process was repeated for each of the excel sheets. Later, the number of occurrences of each factor was counted using the find option. The number of occurrences of each factor was reconfirmed using the formula “=SUM(LEN(range)-LEN(SUBSTITUTE(range,"factor","")))/LEN("factor")” for each column and then summed and later, tabulated in the order of the most recurrent to the least. This process was again repeated for each of the excel sheets to derive the finalised three sheets. The least recurrent factors were omitted, and the lists were condensed to consist of eighteen factors for Total CSFs, fifteen factors for Multiple industry CSFs, and eighteen factors for Single industry CSFs.

Similarly, all the themes emerging from all shortlisted studies for this dissertation (refer *Appendix A*) were copied onto a separate excel sheet named ‘Themes’. The themes were split into multiple columns from a single column using the text to columns function in Excel. Subsequently, the number of occurrences of each theme was totalled using the find option. The number of occurrences of each theme was reconfirmed using the formula “=SUM(LEN(range)-LEN(SUBSTITUTE(range,"theme","")))/LEN("theme")” for each column and then totalled and later, tabularised in the order of the most frequent to the least. The minimum recurring themes were excluded, and the list was reduced to comprise of nineteen themes.