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Critical Success Factors for Business Intelligence in the South African Banking Sector

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1756596

A research article submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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DECLARATION

I, Boipelo Rathebe, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Boipelo Ramphoreng Rathebe

Signed at JOHANNESBURG

On the 29th day of March 2019.

DEDICATION

To all young South Africans that are jobless and without hope, I dedicate this paper to you and say that hope is coming.

ACKNOWLEDGEMENTS

My sincere appreciation to my supervisor, Mr Max Mackenzie, for his guidance through the process of completing this project.

I wish to express my heartfelt gratitude to my wife and family for their unwavering support and patience during this project.

To all those that could not be mentioned here but had a valuable role to play in ensuring the completion of this project—a sincere thank you for your time and assistance in bringing this project to fruition.

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APPENDIX A: FREQUENCY TABLES

RELIABILITY STATISTICS

APPENDIX B: HISTOGRAMS

APPENDIX C: MANN-WHITNEY TEST RESULTS

APPENDIX D: KRUSKAL WALLIS TEST RESULTS

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APPENDIX F: INTRODUCTORY EMAIL

APPENDIX G: QUESTIONNAIRE

† Including abstract and references.

ABSTRACT

With the advent of the Fourth Industrial Revolution, data are more valuable than ever for any banking organization. Business Intelligence enables organizations to make informed decisions based on the data they collect. However, when organisations embark on implementing Business Intelligence systems, the majority of these systems are not always successfully implemented and do not perform as intended. This failure and difficulty associated with Business Intelligence projects is attributed to, among other factors, complexity of disparate data sources, high costs, lack of expertise, and huge data volumes. Critical success factors are important to ensure the success of any project. Therefore, it is vital to understand on which critical success factors to focus when implementing Business Intelligence.

The purpose of this study was to determine which of the critical success factors for Business Intelligence systems are regarded as important in the context of organisations in South Africa's banking sector. A set of 15 critical success factors are derived from previous research and from these, hypotheses are drawn on each one. A Likert-type questionnaire was used to test the hypotheses that are then analysed using descriptive and inferential statistics. The results of the study show that 14 of the 15 critical success factors are important.

Keywords

Business intelligence

Critical success factors

Business Intelligence implementation

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GLOSSARY

BI	Business Intelligence
CI	Competitive Intelligence
CRM	Customer Relationship Management
CSFs	Critical Success Factors
ERP	Enterprise Resource Planning
IS	Information System
IT	Information Technology
SCM	Supply Chain Management
SMEs	Small Medium Enterprises

1 INTRODUCTION

1.1 Background

With the advent of the Fourth Industrial Revolution, data are considered the lifeblood of any organization. Consequently, more studies are focussing on how organizations are leveraging their data through methodologies and tools such as Business Intelligence (BI) to gain competitive advantage (Grabova, Darmont, Chauchat, & Zolotaryova, 2010; Salles, 2006; Thong, 1999).

BI is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance (Gartner, 2012). Most available studies on BI focus on topics of adoption, implementation, frameworks, impact on profits, and other important business measures relating to big corporate organisations.

As a result, this focus on big corporations as a homogeneous group has resulted in a dearth of BI literature that researches success factors relating to specific industries like Banking (Scholz, Schieder, Kurze, & Gluchowski, 2010). Relative to general information systems research, academic research that studies BI topics such critical success factors (CSFs) rate of the adoption, usage, challenges and benefits of BI is still fragmented, more so where the banking sector is concerned (McGrath, & Burgess, 2016).

In order to increase the probabilities of success in BI implementations, it is imperative that organizations know what factors to focus on. Therefore, understanding what CSFs to focus on before undertaking a BI project will provide management and other key project stakeholders with deep insight of key activities and factors to focus on prior to project commencement. This focus on the CSFs will also assist throughout the project implementation life cycle by providing a guiding roadmap to avoid common pitfalls synonymous with BI project implementations.

Because of focusing on the BI CSFs, organizations can increase their competitive advantage (Guarda, Santos, Pinto, Augusto, & Silva, 2013). This is because organizations that implement successful BI systems normally experience resource benefits such as time saving, cost saving, cost avoidance, and revenue enhancement (Lönnqvist & Pirttimäki, 2006). Thus, organization's failure to implement BI successfully by focusing on these CSFs might lead to difficulty in realizing these benefits.

1.2 Problem statement

The implementation of BI systems in general has a low probability of successful implementation. High project costs and project complexity make it critical for the organisation to achieve or at least increase the probability of achieving a successful implementation. Moreover, existing academic literature does not provide clear and definitive guidelines on success factors that are important to ensure a successful BI system implementation.

Therefore, this study was undertaken to define a conclusive list of CSFs that would lead to successful BI implementation in organisations in the South African banking sector.

1.3 Purpose of the study

The main objective of this study was to determine which of the CSFs for BI systems are regarded as important in the context of organizations in South Africa's banking sector. With this objective of the study achieved, the results would benefit a wide range of professionals like academic researchers, market researchers, decision makers in the banking industry, and consultants in the BI industry.

1.4 Delimitation

This study is constrained within the South African banking sector, more so, focusing on only four of the numerous incumbents. From these organizations, only four BI projects, one from each organization, are researched, focusing on key roles that have BI experience. Additionally, the research study only focuses on the importance of CSFs for business intelligence, identified as key in previous research, and no other types of information systems. Banks are regarded as organizations with vast resources, interestingly many of the BI projects implemented within banks end up in failure. Therefore, focusing on the study on the South African banking industry is critical in understanding these failures and how to minimize them.

1.5 Outline of the research paper

The first section of the paper focuses on the background, purpose, and delimitations of the study. The second section focuses on the relevant literature review regarding CSFs for business intelligence; this section's outcome is a comprehensive list of identified CSFs, each having its respective hypothesis. Section 3 of this assignment outlines the research methodology, followed by outlining the results of the assignment in Section 4. Section 5 discusses the results and concludes the assignment.

The structure of the research is depicted in Figure 1 below.



Figure 1. Structure of research study

2 LITERATURE REVIEW

2.1 Introduction

This section of the paper provides an overview of the topic under focus. The literature review is structured into two main sections, the first of which briefly focuses on the concept of BI, followed by CSFs.

In the first section, the paper looks at the general definition of BI and the significance of BI in organizations. The second section defines CSFs and discusses the CSFs that are associated with the implementation of BI.

Finally, from the CSFs discussed and identified, a list of CSFs and hypotheses was formulated.

2.2 Business Intelligence (BI)

The term business intelligence (BI), only becoming prevalent in recent years, was first coined by Luhn (1958). Before Luhn (1958) defines the word, he deconstructs it by providing a general definition of each individual word in the term. He defines business as "a collection of activities carried on for whatever purpose, be it science, technology, commerce, industry, law, government, defence, et cetera" (Luhn, 1958, p. 314). Moreover, he explains "intelligence" as "the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal" (Luhn, 1958, p. 314).

According to Luhn (1958), BI can be defined as a system that automatically disseminates information to the different departments in an organization. Furthermore, Luhn (1958) posits that the objective of the BI system is to supply sustainable information to support certain groups, departments, individuals, and divisions in their decision-making processes. Watson and Wixom (2007) further expand on this definition by citing that BI plays a critical role bringing about change in how organizations are managed, decisions are made, and people carry out their jobs.

Following Luhn's definition, Dresner (as cited in Cebotarean, 2011) takes a different view on BI and defines it as a combination of methods and tools utilizing machine produced factual data to improve decision making in the organization. Turban, Sharda, Aronson and King (2008, p. 8) support Dresner's view by explaining BI as "an umbrella term that combines architectures, tools, databases, analytical tools, applications and methodologies."

Williams and Williams report that BI, in a broader context, is the "business information and business analyses within the context of key business processes that lead to decisions and actions" (2010, p. 2). Turban et al. (2008) view BI from a process perspective, stating that BI is largely based on the transformation of data into information, followed by decisions, and lastly converted to actions. Williams and Williams (2010) further describe BI as the ability to leverage information assets within critical business processes in order to improve and maximize business performance.

According to Nagesh (2004), BI replaced other terms like executive information systems, decision support systems, and management information systems. Data are regarded as one of the most critical assets of an organization. Furthermore, English (2005) indicates that BI is regarded as any tool within the organization that produces information and regards it as one of the most critical information assets an organization can have.

For the purposes of this study, the above definition of BI was adopted. BI is a methodology that combines a suite of technological tools and data to produce enterprise information that analysts, managers and executives (i.e. human resources) can use to support their strategic decisions as a result improving business performance (Williams, & Williams, 2010; English, 2005; Nagesh, 2004).

2.3 Business Intelligence in organizations

Over the years, data has become ubiquitous and cheap to store, however organizations are struggling to keep up with the analysis and manipulation of this data (Chen, Chiang, & Storey, 2012). Taylor and Murphy (2004) argue that in recent times, governments are seeking to promote knowledge economies by building economic dynamism and competitive advantage through information systems. However, some literature (Guarda et al., 2013; Papachristodouloua, Koutsakia, & Kirkosa, 2017; Raj, Wong, & Beaumont, 2016) suggests that BI is primarily eligible for big corporates due to, among other reasons, a lack of resources, a lack of understanding and overall low information systems adoption on the part of smaller organizations such as Small Medium Enterprises (SMEs).

In the South African context, banks have a critical role to fulfil and have the potential to drive the ailing economy in the right direction and this can be achieved if these organizations harness their data more meaningfully with tools such as BI (Ranjan, 2008). In terms of other organizations that are critical to the economy, Olawale and Garwe (2010) suggest that many SMEs are struggling and only just surviving without any signs of real growth. BI is regarded

by many (Dumitriu, 2009; Hočevar, & Jaklič, 2010; Ranjan, 2008) as a tool that can assist organizations to take fact based decisions that can lead to competitive benefits. Ranjan (2008) indicates that BI in organizations has numerous benefits like decision support, data support and savings (e.g. costs, personnel, resources). However, Scholz et al. (2010) argue that organizations still face big barriers in BI and these are related to usage, solution quality, data quality, and interfaces. For example, Olawale and Garwe (2010) posit that in South Africa one of the biggest inhibitors in SME growth is the lack of investment in IT due to a lack of finance.

Gauzelina and Bentza (2017) suggest that many organizations are lagging in the adoption of BI technologies and as a result not benefiting from BI. Hocevar and Jaklic (2010) argue that this is because many organizations such as banking institutions find it very difficult to measure the tangible benefits of BI. However, in contrast to Hocevar and Jaklic (2010), Ponelis (2013) argues that in the context of small enterprises this might be due to a lack of experience with formal BI, management training and the lack of time that always constrains owners of SMEs. Thong (1999) agrees with the low adoption rate of BI, however, he suggests that different organizations experience different barriers to BI.

Raj et al. (2016) support this by stating that BI adoption and implementation is more challenging in SMEs than in larger organizations. However, Dumitriu (2009) opines that larger organizations such as banks face challenges of proving that a BI initiative is beneficial to the organization and that it is not just an IT experiment. Despite these known challenges, Watson and Wixom (2007) argue that BI is an enabler that can bring benefits like reducing IT infrastructure costs, efficient data delivery, and a general improvement in business processes to the organization. Gauzelina and Bentza (2017) argue that competitive intelligence (CI) is another benefit that is not emphasized enough, particularly in conjunction with BI. Gauzelina and Bentza regard CI as a subset of BI. They argue that this type of BI enables organizations, both big and small, that have information on their competitor and customers, to be in a position to compete more competitively and plan more strategically.

Not all organizations in an economy will benefit from BI and Thong (1999) even argues that BI cannot be applied to some organizations. To increase the probability of success, Guarda et al. (2013) and Thong (1999) agree that the system should align and integrate to the existing norms and needs of the potential adopter. If this cannot be achieved the BI system can be classified as difficult to use and as a result be rejected.

Chen et al. (2012) argue that implementing BI in an organization will not guarantee a return on investment but a well-designed BI system can be of great benefit to the organization. However, the combination of low BI adoption in organizations, difficulty to measure tangible BI benefits, and limited literature does not help banking organizations in advancing their competitive advantage through BI. This uncertainty creates a need to determine the CSFs for BI in the SA banking sector.

2.4 Critical success factors (CSFs)

Implementing a BI system is not as traditional as the implementation of other types of information systems. Raj et al. (2016) caution that implementing a BI system is complex and requires good understanding to bring about success. Chua, Kog and Loh (1999) identify CSFs as a means to somewhat guarantee success and state that CSFs are applied in various fields of study to explore the feasibility of success on a project. However, Guarda et al. (2013) argue that the implementation of BI in a business, even with the CSFs, does not guarantee success.

In the existing body of knowledge, there are numerous definitions of CSFs, many (Cooke-Davies, 2002; Poon & Wagner, 2001; Sumner, 1999; Yeo, 2002) agree with Rockart (1979) when he defines CSFs as the performance factors that constantly require management's attention to ensure that the competitive advantage is always achieved. However, Rockart (1979) argues that these factors are generally not designed to be strategic but merely to assist in the decision-making process. With more literature on CSFs becoming available with time, it is now evident that CSFs can vary across industries. Furthermore, Olszak and Ziemba (2012) posit that CSFs can be defined, within a business context, at an operational, managerial, and most importantly strategic level.

2.5 Critical success factors in business intelligence

BI system implementation is not as conventional and as easy as a traditional IT project (Fuchs, 2004; Wixom & Watson, 2001). Sammon and Finnegan (2000) argue that BI projects will differ from organization to organization, as each project will encounter a different set of issues around common factors. Olszak and Ziemba (2012) agree and state that this is because many BI projects have to deal with, among other issues, diverse users and the complex process of integrating disparate data from different systems. Poon and Wagner (2001) support this, stating that although often ignored, interesting differences such as ethnicity and regions also play an important role.

This has led to academics researching the topic of CSFs for BI. However, the existing studies are fragmented and primarily focused on big companies as a homogeneous group. Consequently, this has left a gap when coming to BI implementation in organizations of specific sectors of the economy.

Yeoh and Koronios (2010) argue that BI system implementation is generally complex even for big companies with vast resources, this is because BI projects do not only require the purchase of hardware and software but also rely on the human factor. In contrast to Yeoh and Koronios's argument on big organizations, Fedouaki, Okar and Alami (2013) focus on smaller organizations and state that the failure rate of BI projects in SMEs is very high and the adoption rate very low. However, both Yeoh and Koronios (2010) and Fedouaki et al. (2013) agree, even when focusing on different organizations, stating that the reason for this failure is, among other causes, the lack of BI CSFs coupled with the relatively low knowledge on BI benefits and opportunities. Fedouaki et al. (2013) report that there is a lack of CSFs bespoke for different types of organizations in the different types of sectors of the economy. Yeo (2002) reports that even though the CSFs are satisfied and met, there are still some complex cultural and social issues that need attention.

Yeoh and Koronios (2010) posit that organizations that address CSFs are more likely to produce better results. Schieder and Gluchowski (2011) agree but caution that the identification of BI success factors is a complex process. However, they posit that in a company where CSFs are clear and easy to comprehend, the BI stakeholders are enabled to focus on factors that will improve the probabilities of a successful implementation and optimise the scarce resources. This supports Yeo (2002)'s argument that soft human factors such as culture and politics need to be given attention, over and above the more rigid factors.

Bussen and Myers (1997) disagree and criticize the CSF approach by arguing that simply satisfying a rigid CSF does not necessarily determine success or failure of a system. In their study which focused on failures and successes of BI projects, they found that political, social and economic contexts of a BI project is equally important, if not more important, than CSFs to determine BI system success or failure. In the same vein, Sumner (1999) in her study of different BI projects implemented in different blue chip companies found that over and above the widely regarded CSFs, soft human factors like communication, attitudes, personality clashes, and innovation played a crucial role in the success of information management systems.

Despite the contrarian views of some scholars (Bussen & Myers, 1997; Sumner, 1999; Yeo, 2002) regarding CSFs, CSFs and a deep understanding thereof remain critical constructs for decision makers to fully grasp, this enables them to know what is happening at any given time in a BI project (Mungree, Rudra, & Morien, 2013).

Yeoh and Koronios (2010), using a Delphi method with three rounds of interviews, found that CSFs primarily focused on, and could be grouped into three dimensions, namely organizational, process, and technology. Wixom and Watson (2001) also found that success factors of BI could be grouped into organizational, project, and technology. Additionally, the findings of Yeoh and Koronios (2010) suggest that this can enhance communication relating to the effects of CSFs on BI implementation. Olszak (2016) and Yeoh and Koronios (2008) align by positing that BI implementation success factors can be grouped together into organizational, project, and technical dimensions, and further clarify their point by stating that this is to clearly communicate the kinds of effects implementation factors can have. The following section details the BI CSFs as identified in the different research studies.

2.5.1 Management support

In their study, focusing on the different bodies of literature using a systematic literature review as their method, Gaardboe and Svarre (2018) found that most researchers regarded management support as the most important success factor. Arnott and Pervan (2005) opine that decision support systems in their simplest form were designed for management use, hence, management support is critical for these systems to be adopted and embraced. This is supported by Olszak and Ziemba (2012) in their study of 20 Polish SMEs whereby business owners, business analysts, and IT specialists were interviewed. This study found that committed management support is viewed as the biggest barrier for SMEs.

Managers that do not understand BI and its importance usually show no interest in BI. Chang, Hung, Yen and Lee (2010) argue that IT knowledge of the manager or leader is critical in the successful implementation of an information system. Chang et al. (2010) argue that managers with IT knowledge are more likely to succeed in the implementation of BI in their organizations than those without IS knowledge, who tend to fail. Wixom and Watson (2001) agree and their findings confirm that committed management support and team knowledge contribute to overall implementation success. Yeoh and Koronios (2010) emphasize that consistent support and sponsorship from the organization's executive ensure the availability of the necessary resources such as funding and human capital. This is interesting as executives of an

organization normally have a high-level view of the entire organization. Poon and Wagner (2001) also mention the involvement of an executive sponsor that is committed to the system and its limitations. Sammon and Finnegan (2000), in their study of establishing the 10 commandments of data warehousing in big European companies, regard executive sponsorship and commitment as one role, which is somewhat inaccurate. However, this confusion is clarified when one of the interviewees in the study stated that they secured executive support by getting the head of card services to appoint an aggressive manager that would ensure that the project runs accordingly.

Watson et al. (1999) surveyed 106 organizations that implemented data warehousing projects and found that the majority of the projects that were successful were initially mandated by senior management and subsequently supported by management. Howson (2006) also found that many of the participants in her study emphasized the fact that without executive support political issues became showstoppers. Furthermore, Howson (2006) differentiates between management and executives by stating that without ensuring executive sponsor in a big BI project, managers tend to lack the leadership vision and become engrossed in what is happening in the own environments. Rainer and Watson (1995) support this differentiation as they found that the participants in their study noted the different roles that the executive sponsor and management support need to play. The participants in Rainer and Watson (1995)'s study identified the executive sponsor's one key responsibility as gaining support.

2.5.2 Adequate budget and funding

The funding of the BI implementation relies on the level of management support (Yeoh & Koronios, 2010). Wixom and Watson (2010) argue that BI can be seen to be a risky and expensive undertaking, however for a successful implementation, funding needs to be available at every phase of maturity. Williams and Williams (2003) emphasizes this by stating that its currently hard for many organizations to measure the benefits of BI. Furthermore, Williams and Williams (2003) caution that this might dissuade management to commit the resources that are required for a successful implementation. However, Williams and Williams (2003) do not provide clear detail on why management might take this stance but Watson, Abraham, Chen, Preston and Thomas (2004) do precisely that by categorically stating that BI projects are largely complex, expensive and time consuming. Watson et al. (2004) further state that these projects may require seven-digit expenditure and take a long time to start yielding tangible results. In the same vein, Watson, Gerard, Gonzalez, Haywood and Fenton (1999) caution that after these funds are committed to these projects there is always a possibility of them going over budget

and behind schedule or failing completely. As a result of this, Watson et al. (2004) state that the fear of committing large sums of money and subsequently failing can be overcome by building small proof of concepts before implementing on a large scale.

2.5.3 Strategy and vision

BI is a business centric concept and should form part of the overall organizational strategy in order to succeed (Yeoh & Koronios, 2008). Additionally, Yeoh and Koronios (2008) support this by stating that BI, as a business case, should be fully aligned to the corporate vision, as this alignment will determine the outcome and adoption of the BI system. This is supported by Yeoh (2008) who reports that the most successful implementations of BI were found to have formally aligned their business case of introducing BI with their corporate strategy. Wong (2005) indicates that it is imperative that the staff and users of the system in the business understand and support the vision and believe that it will work. This point is further highlighted by Elbashir, Collier and Davern (2008) in arguing that BI systems are no longer being used for strategic decision making only, but also for operational purposes, for companies to succeed there should be overall alignment with the BI strategy both at a tactical and operational level. Dumitriu (2009) opines that it is important for organizations that intend to implement BI to have a BI strategy and justify the strategy to the business. Howson (2006) argues that it is critically important that when the BI environment is established, a thorough evaluation is undertaken on whether the current build is based on the correct requirements or outdated business and data requirements. Howson adds that organizations should take this opportunity to use the BI strategy to create something fundamental for the organization. Williams and Williams (2003) warns that this isn't easy to do, as users are prone to focus more on their day to day operations and fail to envision how BI can be used to achieve long term organizational performance.

2.5.4 Project champion

Poon and Wagner (2001) argue that to ensure that the BI implementation is a success, a competent BI manager or champion must be designated to ensure that the implementation is properly managed from the users' perspective. Yeo (2002) agrees and cautions that without a competent project champion and manager, failure is guaranteed in the implementation. Caldeira and Ward (2002) found that where there was present management support and a designated project champion the companies exhibited positive levels of IS adoption.

Rainer and Watson (1995) report that the executive sponsor is usually responsible in deciding who plays an active role in the executive information system (EIS). Furthermore, Rainer and Watson (1995) argue that when management show a reasonable level of involvement through deciding who gets to play an active role in the form of an operating sponsor then success is normally achieved. Thite (2000) confirms this when he highlights the concept of hybrid project managers, where the project manager has business, managerial and technical skills. Yeoh and Koronios posit that having the right project champion from the business side is critically important. In their study, one participant said, "The team needs a champion. By a champion, I do not mean someone who knows the tools. I mean someone who understands the business and the technology and is able to translate the business requirements into a (high-level) BI architecture for the system" (2010, p. 27). Sumner (1999) aligns with Yeoh and Koronios and reports that the role of a project champion is critical for the project as this role is always critical to marketing the project throughout the organization. Yeo (2002) also found that the absence of an influential sponsor and change agent could lead to project failures. Cooke-Davies (2002) highlights how the absence of a project champion might be of the detriment of the project by positing that project management success does not necessarily amount to project success as a result roles like the project champion are instrumental in bridging the gap between project management success and project success.

Arnott and Pervan (2005) regard the management involved in the project as the client that pays for the system and opine that for the system to be a success, the management also need to act as a champion. This perspective is interesting as it differs from how others (Caldeira & Ward, 2002; Thite, 2000) see management's role as the appointers of the project champion. Wixom and Watson (2001) disagree, stating that champions and management are two different roles and that like management, champions can assist projects with organizational issues, as they are likely to be more in touch with the daily actions and goals of the project team.

2.5.5 Skilled and qualified staff

Sumner (1999) studied information system projects that were regarded as big investments undertaken by big corporations like Monsanto and Anheuser Busch. The findings in his study revealed that the projects were a success partly because there were early efforts made in the training and development of the system users; this was achieved through pairing internal staff with external consultants. Yeoh, Gao and Koronios (2008) concur with this by stating that in their study it was found that end user training and the constant inclusion of users is critical to ensure a successful BI implementation. Davenport (1998) believes that super users are crucial

to the system as they can train and explain the functionality of the system to other users in the company.

Wixom and Watson (2001) attribute team skills to the success of the BI project by stating that the skills of the development team have been attributed and traced back to IS project success. They further state that a highly skilled team should be better equipped to handle, manage, and solve technical problems. Yeoh and Koronios (2010) go beyond technical skills by stating that human skills, from business to technical, are regarded as fundamental for project success. Yeoh and Koronios (2010) further posit that all 15 participants in their Delphi study agreed that the skill composition of the BI team is of high importance, thereby highlighting the importance of having a multi skilled team that shows to have both business and technical skills. In addition to the technical skills and business knowledge cited as fundamental requirements of a BI team, Chen et al. (2012) highlight the importance of the ability to communicate effectively by the BI team. Dumitriu (2009) indicates that in BI projects the many required skills and resources are often not found in one place, but are dispersed throughout the organization. Dumitriu adds that often these required skills are not available from within the organization and have to be brought in from outside in the form of consultants and technical tool specialists.

2.5.6 User involvement and a well-defined business problem

Yeoh et al. (2008) posits that user participation can assist in getting the demands and expectations of the different users met and that doing this ensures that the system addresses the needs of the users. This is supported by Chen, Soliman, Mao and Frolick (2000) in explaining that for a BI system to be successful, users must be fully involved in the project and gain an understanding of the potential benefits of using the system. Hwang, Ku, Yen and Cheng (2004) agree by finding that user participation often leads to better coordination and communication, which as a result can lead to the successful implementation of the system. Wixom and Watson (2001) link user participation to management support by explaining that users are more prone to accept a system if that system is backed by the managers of the organization. Nah, Lau and Kuang (2001) further explain that user participation should roll up to address a specific business problem that is also aligned to the strategy of the business. Nah et al. (2001) further argue that there should be justification of the investment and that this investment should advance the overall business strategy. Yeoh and Koronios (2010) argue that the higher the user participation the more demands and expectations of various end users are met. Therefore, they further argue that once users know exactly what they want and can specify clearly then the BI system stands a better chance of success. Yeoh and Koronios state: “Users know what they

need better than an architect or developer who lacks direct experience of the product" (Yeoh & Koronios, 2010, p. 28). Chen et al. (2012) agree with Yeoh and Koronios, stating that users are critical to the system as they determine what the system should be and determine when changes should happen. Wixom and Watson (2001) align with both Chen et al. (2012) and Yeoh and Koronios (2010), suggesting that users can help the BI project team to stay focused on the requirements and needs of the greater user base and can ensure that this focus is maintained throughout the project.

2.5.7 Effective change management and user expectations

Kim, Lee and Gosain (2005) argue that the lack of appropriate change management processes in an organization, may impede the organization in adapting to new information systems and as a result hinder performance gains. Yeoh et al. (2008) posit that no BI implementation is rigid and that changes are part of a maturing BI system, and that with adequate user participation users will be in a position to expect and embrace change. Yeoh et al. further state that user oriented change management is deemed critical for a BI system's successful implementation. Caldeira and Ward (2002) found that user resistance was lessened by providing training and by management compelling the staff to do their work using the IS. Yeoh and Koronios (2010) indicate that it is advisable for organizations implementing BI to start with small changes and developments and then adopt small incremental changes. Sammon and Finnegan (2000) support this to a degree, stating that organizations that implement BI have to prioritize elements of the system in advance to allow for incremental changes; they further argue that this allows for incremental and iterative change and therefore makes the system flexible. Rainer and Watson (1995) highlight the importance of users having the capability to embrace change as the information requirements change all the time. Therefore, Rainer and Watson (1995) argue that the BI system should be easy to use and adapt quickly to information changes.

2.5.8 Data quality

Howson (2006) regards data as the most important pillar of any BI architecture. Howson emphasizes by saying "If you implement a BI tool on top of messy or irrelevant data, either the bad stuff proliferates throughout your organization or the BI tool quickly becomes shelf ware" (Howson, 2006, p. 2). Dumitriu (2009) supports this view by positing that one of the major reasons BI projects fail is the lack of trust in the analysis primarily caused by data quality problems. Sammon and Finnegan (2000) posit that BI systems typically rely on disparate sources of data, this makes the loading of the data complex, as a result issues of data quality are normally synonymous with a BI system and should therefore not be underestimated by

organizations. Chen et al. (2000) see bad data quality as a prerequisite to implement a data warehouse. On the contrary, Wixom and Watson (2001) consider data quality to be the quality of the data that are already in the data warehouse, and they found that data quality is consequentially related to the system quality. Chaudhuri, Dayal and Narasayya (2011) indicate that the quality of the data can be enhanced by using data profiling tools that can improve the way data are delivered to decision makers. In line with improving data quality, Howson (2006) suggests that business and BI managers should always strive to establish guidelines for acceptable data quality. Yeoh and Koronios (2008) found that in most BI implementations data quality is given attention. However, this is done at the cost of putting data governance measures that will ensure that data quality is consistently maintained. In the same vein, Hawking and Sellitto (2010) caution that the lack of proper data governance in the long term might compromise the system quality.

2.5.9 System quality

In their study to assess which data warehouse architecture is the best, Ariyachandra and Watson (2008) report that system and data quality are intricately linked. Wixom and Watson (2001) found that system and data quality impacted on data warehouse success. Furthermore, they found system quality to be four times more important than data quality. Hawking and Sellitto (2010) focused on the flexibility, scalability, and integration of a system. Ariyachandra and Watson (2008) report that system quality has individual and organizational impacts, and that a system of good quality is normally accepted and embraced by end users. Shin (2003) emphasizes this in his finding, whereby the majority of the issues were system and service quality related. Furthermore, Shin (2003) opines that concerns like accessibility, data quality extracted from source and system design all affected the system quality. Fuchs (2004) linked the quality of the BI system to the consistent maintenance of the system but found that this is not considered as a key factor.

2.5.10 Information systems infrastructure

Baars and Kemper (2008) posit that a BI system user interface will provide a view that displays data as a simple side-by-side layout or a complex layout with combined search, analysis, and presentation functions. Horakova and Skalska (2013) report that at the core of the BI system is the integration of supply chain management (SCM), enterprise resource planning (ERP), customer relationship management (CRM) and any other legacy system that the organization deems important. Hawking and Sellitto (2010) regard this ability to integrate data from multiple source systems as a unique success factor for a BI system. Rainer and Watson (1995) state that

there needs to be a balance between appropriate technology and cost. For example, Rainer and Watson state that there needs to be careful consideration between options of vendor or custom software. This is supported by Arnott and Pervan (2005), highlighting the consideration that have to be made in implementing BI systems, for example they state that many organizations are faced with two fundamental approaches when implementing a data warehouse—whether to implement a departmental level or enterprise-wide data warehouse. Howson (2006) reports that although organizations rolling out BI systems should not expect a linear journey without challenges, they suggest that when standardization is achieved success is more achievable.

2.6 Summary

This detailed review of the CSF literature revealed that the researchers agree on what the CSFs are and more importantly, which ones are the most relevant in the implementing of BI systems. Furthermore, the research identified that CSFs are grouped primarily into the three themes, namely organizational, process/project, and technological. Researchers have broken down these three main themes into sub-categories. Organizational encompasses management support, adequate budget, business strategy, project management; process has subcategories like skilled and qualified staff and user requirements; and technological subcategories are system and data quality, and IS infrastructure.

The above variables are considered the critical factors for successful BI implementation. The literature review explored factors as closely related to BI systems as possible. These variables were identified as the most applicable when formulating a list. Below is a list of factors that are relevant to the success of BI systems and project implementation in an organization.

2.6.1 List of BI CSFs

Table 1 below is a list of CSFs for BI is a fundamental step to determining which CSFs are important for BI in the banking sector. For relevance, some factors are expanded to make it clearer for the different business units. Over and above having a competent BI project champion and manager, project management is added as a factor. In big organizations a competent BI project manager is needed to ensure that resources are available and used accordingly (Thite, 2000; Yeo, 2002).

Organizational strategy is broken down into two factors, namely business unit vision and plan and BI strategy alignment to the greater organization's strategy. This is because this study focussed on individual business units that have their own strategies. Staff training was added to the survey list as a factor. This is because the business units regard training as imperative to

the development of human capital and a way to manage change (Smith, Oczkowski, Macklin, & Noble, 2003). Additionally, skilled and qualified staff is arguably closely related to staff training is several ways.

User involvement and well-defined business problem is split into two factors namely business user involvement and well-defined user requirements because these factors are recognized as two different processes in the context of business. Information systems infrastructure changes to appropriate technology and tools as the different BI projects are most likely to use different tools and technologies.

Table 1. List of CSFs for BI

CSF	Description	References
Committed and informed executive sponsor.	Executive sponsor is important for BI projects especially in the management and pushing back of politics that can threaten success.	Rainer and Watson (1995) Howson (2006) Sammon and Finnegan (2000) Olbrich, Poppelbuß, & Niehaves (2012)
Committed management support.	Management support is regarded as the as the one enabler for the success of a BI project.	Gaardboe and Svarre (2018) Arnott and Pervan (2005) Olszak and Ziemba (2012) Chang et al. (2010) Wixom and Watson (2001) Yeoh and Koronios (2010) Sammon and Finnegan (2000) Watson et al. (2004)
Project champion.	Project champion is an agent that ensures that the BI project remains relevant and the team can be led into understanding the tool technology and business.	Poon and Wagner (2001) Yeo (2002) Caldeira and Ward (2002) Rainer and Watson (1995) Yeoh and Koronios (2010) Sumner (1999) Cooke-Davies (2002) Olbrich et al. (2012)
Skilled and qualified staff.	Staff skills, experience, and expertise are needed to develop a BI system that will produce successful results.	Sumner (1999) Yeoh et al. (2008) Davenport (1998) Yeoh and Koronios (2010) Dumitriu (2009) Olbrich et al. (2012)
Business user involvement.	Business user involvement ensures that the BI systems is relevant and answers the business questions by ensuring that the business requirements are always known.	Yeoh et al. (2008) Chen et al. (2000) Hwang et al. (2004) Nah et al. (2001) Olbrich et al. (2012) Yeoh and Koronios (2010) Chen et al (2012)
Competent BI project manager.	A competent project manager should always be aware that BI projects might over run, stretch resources, and go over budget.	Olszak and Ziemba (2012) Olbrich et al. (2012) Rainer and Watson (1995)
Clear business unit vision and plan.	Each business unit has its own strategy and plans, as a result, unique objectives are declared by each business unit.	Dumitriu (2009) Yeoh and Koronios (2008) Wong (2005) Yeoh (2008) Elbashir et al. (2008)
Align BI strategy with organization's objectives.	The business case of the BI project and its expected value must be clear from the onset and align to the organization's objectives.	Dumitriu (2009) Yeoh and Koronios (2008) Wong (2005) Yeoh (2008) Elbashir et al. (2008)
Adequate budget.	There should be available and adequate financial resources to ensure that resources like consultants, software, and hardware are available so that the BI project is successful.	Yeoh and Koronios (2010) Wixom and Watson (2010) Watson et al. (2004) Howson (2006) Watson et al. (1999)

Staff training.	The upskilling of staff and ensuring that they understand and are able operate the BI system is critically important.	Caldeira and Ward (2002) Yeoh et al. (2008) Ponelis (2013)
Effective change management.	The BI project should be rolled out iteratively and in incremental manageable phases; this ensure that user resistance is minimized.	Kim et al. (2005) Yeoh et al. (2008) Caldeira and Ward (2002) Yeoh and Koronios (2010) Sammon and Finnegan (2000) Rainer and Watson (1995)
Well-defined user requirements.	The BI system cannot exist without users, to ensure that the BI system is relevant, the system user requirements must be of utmost clarity to ensure that they are adequately captured in the system development phase.	Yeoh and Koronios (2010) Watson et al. (2004) Poon and Wagner (2001) Rainer and Watson (1995)
Data quality.	To ensure consistent system success and user trust, the data quality of the data fed into the BI system is critical as it can determine the overall use and acceptance of the BI system.	Howson (2006) Dumitriu (2009) Sammon and Finnegan (2000) Chen et al. (2000) Chaudhuri et al. (2011) Wixom and Watson (2001)
System quality.	To remain relevant and valuable, the BI system should be of high quality by always being available and accessible and ensuring that flexibility and scalability are possible.	Ariyachandra and Watson (2008) Wixom and Watson (2001) Hawking and Sellitto (2010) Shin (2003)
Appropriate technology and tools.	The BI system should have the capability to fit easily into the organization's existing technological infrastructure.	Baars and Kemper (2008) Hawking and Sellitto (2010) Rainer and Watson (1995) Arnott and Pervan (2005)

2.6.2 Hypotheses

Based on the established list above, hypotheses were formulated for each CSF as below:

Hypothesis 1: The participants of the study will rate the CSFs as important.

- Hypothesis 1a: Committed and informed executive sponsor will be identified as important.
- Hypothesis 1b: Committed management support will be identified as important.
- Hypothesis 1c: Project champion will be identified as important.
- Hypothesis 1d: Skilled and qualified staff will be identified as important.
- Hypothesis 1e: Business user involvement will be identified as important.
- Hypothesis 1f: Competent BI project manager will be identified as not important.
- Hypothesis 1g: Clear business unit vision and plan will be identified as important.
- Hypothesis 1h: Align business unit BI strategy with organization's objectives will be identified as important.
- Hypothesis 1i: Adequate budget will be identified as important.

- Hypothesis 1j: Staff training will be identified as important.
- Hypothesis 1k: Effective change management will be identified as important.
- Hypothesis 1l: Well-defined user requirements will be identified as important.
- Hypothesis 1m: Data quality will be identified as important.
- Hypothesis 1n: System quality will be identified as important.
- Hypothesis 1o: Appropriate technology and tools will be identified as important.

Hypothesis 2: The ratings between the Business and IT participants will align.

Hypothesis 3: The importance of the CSFs will align between the different projects.

3 RESEARCH METHODOLOGY

3.1 Research aim and objectives

The purpose of this research is to determine which CSFs associated with BI are regarded as important for the South African banking sector. The identification of the CSFs will in turn result in findings on which players in the banking sector can focus when implementing BI. The literature review discussed and identified CSFs associated with achieving success in Business Intelligence. Based on the literature review a list of 15 CSFs, which provided the foundation for the research, was created. The objective of this section is to outline the research methodology used in gathering and analysing the data for this research study.

3.2 Research method and design

Most studies (Hawking & Sellitto, 2010; Hwang et al., 2004; Kim, Lee & Gosain, 2005; Olbrich et al., 2012; Wixom & Watson, 2001; Yeoh & Koronios, 2010) exploring CSFs have followed the quantitative methodology in establishing CSFs for BI and other forms of information systems, this is because this type of research methodology seeks to test hypothesis and precisely measure concepts. Ragin (2014) posits that research studies that use the quantitative methodology start by establishing a set of hypotheses that can be tested once the data has been collected.

According to Kwon and Zmud (1987), factor research normally collects quantitative data to determine the importance of variables. The current study researched CSFs, therefore quantitative methodology was deemed relevant. However, Johnson (2001) states that quantitative research design can be classified into two categories, namely experimental and non-experimental designs. Furthermore, he states that the vast majority of academic studies are non-experimental because the important variables of these research studies are not rigid and cannot be manipulated. Kalaian (2008) states that the simple goal of non-experimental research design is to answer research questions by identifying relevant factors and relationships among these factors. Once this is done, a detailed quantitative description of the subject or phenomena of the study can be provided.

Aligning with the study's aim to establish the perceptions around the CSFs involved in the successful implementation of BI, a quantitative non-experimental research design was chosen as the appropriate approach.

3.3 Type of data collected

Part of the data collection process in this research was to compile a survey based on a 5-point Likert scale, where each of the five responses had a numerical value, measuring the level of importance on the identified CSFs (**i.e.** from 1 'not at all important' to 5 'extremely important'). Likert (1932) developed this tool to accurately measure the attitudes of what a group of people think on a subject. Bowling (1997) opines that a five or seven-point scale to state the level of agreement can be used. The objective of the questionnaire was to collect suitable data to rigorously test the significance of the proposed hypotheses and for identifying the factors that are regarded as important for BI by South African banks. For this study, the Likert scale was embedded on an online survey where the research participants were asked to specify each individual CSF's level of importance, consequently this collected data have been used by the researcher to test the hypotheses and ultimately determine which CSFs are regarded as important in the banking sector.

According to Kumar (2014), instruments such as the Likert scale produce ordinal data and therefore, this data cannot be used to compute descriptive analysis like variance and standard deviation. Ragin (2014) argues that statistical measures like the mode and the median can be derived from ordinal data; however, Ragin further argues that one cannot measure the distance between the different ordinal scale levels.

With this research study using a Likert scale, ordinal measures were used as a result. Likert (1932) reports that ordinal scales are suitable for non-parametric statistics. Bowling (1997) supports this by stating that statistics such as modes, Kruskal Wallis test, chi-square, Mann-Whitney test for inference can be computed. For the purposes of this study, detailed frequency tables, the Mann-Whitney test and the Kruskal Wallis test, were used to test the hypotheses.

3.4 Method of data collection

A literature review was conducted and emanating from the literature review a conceptual list of CSFs was established. Finally, a survey was conducted to collect quantitative data to measure the importance of the identified CSFs. Kalaian (2008) states that survey research is a systematic process for collecting data from a sample of participants utilising instruments of open-ended or closed-ended questions. Surveys are commonly used in non-experimental research designs; therefore, a web-based survey was identified as appropriate for this research study.

Web-based surveys are used to collect different, small and large, amounts of data, depending on the aim of the study. Online surveys are regarded as an effective way of surveying research participants. Fricker and Schonlau (2002) found some key advantages and disadvantages of web-based surveys:

Advantages

- Timeliness, web survey responses are collected very quickly.
- Cost, it is relatively cheap to set up a web-based survey.
- Logistics, distributing the survey is very easy and requires minimal effort.
- Anonymity of the participants is often guaranteed.

Disadvantages

- Unanticipated technical errors.
- Easy for would be participants to ignore and not participate.
- Some participants may not be well versed with the technology used.
- Some participants may not be able access the electronic survey.

In line with the objectives of this research study, a web-based survey was appropriate because of the below advantages and disadvantages:

Benefits

- Given the disparity of the respondents, in terms of positions, job demands, and location, a web-based survey ensured that a questionnaire could be completed at the convenience of the different respondents.
- Rule enforcement, the survey tool had functionality to enforce mandatory responses, which increased the validity of the responses.
- Speedy responses and completion
- The survey tool provided a reporting tool that provided information on the number of respondents and completion rates.
- Sending the web-based questionnaire was very easy.

Disadvantages

- Some respondents regard web-based surveys as a waste of time.
- Anonymity of the respondents.
- High dropout rate and low responses.

3.5 Survey design

For this study, Survey Monkey was the platform of choice. The platform was chosen for its popularity and for typically being the tool of choice for web-based surveys, its response analysis features, and its ease of use. A Likert scale was embedded on a web-based survey. The questionnaire was circulated for the purposes of collecting and analysing the responses where the research participants were asked to measure each individual CSF's level of importance, consequently this collected data have been used by the researcher to test the hypotheses and to determine which CSFs are regarded as highly important in the banking sector.

The questionnaire used closed-ended questions to collect data and it had two main sections. The first section focused on collecting demographic data of the respondents and the specific BI projects in which they are involved. This section sought to collect information on the type of BI system, the respondent's overall experience, and the respondent's job title.

The second section was the core section of the questionnaire; this section was where the actual importance of 15 different CSFs was identified by the different respondents. This section provided a list of 15 CSFs for the respondents to rate from "Not At All Important" to "Extremely Important". Additionally, this section required respondents to specify any other important factors that were not identified as part of this study. The basic rationale behind the last part of section two was to seek additional information regarding the CSFs for implementing BI in the banking sector.

3.6 Target population

The target population for this study is the South African banking sector. The South African banking sector is one of the most sophisticated and advanced banking sectors in Africa (South African Reserve Bank [SARB], 2016). The South African banking sector is dominated by five large incumbents, which own over 90% of the total banking asset base (SARB, 2016). This research study focused on four of the five largest banks of the South African banking sector (see Table 2 below).

Table 2. South African banks by assets

Bank	Assets (R million)	Growth
1. Standard Bank	1 254 849	+1,64%
2. First Rand Bank	1 120 747	+10,23%
3. Absa	983 378	+7,51%
4. Nedbank	892 006	+2,60%
5. Investec	415 285	+7,29%
6. Capitec	87 033	+21,34%
7. African Bank	31 356	-14%
8. Grindrod Bank	16 696	+9,91%
9. Mercantile Bank	12 892	+8,9%
10. Bidvest Bank	8 508	+21,39%
11. Sasfin	7 778	14,97%
12, Albaraka Bank	5 930	+10,10%
13. Ubank	5 224	12,90%
14. HBZ Bank	4856	+14,97%
15. South African Bank of Athens	2 355	+3,95%

3.7 Sample

As stated above, the study focused on the four large banks of the South African banking sector. From each bank, a BI project was identified. These BI projects were identified based on their strategic significance to their respective banks. To extract the sample, the study used both purposive and snowball sampling, this is because the researcher sought to identify the key stakeholders in the form of project managers from each of the banks identified and their respective BI projects. Consequently, these BI project managers were then asked to schedule a meeting where the researcher would give all possible participants a detailed breakdown on the research study. However, this proved to be impossible due to the clashes of schedules for all involved. As a result, the respective BI project managers were asked by the researcher, to

disseminate the questionnaire to all the identified key stakeholders involved in their respective BI projects. As a result, the BI project managers became the primary contacts of the researcher.

This form of sampling approach was taken because of the researcher not having access to the different groups of possible participants and the possible participants of the study having different schedules and being in different places at different times. Kumar (2014) states that snowballing as a form of sampling technique is useful if the researcher knows little about the group or organization, however, he also cautions that it is quite risky as the researcher puts the choice of the entire sample upon the choice of these key individuals. This could lead to the study being biased if the individual is part of a faction in the organization.

To mitigate this risk the researcher emphasized the importance of the survey being taken by a variety of stakeholders with relevant experience, which are involved in the specific BI projects. This was communicated to the respective BI project managers as they play the central role in carrying forward the project. To ensure that this was recorded the list of job titles was included as one of the questions in the questionnaire.

3.8 Validity

When one looks at the concept of validity one is always met with a set of unclear and confusing ideas (Hammersley, 1987). Winter (2000) reports that validity simply refers to the means of measurement in a study being accurate and that the tools of measurement are actually measuring precisely what they are intended to measure. Kumar (2014) states that validity is about the research instrument providing relevant answers to the research questions, and if so, are these answers obtained using appropriate methods and procedures. Many authors (Hammersley, 1987; Kumar, 2014; Roberts & Priest, 2006; Winter, 2000) posit that there are several types of validity to consider when undertaking a research study, namely, face validity, criterion-related validity, content validity and construct validity.

For the purposes of this research study, content validity was the most appropriate type of validity to be used. This is because this research study's questionnaire aimed to measure the opinions and attitudes of the individuals involved in various BI projects, towards a list of pre-determined CSFs identified through the literature review. As a result, content validity was checked by sending a pilot questionnaire to a panel of four highly experienced BI consultants and the academic supervisor to test respondents before it was declared ready to be used for data collection. Feedback in the form of comments was received, and the initial questionnaire was

altered to produce the final draft of the questionnaire, which would be ready to be sent to the actual respondents.

3.9 Reliability

Reliability relates to the ability of the questionnaire to be consistent at all times it is used (Kumar, 2014). Roberts and Priest (2006) argue that essentially any research tool should produce the same output even when used at different times or by different people; furthermore, Roberts and Priest (2006) identify these two types of reliability tests as inter-rater reliability and test-retest reliability, respectively. Heal and Twycross (2015) support this by stating that internal consistency, which is the extent to which items on a scale measure one construct, is the most common method used to test reliability.

The test-retest method is also effective, as the researcher gives the same test instrument to the same group of participants at two different times (Kumar, 2014). Kumar adds that the ratio between the test and rest scores indicates reliability. However, for the purposes of this research study, time did not allow for the test and retest method, therefore Cronbach's α, which measures the internal consistency of the instrument or the total average correlations in every combination of split-halves determined (Heale & Twycross, 2015), is appropriate for the purposes of this study. An acceptable reliability score is one that is 0.7 and higher (Hair, Anderson, Tatham, & Black, 1998; Heale & Twycross, 2015)

Therefore, a Cronbach's analysis was conducted on the Likert scale of the CSF survey to test its reliability. It was found that the alpha level was .715, which indicates that the scale has an adequate and reasonable level of inter-item reliability. After further analysis, it was found that deleting some of the variables would have slightly improved the alpha; however, the improvement would have not been significant. As a result, the alpha .715 was adequate to proceed with utilising the scale in the study (see Appendix A).

4 RESEARCH RESULTS AND DATA ANALYSIS

4.1 Introduction

In the previous section, the research methodology adopted for this study and development of the research questionnaire were discussed. This section discusses the interpretation and analysis of the collected data from the questionnaire. In addition, this section outlines the descriptive and statistical analysis of the identified BI CSFs and provides insight into the perceptions of the participants on the different CSFs.

4.2 Demographic data analysis

The questionnaire, in the form of a link, was sent by email to the four BI project stakeholders, primarily project managers, of the big four South African banks. These initial recipients of the questionnaire were asked to forward the link to other key BI project stakeholders involved in the implementation of the respective BI project. Fifty-six respondents from an estimated 80 participated in the questionnaire. It was difficult to estimate the number of possible respondents as the link was forwarded to them by the BI project manager, who in effect acted as an intermediary. Two rounds of emails had to be sent to the initial recipients to solicit a higher response rate. From the estimated number of respondents, a final response rate of 63.75% was received. There were 5 skipped responses, meaning 51 valid responses were used in the study.

4.2.1 Response by stakeholder group.

The respondents that participated in the study primarily come from a Business and information technology (IT) stakeholder group. From the 56 respondents, 5 responses were incomplete—3 from Business and 2 from IT. Of the 56 respondents that participated in the study, 26 came from an IT background and 30 from the Business background, which represented 46.43% and 53.57% respectively, as listed in Table 3 below.

Table 3. Participants by expert categories

ANSWER CHOICES	RESPONSES	
IT	46.43%	26
Business	53.57%	30
TOTAL		56

4.2.2 Response by working experience.

Furthermore, the respondents, both from IT and Business backgrounds, represent a wide range of stakeholders playing diverse roles in the different banks and BI projects. From the 56

respondents, the respondent with the longest work experience had over 30 years and the respondents with the least working experience had 3-5 years. The majority of the respondents had a reasonable amount of working experience, with 25 respondents (44.64%) having between 11-20 years working experience as listed in Table 4 below.

Table 4. Respondents by working experience

ANSWER CHOICES	RESPONSES	
Less than 3 years	0.00%	0
3-5 years	3.57%	2
6-10 years	35.71%	20
11-20 years	44.64%	25
21-30 years	14.29%	8
Over 30 years	1.79%	1
TOTAL		56

4.2.3 Response by job title

All of the job titles represented in the questionnaire had a response except for two, namely graduate and junior analyst. This was expected as the study focused on seasoned experts that had wide ranging BI project experience and not only BI users. The survey indicated a balanced response rate between consultants, managers, senior managers, and executives. Of the 56 respondents, managers had the highest representation at 25%, followed by senior managers at 23.21%, consultants at 19.64%, and executives at 14.29%, as listed in Table 5 below.

Table 5. Respondents by job title

ANSWER CHOICES	RESPONSES	
Graduate	0.00%	0
Junior Analyst	0.00%	0
Analyst	1.79%	1
Senior Analyst	7.14%	4
Consultant	19.64%	11
Junior Manager	8.93%	5
Manager	25.00%	14
Senior Manager	23.21%	13
Executive	14.29%	8
TOTAL		56

4.2.4 Response by BI project

As stated above, the four BI projects listed in this research study are representative of the big four South African banks. Each project from each bank received a pseudonym to maintain anonymity. From a participation perspective, all four projects were well represented in the survey. The highest participating project was 26.79% and the lowest 21.43%, with the exception of 1 participant who noted "other" (1.79%). Table 6 below depicts the participants by project.

Table 6. Respondents by BI project.

ANSWER CHOICES	RESPONSES	
Portfolio Management Tool (PMT)	26.79%	15
Client Revenue Tracking (CRT)	23.21%	13
Universal Cube	21.43%	12
Bank Analyzer (BA)	26.79%	15
Other	1.79%	1
TOTAL		56

4.3 Critical success factors data analysis

In this section, the significance and importance of the CSFs identified in the literature review is analysed. The participants of the survey were asked to rate each CSF from "Not At All Important" to "Extremely important"; additionally, each of these CSFs were allocated a value, from 1 for "Not At All Important" to 5 for "Extremely important". Because of the rating of the CSFs by the respondents, the data provide several options for ranking. For the purpose of this analysis, a descending ranking using the mean rank to provide a list of prioritized CSFs was computed. This means that the weighted mean variable was used as the sorting key. The analysis in Table 7 below indicates the ranking of the prioritized CSFs.

Table 7. Prioritized CSFs

Descriptive Statistics

	N	Mean	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
Dataquality#	51	4.80	4	5	5.00	5.00	5.00
Welldefineduserrequirements#	51	4.78	4	5	5.00	5.00	5.00
Businessuserinvolvement#	51	4.63	3	5	4.00	5.00	5.00
Committedmanagement support#	51	4.55	3	5	4.00	5.00	5.00
AlignBIstrategywithorganizationsobjectives#	51	4.47	2	5	4.00	5.00	5.00
Systemquality#	51	4.45	3	5	4.00	5.00	5.00
Skilledandqualifiedstaff#	51	4.43	3	5	4.00	4.00	5.00
Effectivechangemanagement#	51	4.41	3	5	4.00	4.00	5.00
Appropriatetechnologyandtools#	51	4.39	3	5	4.00	4.00	5.00
Adequatebudget#	51	4.35	1	5	4.00	4.00	5.00
Stafftraining#	51	4.29	2	5	4.00	4.00	5.00
Projectchampion#	51	4.24	3	5	4.00	4.00	5.00
Committedandinformedexecutivesponsor#	51	4.16	1	5	4.00	4.00	5.00
CompetentBIprojectmanager#	51	4.10	2	5	4.00	4.00	5.00
Clearbusinessunitvisionandplan#	51	3.94	1	5	4.00	4.00	5.00

The results in Table 7 above display that the top 3 CSFs found to be most important was data quality, followed by well-defined user requirement and business user involvement. This means that these top 3 CSFs received the most 4 and 5 ratings. The importance of the CSFs was determined using the below Likert ratings and descriptions (see Table 8 below).

Table 8. Likert scale descriptions and ratings

Value	Likert Scale Option	Description
1	Not At All Important	Not At All Important
2	Low Importance	Important to a Small Degree
3	Neutral	Important to a Moderate Degree
4	Very Important	Important to a Considerable Degree
5	Extremely Important	Important to a Great Degree

The results for the individual CSFs, with detailed findings and conclusions, are outlined in Section 5. Only 5 respondents skipped the questions pertaining to the CSFs. The remaining 51 respondents answered all the questions. The following CSFs are based on the question of how the different CSFs are identified by the participants. The results below are ordered in a logical flow by CSF and according to their respective hypothesis.

4.3.1 Hypothesis 1: The participants of the study will rate the CSFs as important.

Hypothesis 1a: Committed and informed executive sponsor will be identified as important.

On the committed and informed executive sponsor CSF, 47% of these respondents thought that it was very important, while 39% perceived it to be extremely important. Cumulatively, 86% (44) respondents believed that this CSF is either very important or extremely important (see Table 9 below).

Table 9. Committed and informed executive sponsor

Committedandinformedexecutivesponsor#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not At All Important	1	2.0	2.0	2.0
	Low Importance	3	5.9	5.9	7.8
	Neutral	3	5.9	5.9	13.7
	Very Important	24	47.1	47.1	60.8
	Extremely Important	20	39.2	39.2	100.0
	Total	51	100.0	100.0	

Hypothesis 1b: Committed management support will be identified as important.

Committed management support was perceived as either very important or extremely important by 21 and 29 respondents respectively. These 50 respondents make up a cumulated 98%, where 41% thought that having committed management support was very important and 57% thought that it was extremely important (see Table 10 below).

Table 10. Committed management support

Committedmanagementsupport#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	1	2.0	2.0	2.0
	Very Important	21	41.2	41.2	43.1
	Extremely Important	29	56.9	56.9	100.0
	Total	51	100.0	100.0	

Hypothesis 1c: Project champion will be identified as important.

Having a project champion was indicated as being either very important or extremely important by 44 (86%) of the 51 respondents. The split was very important 25 (49%) and extremely important 19 (37%). Furthermore, 7 of the 51 respondents (14%) thought that this CSF is neutral (see table 11 below).

Table 11. Project champion

Projectchampion#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	7	13.7	13.7	13.7
	Very Important	25	49.0	49.0	62.7
	Extremely Important	19	37.3	37.3	100.0
	Total	51	100.0	100.0	

Hypothesis 1d: Skilled and qualified staff will be identified as important.

From the 51 respondents, 25 (49%) perceived this CSF as extremely important while 23 (45%) perceived it as very important (see Table 12 below).

Table 12. Skilled and qualified staff

Skilledandqualifiedstaff#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	3	5.9	5.9	5.9
	Very Important	23	45.1	45.1	51.0
	Extremely Important	25	49.0	49.0	100.0
	Total	51	100.0	100.0	

Hypothesis 1e: Business user involvement will be identified as important.

Business user involvement was seen as either very important or extremely important by 50 of the 51 respondents, with 33% (17) deeming it very important, and 65% (33) indicating that it was extremely important (see Table 13 below).

Table 13. Business user involvement

Businessuserinvolvement#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	1	2.0	2.0	2.0
	Very Important	17	33.3	33.3	35.3
	Extremely Important	33	64.7	64.7	100.0
	Total	51	100.0	100.0	

Hypothesis 1f: Competent BI project manager will be identified as not important.

Contrary to the study's hypothesis, in responding to competent BI project manager as a CSF, 28 respondents (55%) thought that it was very important, and 15 (29%) thought it was extremely important. Additionally, 12% (6) of the respondents thought that this CSF was neutral (see Table 14 below).

Table 14. Competent BI project manager

CompetentBIprojectmanager#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low Importance	2	3.9	3.9	3.9
	Neutral	6	11.8	11.8	15.7
	Very Important	28	54.9	54.9	70.6
	Extremely Important	15	29.4	29.4	100.0
	Total	51	100.0	100.0	

Hypothesis 1g: Clear business unit vision and plan will be identified as important.

Having a clear business unit vision and plan was perceived as either very important 24 (47%) or extremely important by 16 (31%) of respondents, respectively. These 40 respondents make up a cumulated 78%. Six of the 51 respondents were neutral and the remaining 2 and 3 indicated not at all important and low importance respectively (see Table 15 below).

Table 15: Clear business unit vision and plan

Clearbusinessunitvisionandplan#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not At All Important	3	5.9	5.9	5.9
	Low Importance	2	3.9	3.9	9.8
	Neutral	6	11.8	11.8	21.6
	Very Important	24	47.1	47.1	68.6
	Extremely Important	16	31.4	31.4	100.0
	Total	51	100.0	100.0	

Hypothesis 1h: Align business unit BI strategy with organization's objectives will be identified as important.

Of the 51 respondents, 48 thought that it was either very important (39%) or extremely important (55%) to align BI strategy with the organization's objectives (see Table 16 below).

Table 16. Align BI strategy with organization's objectives

AlignBIstrategywithorganizationsobjectives#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low Importance	1	2.0	2.0	2.0
	Neutral	2	3.9	3.9	5.9
	Very Important	20	39.2	39.2	45.1
	Extremely Important	28	54.9	54.9	100.0
	Total	51	100.0	100.0	

Hypothesis 1i: Adequate budget will be identified as important.

Adequate budget was regarded as either very important by 22 (43%) or extremely important by 25 (49%) respondents, while 2 respondents believed it was of no importance or low importance (see Table 17 below).

Table 17. Adequate budget

Adequatebudget#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not At All Important	1	2.0	2.0	2.0
	Low Importance	1	2.0	2.0	3.9
	Neutral	2	3.9	3.9	7.8
	Very Important	22	43.1	43.1	51.0
	Extremely Important	25	49.0	49.0	100.0
	Total	51	100.0	100.0	

Hypothesis 1j: Staff training will be identified as important.

Staff training was considered by 86% (44) of respondents to be either very important or extremely important. This is broken down into 41% (21) of respondents indicating this CSF to be very important, while 45% (23) perceived it as extremely important. A further 12% thought that staff training was a neutral CSF (see Table 18 below).

Table 18. Staff training

Stafftraining#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low Importance	1	2.0	2.0	2.0
	Neutral	6	11.8	11.8	13.7
	Very Important	21	41.2	41.2	54.9
	Extremely Important	23	45.1	45.1	100.0
	Total	51	100.0	100.0	

Hypothesis 1k: Effective change management will be identified as important.

A significant 92% respondents perceived effective change management as either very important or extremely important, 43% (22) believing it was very important and 49% (25) considering this CSF as extremely important (see Table 19 below).

Table 19. Effective change management

Effectivechangemanagement#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	4	7.8	7.8	7.8
	Very Important	22	43.1	43.1	51.0
	Extremely Important	25	49.0	49.0	100.0
	Total	51	100.0	100.0	

Hypothesis 1l: Well-defined user requirements will be identified as important.

All 51 (100%) respondents considered well-defined user requirements as either very important (11=22%) or extremely important (40=78%) (see Table 20 below).

Table 20. Well-defined user requirements

Welldefineduserrequirements#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Important	11	21.6	21.6	21.6
	Extremely Important	40	78.4	78.4	100.0
	Total	51	100.0	100.0	

Hypothesis 1m: Data quality will be identified as important.

Data quality was considered very important or extremely important by all 51 respondents, constituting 10 (20%) very important and 41 (80%) extremely important (see Table 21 below).

Table 21. Data quality

Dataquality#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Important	10	19.6	19.6	19.6
	Extremely Important	41	80.4	80.4	100.0
	Total	51	100.0	100.0	

Hypothesis 1n: System quality will be identified as important.

System quality was perceived as either very important or extremely important by 18 and 28 respondents, respectively. These 46 respondents make up a cumulative 90%, where 35% thought that system quality was very important, and 55% thought that it was extremely important. The remaining 10% identified this CSF as being neutral (see Table 22 below).

Table 22. System quality

Systemquality#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	5	9.8	9.8	9.8
	Very Important	18	35.3	35.3	45.1
	Extremely Important	28	54.9	54.9	100.0
	Total	51	100.0	100.0	

Hypothesis 1o: Appropriate technology and tools will be identified as important.

Of the 51 respondents, 48 thought that it was either very important (25=90%) or extremely important (23=45%) to have appropriate technology and tools (see Table 23 below).

Table 23. Appropriate technology and tools

Appropriatetechnologyandtools#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	3	5.9	5.9	5.9
	Very Important	25	49.0	49.0	54.9
	Extremely Important	23	45.1	45.1	100.0
	Total	51	100.0	100.0	

4.3.2 Hypothesis 2: The ratings between the Business and IT participants will align

This hypothesis postulated that there would be alignment of perceptions between the participants from the different stakeholder groups. Below are the results from the Mann Whitney test used to test this hypothesis.

Committed and informed executive sponsor

The mean rank between the IT and Business stakeholder groups are perceivably different, with IT having a mean rank of 24.41 and Business a mean rank of 27.30. The mean ranks show that the Business stakeholder group regard this CSF a bit more highly than the IT group.

On the contrary, analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.756 and a p value of .450, which is more than the alpha of 0.05. The inference is that the perceived difference in the mean ranks, between IT and Business participants, is statistically insignificant. Therefore, the null hypothesis that the two groups align and do not differ is accepted in this regard. Both IT and Business stakeholders regard committed and informed executive sponsor as equally important (see Appendix C).

Committed management support

For this particular CSF, committed management support, the mean rank between the IT and Business stakeholder group are perceivably varied with IT having a mean rank of 28.30 and Business a mean rank of 24.11. The mean ranks show that the IT stakeholder group regard this CSF considerably higher than the Business stakeholder group.

Conversely, analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -1.161 and a p value of .246, which is more than the alpha of 0.05. This confirms that the perceived difference in the mean ranks, between IT and Business stakeholder groups, is statistically insignificant. Therefore, the null hypothesis that the two groups align and do not differ is accepted in this regard. Both IT and Business stakeholders regard committed management support as equally important (see Appendix C).

Project champion

For this particular CSF, project champion, the mean rank between the IT and Business stakeholder group are perceivably different, with IT having a mean rank of 27.48 and Business a mean rank of 24.79. The mean ranks show that the IT stakeholder group regard this CSF higher than the Business stakeholder group.

Statistical analysis on this variable shows that there is no statistical difference. This confirms that the perceived difference in the mean ranks, between IT and Business stakeholder groups, is statistically insignificant. This is supported by the Z value of -.707 and a p value of .479, which is more than the alpha of 0.05. Therefore, the null hypothesis that the two groups align

and do not differ is accepted for this CSF. Both IT and Business stakeholders regard project champion as equally important (see Appendix C).

Skilled and qualified staff

For skilled and qualified staff, the mean rank between the IT and Business stakeholder group are perceivably different, with IT having a mean rank of 24.78 and Business a mean rank of 27.00. The mean ranks demonstrate that the IT stakeholder group regard this CSF lower than the Business stakeholder group.

Statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.596 and a p value of .551, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant. Therefore, the null hypothesis that the two groups align and do not differ is accepted. Both IT and Business stakeholders regard skilled and qualified staff as equally important (see Appendix C).

Business user involvement

For business user involvement, the mean rank between the IT and Business stakeholder group are perceivably different, with IT having a mean rank of 26.30 and Business a mean rank of 25.75. The mean ranks demonstrate that the IT stakeholder group's mean rank is slightly higher than the Business stakeholder group's mean rank.

Statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.159 and a p value of .873, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant. Therefore, the null hypothesis that the two groups align and do not differ is accepted. Both IT and Business stakeholders regard business user involvement the same (see Appendix C).

Competent BI project manager

For competent BI project manager, the mean rank between the IT and Business stakeholder group are perceivably different, with IT having a mean rank of 24.98 and Business a mean rank of 26.84. The mean ranks demonstrate that the IT stakeholder group's mean rank is lower than the Business stakeholder group's mean rank.

Statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.495 and a p value of .621, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant. Therefore, the null hypothesis that the two groups align and do not differ is accepted. Both IT and Business stakeholders regard competent BI project manager the same (see Appendix C).

Clear business unit vision and plan

For this variable the mean rank between the IT and Business stakeholder group are perceivably different, with IT having a mean rank of 23.46 and Business a mean rank of 28.09. The mean ranks demonstrate that the IT stakeholder group's mean rank is significantly lower than the Business stakeholder group's mean rank.

Statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -1.192 and a p value of .233, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant.

Therefore, the null hypothesis that the two groups align and do not differ is accepted. Statistically, both IT and Business stakeholders regard clear business unit vision and plan the same. (See Appendix C).

Align BI strategy with organization's objectives

For this variable the mean rank between the IT and Business stakeholder group are perceivably different, with IT having a mean rank of 26.59 and Business a mean rank of 25.52. The mean ranks demonstrate that the IT stakeholder group's mean rank is slightly higher than the Business stakeholder group's mean rank.

Statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.290 and a p value of .772, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant. Therefore, the null hypothesis that the two groups align and do not differ is accepted. Statistically, both IT and Business stakeholders align on this variable (see Appendix C).

Adequate budget

For this variable the mean rank between the IT and Business stakeholder group are perceivably different, with IT having a mean rank of 26.61 and Business a mean rank of 25.50. The mean ranks demonstrate that the IT stakeholder group's mean rank is slightly higher than the Business stakeholder group's mean rank.

Statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.296 and a p value of .767, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant.

Therefore, the null hypothesis that the two groups align and do not differ is accepted. Statistically, both IT and Business stakeholders classify adequate budget the same (see Appendix C).

Staff training

For staff training the mean rank between the IT and Business stakeholder group are perceivably different. The IT stakeholder group has a mean rank of 26.17 and the Business stakeholder group a mean rank of 25.86. The mean ranks demonstrate that the IT stakeholder group's mean rank is slightly higher than the Business stakeholder group's mean rank.

Statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.083 and a p value of .934, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant.

Therefore, the null hypothesis, which postulates that the two groups align and do not differ, is accepted. Statistically, both IT and Business stakeholders regard staff training the same (see Appendix C).

Effective change management

For effective change management, the mean rank between the IT and Business stakeholder group are perceivably different. The IT stakeholder group has a mean rank of 25.04 and the Business stakeholder group a mean rank of 26.79. The mean ranks demonstrate that the IT stakeholder group's mean rank is lower higher than the Business stakeholder group's mean rank.

The statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.465 and a p value of .642, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant.

Therefore, the null hypothesis, which postulates that the two groups align and do not differ, is accepted. Statistically, both IT and Business stakeholders regard effective change management the same (see Appendix C).

Well-defined user requirements

For well-defined requirements, the mean rank between the IT and Business stakeholder group are perceivably different. The IT stakeholder group has a mean rank of 27.07 and the Business stakeholder group a mean rank of 25.13. The mean ranks demonstrate that the IT stakeholder group's mean rank is higher than the Business stakeholder group's mean rank.

The statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.651 and a p value of .515, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant.

Therefore, the null hypothesis, which postulates that the two groups align and do not differ, is accepted. Statistically, both IT and Business stakeholders regard well-defined user requirements the same (see Appendix C).

Data quality

For data quality, the mean rank between the IT and Business stakeholder group are perceivably different. The IT stakeholder group has a mean rank of 26.57 and the Business stakeholder group a mean rank of 25.54. The mean ranks demonstrate that the IT stakeholder group's mean rank is slightly higher than the Business stakeholder group's mean rank.

The statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.358 and a p value of .721, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant.

Therefore, the null hypothesis, which postulates that the two groups align and do not differ, is accepted. Statistically, both IT and Business stakeholders regard data quality the same (see Appendix C).

System quality

For system quality, the mean rank between the IT and Business stakeholder group are perceivably different. Both the IT and Business stakeholder groups have a mean rank of 26.00. These mean ranks demonstrate that the IT stakeholder group's mean rank is equal to the Business stakeholder group's mean rank.

Consequently, the statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of .000 and a p value of 1.000, which is more than the alpha of 0.05. This means that for this variable the IT and Business stakeholder groups were identical.

Therefore, the null hypothesis, which postulates that the two groups align and do not differ, is accepted. Statistically, both IT and Business stakeholders regard data quality the same (see Appendix C).

Appropriate technology and tools

For this variable, the mean rank between the IT and Business stakeholder group are perceivably different. The IT stakeholder group has a mean rank of 24.17 and the Business stakeholder group a mean rank of 27.50. The mean ranks demonstrate that the IT stakeholder group's mean rank is lower than the Business stakeholder group's mean rank.

The statistical analysis on this variable shows that there is no statistical difference. This is informed by the Z value of -.894 and a p value of .371, which is more than the alpha of 0.05. This confirms that the perceived difference between the mean ranks for IT and Business stakeholder groups is statistically insignificant.

Therefore, the null hypothesis, which postulates that the two groups align and do not differ, is accepted. Statistically, both IT and Business stakeholders regard data quality the same (see Appendix C).

4.3.3 Hypothesis 3: The importance of the CSFs will align between the different projects

It was hypothesised that the CSFs will be broadly identified as important. To gain a deeper insight into this hypothesis, the study pursued to establish if there were any significant differences from the respondents representing the different projects. To test this hypothesis the Kruskal Wallis test was used as stated in Section 3.3 and Section 3.7. This method was used to conduct this test because the data were found to be nonparametric and the independent variable had more than three items.

This analysis was performed on all the 15 CSFs. The testing of these variables—committed and informed executive sponsor, committed management support, project champion, skilled and qualified staff, business user involvement, competent BI project manager, align BI strategy with organization's objectives, adequate budget, staff training, effective change management, data quality, system quality and appropriate technology and tools—found no significant difference when categorized by ProjectType variable as their p-values were all greater than the alpha of .05 (See Appendix D). This implied that from the different BI projects studied, the respondents' perceptions on the importance of these CSFs was relatively the same and do not change even when ProjectType changes.

On the other hand, well-defined user requirements and clear business unit vision and plan were the CSFs identified with significant differences when categorized by ProjectType. This is because both CSFs had a p value of less than .05. Both well-defined user requirements and clear business unit vision and plan have p-values of .028. A p-value of .28 rejects the null hypothesis that there are no significant differences. This statistical difference implied that when the respondents' ProjectType changed, the perceptions of the respondents changed along with it (see Table 24 below).

Table 24. CSFs mean rankings

	ProjectTitle	N	Mean Rank
Clear business unit vision and plan	Bank Analyzer (BA)	14	26.79
	Client Revenue Tracking (CRT)	12	19.92
	Other	1	23.5
	Portfolio Management Tool (PMT)	13	35.81
	Universal Cube	11	20.27
	Total	51	
Well-defined user requirements	Bank Analyzer (BA)	14	27.86
	Client Revenue Tracking (CRT)	12	31.5
	Other	1	6
	Portfolio Management Tool (PMT)	13	25.62
	Universal Cube	11	19.91
	Total	51	

4.4 Conclusion

This section focused on the analysis of the data collected according to the methodology outlined in the previous section, Section 3, Research Methodology. Fifty-one complete responses were received from the target group of banking sector organizations outlined in the section Research Methodology. The questionnaire had two sections, section one collected demographic data and section two collected data relating to the CSFs for BI. The demographic data gathered from the questionnaire showed that most of the respondents had working experience of more than five years. The data also revealed that most of the participants were either managers or consultants.

To determine the importance of the 15 CSFs identified through the literature review, the participants were asked in the second section of the questionnaire to rate each CSF from "Not At All Important" to "Extremely Important". The output was ranked according to the mean rank, to prioritize the list of CSFs. Furthermore, the study found, with the exception of one, that all of the CSFs identified through the literature review were considered to be in line with their respective hypothesis, except for project management. To gain more insight from the data collected, two more hypotheses were postulated and tested. Significance tests were undertaken across two main demographics, namely project type and stakeholder group.

5 DISCUSSION

5.1 Introduction

The objective of this research study was to identify important CSFs for BI in the South African banking sector. This is because taking business decisions without any decision support system is getting riskier by the day. However, BI projects can be very complex to implement and therefore these projects often fail. This claim is corroborated by the literature review of previous studies, subject matter experts and academic researchers, to establish and understand what CSFs exist for BI. Once these CSFs were identified, a base set of these CSFs was defined. Their importance was tested by means of a survey.

This discussion section focuses on the meaning of what was found in the results section and, where applicable, linked these findings to the relevant literature. The limitations of this study are outlined, followed by the recommendations, key findings and conclusion.

5.2 CSFs results discussion

5.2.1 Committed and informed executive sponsor

Committed and executive sponsor was identified as important by the respondents. The majority of the respondents identified it as very important and extremely important. This is interesting as the majority of relevant studies (Chang et al., 2010; Watson et al., 2004; Yeoh, & Koronios, 2010) have not identified and acknowledged this CSF as a critical standalone factor, and therefore this could be regarded as rendering this insignificant as a CSF. As a result, it is interesting that this CSF is treated this way, as executive sponsorship and support are regarded as crucial in any banking institution. Therefore, it was hypothesized that committed and informed executive sponsor will be regarded as an important factor that plays a critical role.

In support of this hypothesis, the data in this study indicated that this CSF is regarded as important even though it is at the bottom of the list when the CSFs are ordered by their mean ranks. The existence and importance of this CSF was conversely highlighted by Sammon and Finnegan (2000) who found that management and the executives play different roles in the implementation of a BI project. Howson (2006) differentiates between management support and executive support by stating that management often get engrossed in their own environments and lose focus of the bigger picture. Furthermore, Howson also found that many of the respondents in her research study regarded executive sponsor as crucial in a big BI project. This is reflected in the current study's findings where the majority of the participants

rated this CSF as very important and extremely important. Furthermore, this is confirmed by the statistical findings where no statistical differences were found in the unanimous classification of this CSF as important.

The hypothesis that this CSF will be classified as important by the respondents was accepted by all the descriptive and statistical tests conducted, which as a result highlight the importance of a committed executive sponsor in the implementation of a BI project in a South African banking organization.

5.2.2 Committed management support

Committed management support is one of the top CSFs as identified by the respondents in this study. It was hypothesized that this CSF will be found as important. The majority of the respondents (56.9%) identified this CSF as extremely important. This is in line with the findings of Olszak and Ziemba (2012) who found that management support can be the biggest barrier to or enabler of the success of a BI project. This particular finding is in line with Watson et al. (2004) who found that the majority of the organizations that had very successful BI projects had very good management support in the implementation of their BI projects.

Several studies (Arnott & Pervan, 2005; Chang et al. 2010; Olszak & Ziemba, 2012; Yeoh & Koronios, 2010) classified this CSF as one the most crucial and therefore positioned as the top CSF in the implementation of BI. In line with the findings of Yeoh and Koronios (2010), management's consistent support is extremely important. In the current study, it was hypothesized that this CSF would be identified as important and this was supported by the findings. However, it was interesting that this CSF did not top the list of CSFs when ordered by their mean ranks, as was expected. The significance of this rank order was tested using the different stakeholder groups and project types and found no existence of significant statistical difference. This simply implies that management support, according to the statistical tests conducted in this study, is consistently important across the different BI projects and across the IT and Business stakeholders.

5.2.3 Project champion

Analysis of the frequency of the responses indicated that project champion was classified by the majority of the respondents as very important. This is in line with the hypothesis that project champion would be identified as important. Caldeira and Ward (2002) found that where a dedicated project champion existed then the probability of the information systems project succeeding also increased. However, the frequency table (see Appendix A) indicated that this

CSF received the most neutral ratings of all the CSFs on the list. This implies that some of the respondents identified a project champion as unnecessary. However, Thite (2000) countered this when he found that even projects that did not have a dedicated project champion but had a hybrid project manager that fulfilled both roles of project manager and project champion had a better chance of success. Overall, respondents classified this CSF as important and the statistical analysis found no significant difference when project or stakeholder group changed. This implies that the mean ranks did not have any significance in determining and that the different respondents from different organizations and projects are consistent in classifying this CSF as important.

5.2.4 Skilled and qualified staff

Skilled and qualified staff was found to be important by the majority of the respondents. The research hypothesized that skilled and qualified staff would be identified as important by the respondents. It followed that the majority of the responses were identified as extremely important. This particular finding is in line with Yeoh et al.'s (2008) findings that successful BI project implementations are partly due to user training and constant inclusion of users. This implies that getting users skilled and qualified is an important step in ensuring successful BI implementation. The mean ranking of the CSFs confirm the importance of this CSF as it is in the top 10. Furthermore, from the total responses only three respondents indicated this CSF as not very important or extremely important.

In Yeoh and Koronios' (2010) study, the participants emphasized the importance of this CSF by stating that the team involved in the BI project must be multi-skilled and display both technical and business skills. To establish whether the two different stakeholder groups would have different views, the study further tested this CSF for significant differences. It was found that there was no significant difference between the IT and Business respondents which primarily possess technical and business skills, respectively. The study found that the importance of skilled and qualified staff did not change even when the stakeholder groups changed. This infers that both skill sets are important for a BI project and therefore, staff that possess these skills, are more likely to render a BI project successful.

5.2.5 Business user involvement.

Business user involvement was identified as important by the different respondents. The study hypothesized that this particular CSF would be identified as important by the participants. In testing this hypothesis, the business user involvement was found by the majority of the

participants as extremely important for a BI project. These findings align with the findings numerous researchers (Chen et al., 2012; Wixom & Watson, 2001; Yeoh & Koronios, 2010) who found and agreed that user involvement in a BI project is critical as users assist in determining how the system should function and where it should be tweaked to ensure optimal functionality.

Yeoh and Koronios highlighted the importance of user involvement by stating that "users know what they need better than an architect or developer who lacks direct experience of the product." (2010, p. 28). Wixom and Watson (2001) found that user involvement can be linked to management support but the current study did not test that correlation. The findings of this study infer that the participants agree with Yeoh and Koronios (2010). Additionally, in finding that business user involvement is regarded as important, it was further tested to see if there was any significant difference. The tests for significant difference revealed that there was no significant difference present, thereby implying that all the participants of this study regard this CSF as important, regardless of their respective project or stakeholder group.

5.2.6 Competent BI project manager

Competent BI project manager was found to be important by most of the participants. However, it was hypothesized that having a competent BI project manager is not important for a BI project. This hypothesis was rejected by the findings of the study where only two respondents regarded it as being of low importance, while the majority of the respondents regarded this particular CSF as important. Such results are very interesting as project management as a BI factor was not emphasized in previous studies. Furthermore, researchers such as Rainer and Watson (1995) and Thite (2000) regarded the role of BI project manager as a by-product of other roles like management support and project champion. Thite (2000) highlighted the concept of hybrid project managers, stating that these individuals need to have business, managerial, and technical skills.

Cooke-Davies (2002) highlights how project management success does not necessarily amount to project success and that the role of a project champion is instrumental in bringing project success and project management success. Contrary to Cooke-Davies' findings, the current study found that competent BI project management is important. This finding was consistent, irrespective of project or stakeholder category. There was no significant differences found, which implies that the participants of this study regard this CSF as important. Interpretation of these results suggests that participants in the banking sector are project-oriented and believe

that a project of any format, especially a BI project, is more likely to succeed with a competent BI manager involved.

5.2.7 Clear business unit vision and plan

In analysing the frequency of the responses, it was found that a clear business unit vision and plan is important and this is in line with the hypothesis that clear business unit vision and plan will be found to be important. This implies that the respondents recognized having a clear vision and plan and regard it as important. From the respondents' output, the majority classified this CSF as very important. This finding is aligned to the findings of previous studies. Yeoh (2008) found that the most successful BI implementations were found to have formally aligned their business case of introducing BI with their corporate strategy. This implies that the participants of the study realize the importance of a strategy and aligning the BI project with this strategy. Wong (2005) found that it is critical that the staff and users of the BI system understand and support the vision and believe that it will work. This implies that the findings of the study agree with previous studies (Wong, 2005; Yeoh, 2008).

Additionally, tests for significance were conducted on this CSF. There were no significant differences between the different stakeholder categories, which implies that perceptions of the participants do not change, irrespective of their stakeholder groups. However, significant differences were recorded when the project changed, which implies that the participants' perceptions change according to the different projects. Overall, the participants of the study, in line with the literature, regard clear business unit vision and plan as an important CSF.

5.2.8 Align BI strategy with organization's objectives

Yeoh and Koronios (2008) argue that BI is a business centric concept that should form part of the overall organizational strategy in order to succeed. This study found, through frequency tables, that the majority of the participants classified this CSF as extremely important. Indeed, it was hypothesized that aligning the BI strategy with the organization's objectives will be classified as important. Howson (2006) opines that organizations should take and use the opportunity to use the BI strategy to create something fundamental for the organization. The output of this study implies that the participants understand the importance of aligning BI strategy with the organization's strategy.

There were no significant differences found between the two categories tested, namely project and stakeholder. This finding is in line with the findings of Elbashir et al. (2008), who states that BI projects are important across all spheres of the organization. This implies that the

perceptions of the participants on these CSFs do not change, even when the project or stakeholder is changed. This outcome means that the participants acknowledge that aligning BI strategy with the organization's strategy is imperative for the success of a BI project.

5.2.9 Adequate budget

Resources are a critical need for any project to succeed. Yeoh and Koronios (2010) found that the funding of BI implementation relies on the level of management support. In this study it was hypothesized that adequate budget will, at least, be identified as important. Of all the respondents, only four did not classify adequate budget as either very important or extremely important. Watson et al. (2004) indicate that BI projects are usually expensive and need to be properly planned and organized to avoid wastage of resources. Furthermore, Watson et al. suggest that BI projects can be implemented in smaller iterations that do not require big capital outlays.

The importance of this CSF is that the respondents agree with the literature (Watson et al., 1999; Williams & Williams, 2003) which states that adequate budget is dependent on management support. This CSF can be very controversial as funds are often limited in organizations and if not allocated strategically, might cause conflict. There were no significant differences, which means that all the participants are aligned on the importance of adequate budget as a CSF.

5.2.10 Staff training

In analysing the frequency of responses for this particular CSF, staff training was rated extremely important by the majority of the respondents. This is in line with Sumner's (1999) findings. Sumner focused on corporate information systems projects and found that the projects that became successful became so partly because there were early efforts made in the training and development of the system users, which was achieved through pairing internal staff with external consultants. This implies that the importance of staff training is understood by the participants of this study, hence the overall rating of important. Indeed, the study hypothesized that staff training will be classified as important by the respondents and this was found to be the case.

Staff training was related to the skills and qualifications of the BI project team. Therefore, it would follow that these two CSFs were understood by the respondents in the banking sector, hence they rated them both as important. Additionally, staff training was identified by Caldeira and Ward (2002) as a way to lessen user resistance towards user systems. Unfortunately this

interesting relationship could not be measured as it was beyond the scope of the study. The hypothesis was further tested for significant differences and none was found, implying that the perceptions of the participants on this CSF do not change even when the project or stakeholder is changed. This means that staff training is regarded as an important CSF in the South African banking sector.

5.2.11 Effective change management

Effective change management is regarded as critical for a BI system's successful implementation (Yeoh et al., 2008). Sammon and Finnegan (2000) indicate that change leads to success when undertaken in small iterative steps. Analysis of the frequency of responses found that only four respondents identified effective change management as neutral and the rest of the responses were either very important or extremely important. This finding is in agreement with the hypothesis that effective change management will be classified as important. The findings on this CSF imply that the respondents regard it as an important factor.

Further testing of the hypothesis using project and stakeholder group as the independent variable of the tests, revealed no significant difference between the different categories. Rainer and Watson (1995) stressed the importance of the capability of the BI project team to manage and embrace change as change arises all the time. This implies that participants regard effective change management as an important factor, irrespective of which category changes.

5.2.12 Well-defined user requirements

It was hypothesized that well-defined user requirements will be rated as an important factor for BI in the South African banking sector. In analysing the frequency of responses for well-defined user requirements, it was rated extremely important by the majority of the respondents. This finding is supported by a number of researchers (Chen et al., 2012; Wixom & Watson, 2001; Yeoh & Koronios, 2010), who state that once the users know exactly what they want then the BI system stands a better chance for success. Yeoh and Koronios argue that "users know what they need better than an architect or developer who lacks direct experience of the product" (2010, p. 28).

The hypothesis was further tested for significant differences and a significant difference was found where there were different projects. This implies that the responses of the different respondents change when the projects change. However, overall, well-defined user requirements was found to be an important factor.

5.2.13 Data quality

Data quality was one of the top ranking CSFs when using the mean rankings. This research study hypothesized that data quality will be rated as an important CSF for BI in the South African banking sector. Analysis of the frequency of responses revealed that this CSF was classified by all respondents as very important or extremely important and was the top ranked CSF. Sammon and Finnegan (2000) found that data quality issues are synonymous with BI project rollouts and should therefore not be underestimated by organizations. This implies that the respondents that rated this CSF are aware of the critical role it plays. "If you implement a BI tool on top of messy or irrelevant data, either the bad stuff proliferates throughout your organization or the BI tool quickly becomes shelf-ware" (Howson, 2006, p. 2). Yeoh and Koronios (2008) found that data are given in most successful implementation. This could be one of the reasons why the participants in this study rated this CSF as extremely important.

The hypothesis was tested for significant differences and none were found. As a result, this finding implies that all the respondents consider data quality as important, irrespective of the project or stakeholder group they represent.

5.2.14 System quality

Hawking and Sellitto (2010) caution that a lack of proper data governance can damage the quality of the system in the long term. The study hypothesized that system quality would be identified as important. This hypothesis was tested by analysing the frequency of responses and it was found that only five responses were not positive. The rest of the respondents classified system quality as either very important or extremely important, with the majority being the latter.

Ariyachandra and Watson (2008) found that data quality and system quality are closely linked. It can possibly imply that the respondents that rated data and system quality are aware of this link. However, analysis of the mean rankings of these two CSFs show differences but these differences were not tested for significance. When significant differences were tested, it was found that no statistical differences exist

5.2.15 Appropriate technology and tools

Previous studies (Horakova & Skalska, 2013; Howson, 2006) found the success of a BI system lies in its ability to become flexible. Therefore, for any BI project the appropriate tools with the right level of flexibility must be picked. The analysis of the frequency of responses revealed that only three respondents classified this CSF as neutral, while the rest indicated very or

extremely important. This finding supports the hypothesis that appropriate technology and tools will be classified as important. This implies that respondents regard appropriate technology and tools as an important factor.

Hawking and Sellitto (2010) found that the one unique success factor for a BI system is its ability to integrate data from multiple source systems, while Rainer and Watson (1995) highlighted the importance of costs and benefits when choosing which BI tool to use. These factors play an important role in the success of a BI project. Though the participants of this study were not asked about their knowledge on the different BI tools, their classification of this CSF was that it was of overall importance.

5.3 Limitations

Although the research on BI and information systems has gathered momentum in recent years, it is still seen as very underdeveloped. This study had a narrow mandate of focusing on the state of BI in the South African banking industry. As a result, this research study realised several limitations.

Due to time pressure and access to banking institutions, only four banking institutions were used in this research study and this fact may limit the outcome of the study. This is because the study will not be fully representative of the perceptions of all stakeholders and institutions in the South African banking industry. Getting a broader base of banking institutions involved in the study would have likely increased the confidence in the results. Additionally, the respondents in this study were not requested to identify themselves or to identify the banking institution for which they worked. To lessen the impact of this decision, each project was given a pseudonym using the ProjectType variable.

Another limitation worth considering for this research study is the sample size. Even though the research study got a response rate of 63.75%, which was considered as acceptable, a wider sample would have enhanced confidence in the results.

Another limitation is the use of an ordinal scale to measure the perceptions of the respondents, this is because this method of data collection and measurement does not provide information about the size of the difference between the observed rankings or data points. As a result, even though the prioritized list of CSFs is provided it is impossible to measure the difference between the rankings. However, the use of frequency tables acted as a buffer to lessen this limitation. Furthermore, the purpose of this study was to determine which CSFs identified from

the literature review are regarded as important in the context of the South African banking sector. The Likert scale as a tool of measurement was deemed appropriate. However, Likert scales are subject to distortion by people agreeing with statements as they are presented and portraying themselves or the institutions they represent in favourable light.

5.4 Recommendations

This study focused on the determination of important CSFs for BI in the South African banking sector and used a quantitative methodology to obtain results. Because of this, the results of this study are partly generalizable. Future research could focus on whether these CSFs are extendable to other sectors of the economy and not just the banking sector. As this study only focused on the importance of the CSFs, future studies could attempt to determine the correlation between the different CSFs and whether there is causation as well.

In this study, frequency tables and tools like the Mann Whitney test and Kruskal Wallis were used. To obtain deeper insight into the CSFs, different tools of analysis could be used in future research, such as ordered logistic regression or multinomial logistic regression analyses. Neither of these tools were used in this study since the purpose of this study was to examine how the CSFs from previous research aligned with the perceptions of respondents in the South African banking sector.

5.5 Key findings and conclusion

The mean rankings of the CSFs can be regarded as core to this study in the sense that the study's primary objective was to identify CSFs that are important for BI in the banking sector. The data in Table 18 indicates that all but one of the identified CSFs are critical and important. This inference is based on the weighted mean rating of each CSF in the list. From this consolidated list, data quality, well-defined user requirements, and business user involvement are the top three important CSFs. From a conceptual perspective, BI is a user centric system, so it makes logical sense as data quality is the input and output of any BI system. The quality of data that feeds into the system usually determines the output and quality of consequent decisions taken. Well-defined user requirements will determine the ultimate purpose of the BI system, and when these are properly measured and executed, the output of this process is a user that is fully involved and committed to the BI system.

The main objective of this study was to establish, through a literature review and a research survey, which of the identified CSFs of BI are regarded as important. Thus, the conclusion

drawn from the findings in Table 7 and other supporting findings in Section 4 is that the 15 CSFs identified from the literature review are regarded as important, although some are more important than others are. Therefore, from this conclusion it can be inferred that the enactment of this list of CSFs by the key project stakeholders may bring about successful implementation of a BI project in a banking organization. However, this list of CSFs is not exhaustive and success is not guaranteed. This is because BI projects are generally complex projects to undertake, especially in vast organizations such as banks.

Prioritization of these CSFs can capacitate current and future stakeholders to increase the probability of successfully implementing a BI system. Furthermore, this list of prioritized CSFs can ensure that success is realized by ensuring that scarce resources are focused on the key critical factors that are most likely to contribute to the success of the BI project implementation.

APPENDICES

APPENDIX A: FREQUENCY TABLES

Committedandinformedexecutivesponsor#

		Frequency	Percent	Valid%	Cumulative%
Valid	Not At All Important	1	2.0	2.0	2.0
	Low Importance	3	5.9	5.9	7.8
	Neutral	3	5.9	5.9	13.7
	Very Important	24	47.1	47.1	60.8
	Extremely Important	20	39.2	39.2	100.0
	Total	51	100.0	100.0	

Committedmanagementsupport#

		Frequency	Percent	Valid%	Cumulative%
Valid	Neutral	1	2.0	2.0	2.0
	Very Important	21	41.2	41.2	43.1
	Extremely Important	29	56.9	56.9	100.0
	Total	51	100.0	100.0	

Projectchampion#

		Frequency	Percent	Valid%	Cumulative%
Valid	Neutral	7	13.7	13.7	13.7
	Very Important	25	49.0	49.0	62.7
	Extremely Important	19	37.3	37.3	100.0
	Total	51	100.0	100.0	

Skilledandqualifiedstaff#

		Frequency	Percent	Valid%	Cumulative%
Valid	Neutral	3	5.9	5.9	5.9
	Very Important	23	45.1	45.1	51.0
	Extremely Important	25	49.0	49.0	100.0
	Total	51	100.0	100.0	

Businessuserinvolvement#

		Frequency	Percent	Valid%	Cumulative%
Valid	Neutral	1	2.0	2.0	2.0
	Very Important	17	33.3	33.3	35.3
	Extremely Important	33	64.7	64.7	100.0
	Total	51	100.0	100.0	

CompetentBIprojectmanager#

		Frequency	Percent	Valid%	Cumulative%
Valid	Low Importance	2	3.9	3.9	3.9
	Neutral	6	11.8	11.8	15.7
	Very Important	28	54.9	54.9	70.6
	Extremely Important	15	29.4	29.4	100.0
	Total	51	100.0	100.0	

Clearbusinessunitvisionandplan#

		Frequency	Percent	Valid%	Cumulative%
Valid	Not At All Important	3	5.9	5.9	5.9
	Low Importance	2	3.9	3.9	9.8
	Neutral	6	11.8	11.8	21.6
	Very Important	24	47.1	47.1	68.6
	Extremely Important	16	31.4	31.4	100.0
	Total	51	100.0	100.0	

AlignBIstrategywithorganizationsobjectives#

		Frequency	Percent	Valid%	Cumulative%
Valid	Low Importance	1	2.0	2.0	2.0
	Neutral	2	3.9	3.9	5.9
	Very Important	20	39.2	39.2	45.1
	Extremely Important	28	54.9	54.9	100.0
	Total	51	100.0	100.0	

Adequatebudget#

		Frequency	Percent	Valid%	Cumulative%
Valid	Not At All Important	1	2.0	2.0	2.0
	Low Importance	1	2.0	2.0	3.9
	Neutral	2	3.9	3.9	7.8
	Very Important	22	43.1	43.1	51.0
	Extremely Important	25	49.0	49.0	100.0
	Total	51	100.0	100.0	

Stafftraining#

		Frequency	Percent	Valid%	Cumulative%
Valid	Low Importance	1	2.0	2.0	2.0
	Neutral	6	11.8	11.8	13.7
	Very Important	21	41.2	41.2	54.9
	Extremely Important	23	45.1	45.1	100.0
	Total	51	100.0	100.0	

Effectivechangemanagement#

		Frequency	Percent	Valid%	Cumulative%
Valid	Neutral	4	7.8	7.8	7.8
	Very Important	22	43.1	43.1	51.0
	Extremely Important	25	49.0	49.0	100.0
	Total	51	100.0	100.0	

Welldefineduserrequirements#

		Frequency	Percent	Valid%	Cumulative%
Valid	Very Important	11	21.6	21.6	21.6
	Extremely Important	40	78.4	78.4	100.0
	Total	51	100.0	100.0	

Dataquality#

		Frequency	Percent	Valid%	Cumulative%
Valid	Very Important	10	19.6	19.6	19.6
	Extremely Important	41	80.4	80.4	100.0
	Total	51	100.0	100.0	

Systemquality#

		Frequency	Percent	Valid%	Cumulative%
Valid	Neutral	5	9.8	9.8	9.8
	Very Important	18	35.3	35.3	45.1
	Extremely Important	28	54.9	54.9	100.0
	Total	51	100.0	100.0	

Appropriatetechnologyandtools#

		Frequency	Percent	Valid%	Cumulative%
Valid	Neutral	3	5.9	5.9	5.9
	Very Important	25	49.0	49.0	54.9
	Extremely Important	23	45.1	45.1	100.0
	Total	51	100.0	100.0	

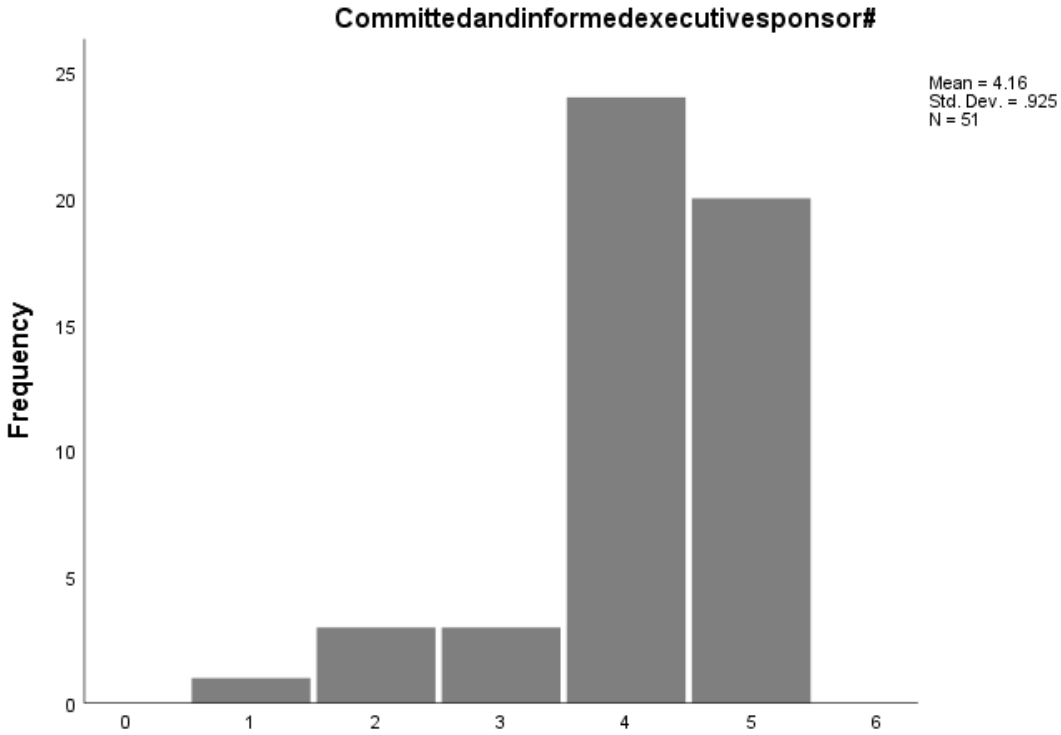
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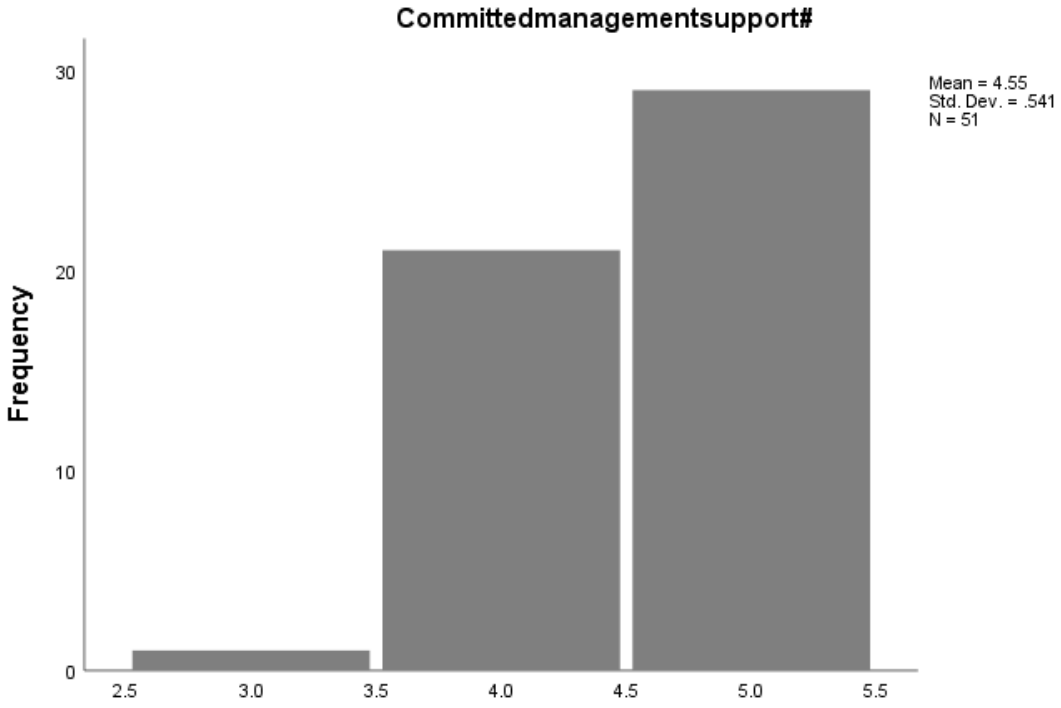
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N	Valid	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
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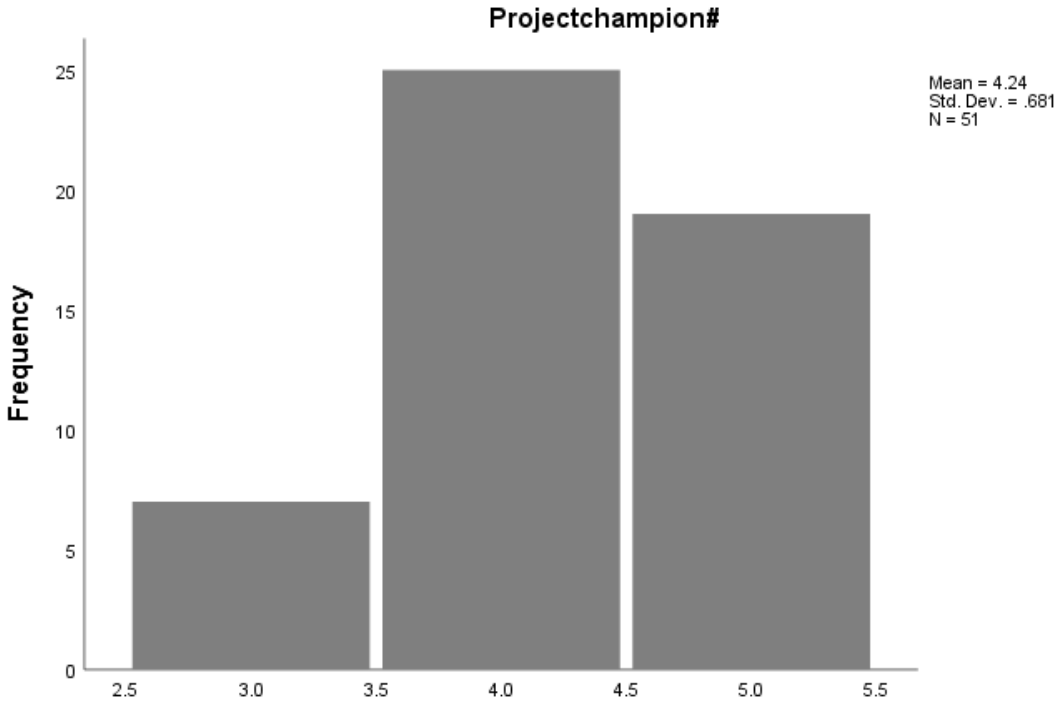
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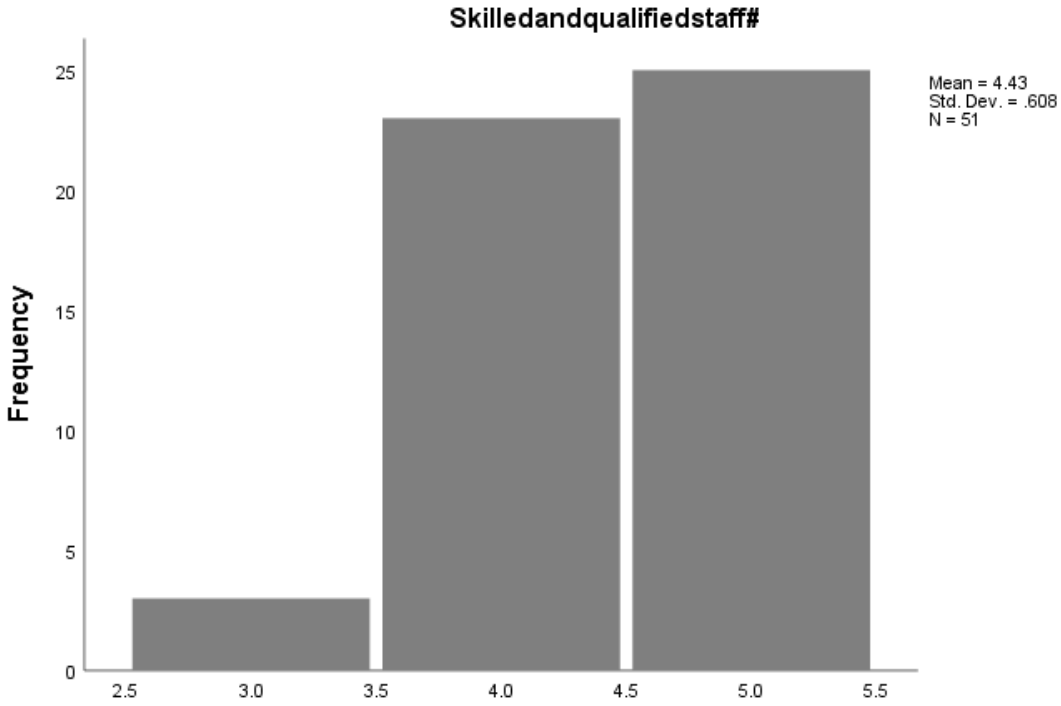
Cronbach's Alpha	N of Items
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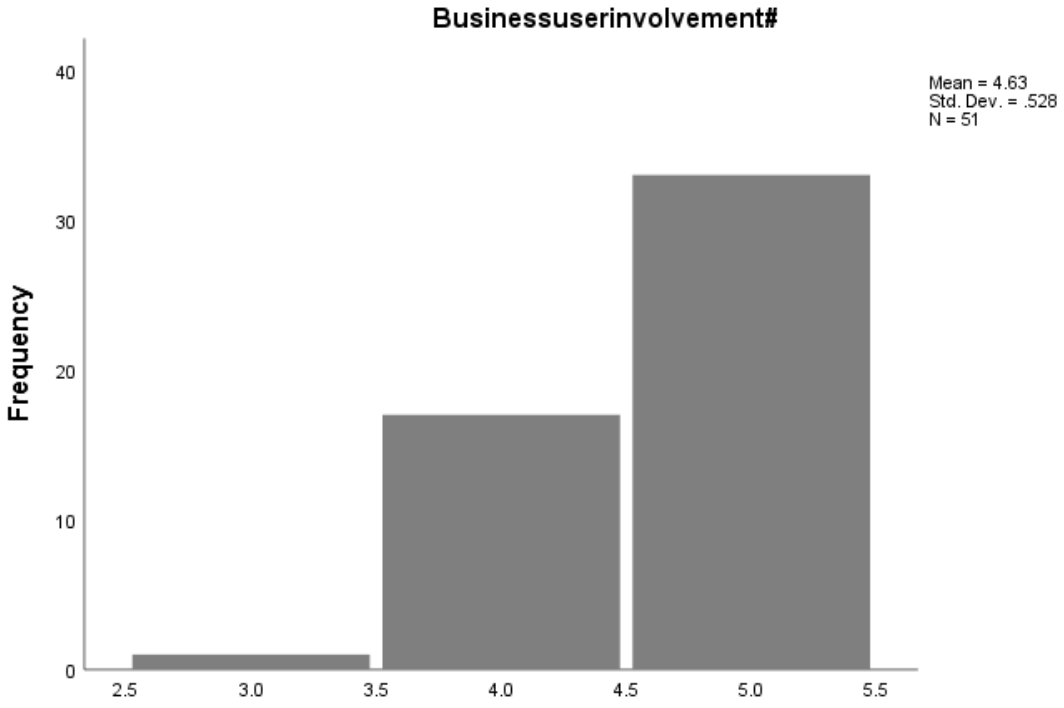
APPENDIX B: HISTOGRAMS

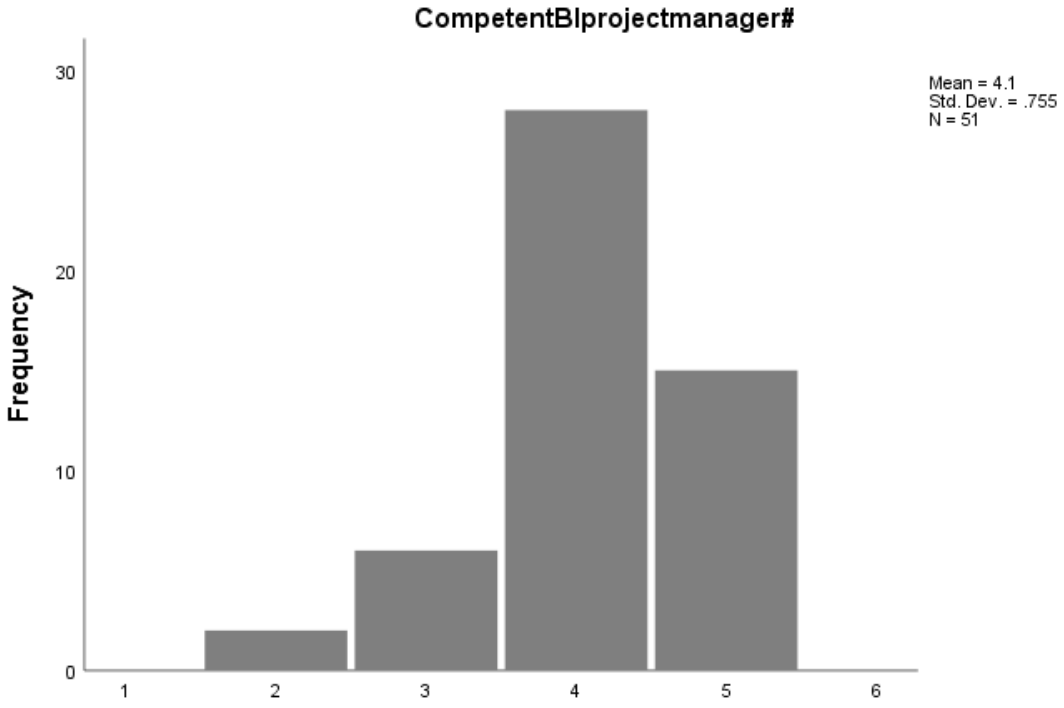


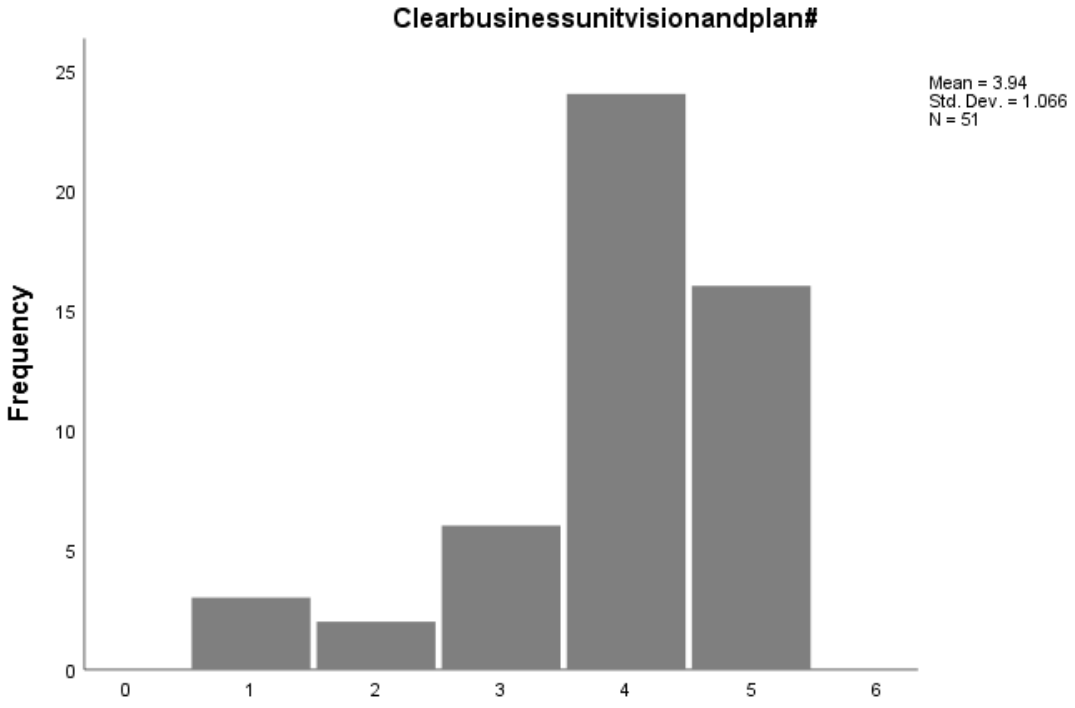


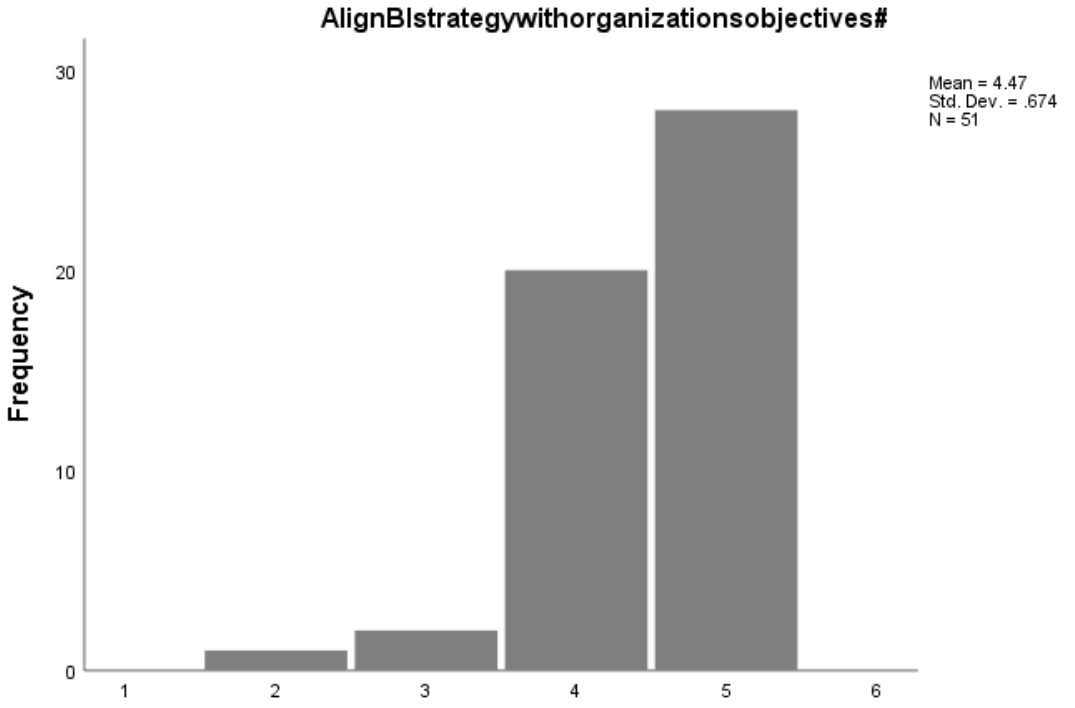

Projectchampion#
Mean = 4.24
Std. Dev. = .681
N = 51
Frequency
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20
15
10
5
0
2.5
3.0
3.5
4.0
4.5
5.0
5.5

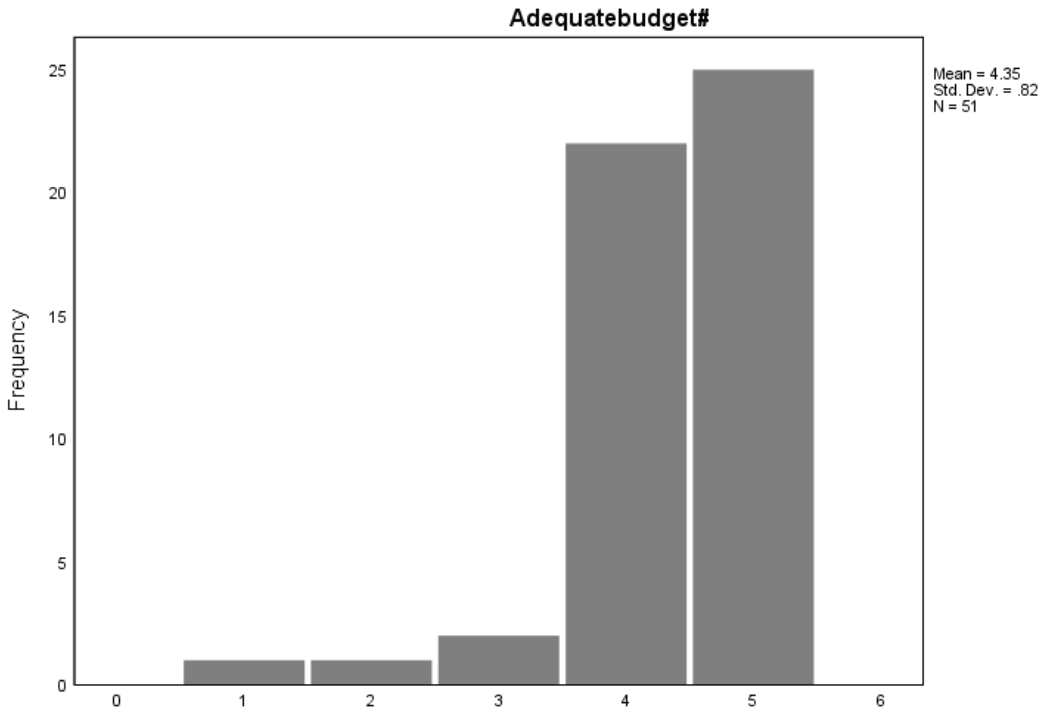

Skilledandqualifiedstaff#
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Std. Dev. = .608
N = 51
Frequency
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15
10
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3.0
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4.0
4.5
5.0
5.5

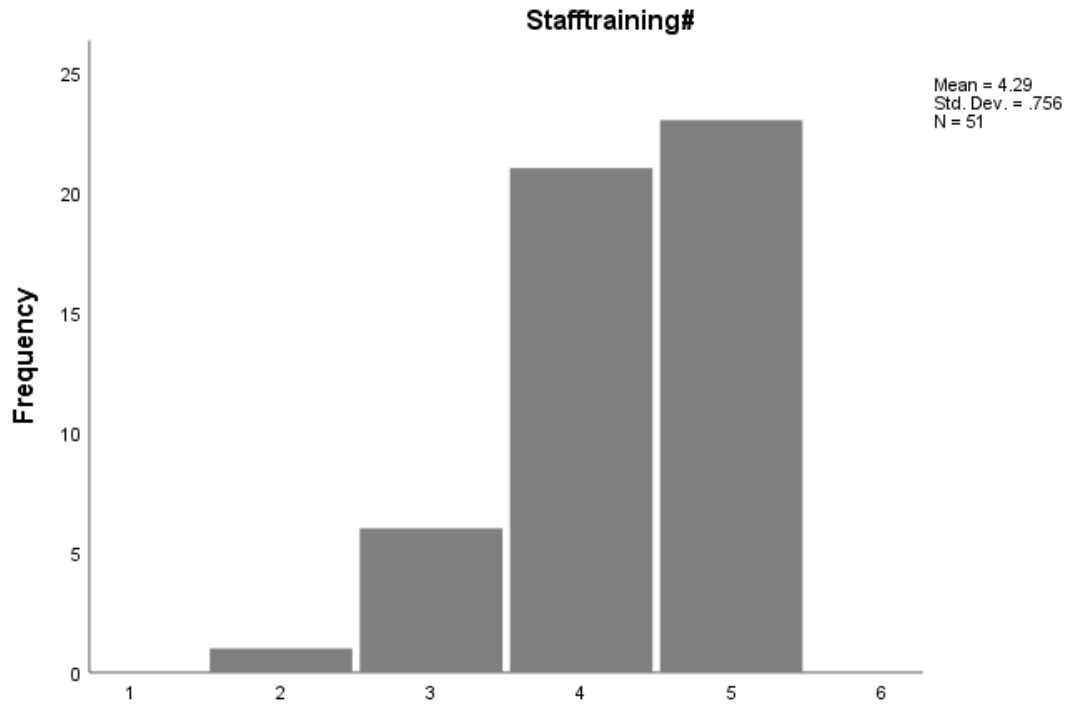

Businessuserinvolvement#
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Std. Dev. = .528
N = 51
Frequency
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30
20
10
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2.5
3.0
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4.5
5.0
5.5

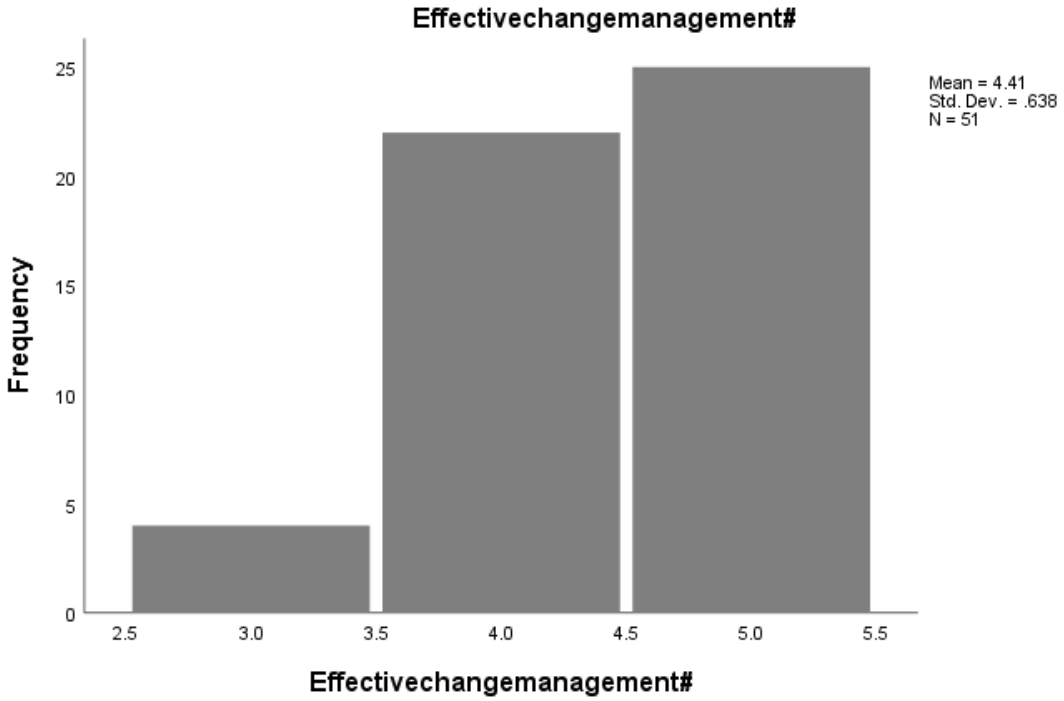

CompetentBIprojectmanager#
Mean = 4.1
Std. Dev. = .755
N = 51
Frequency
30
20
10
0
1
2
3
4
5
6

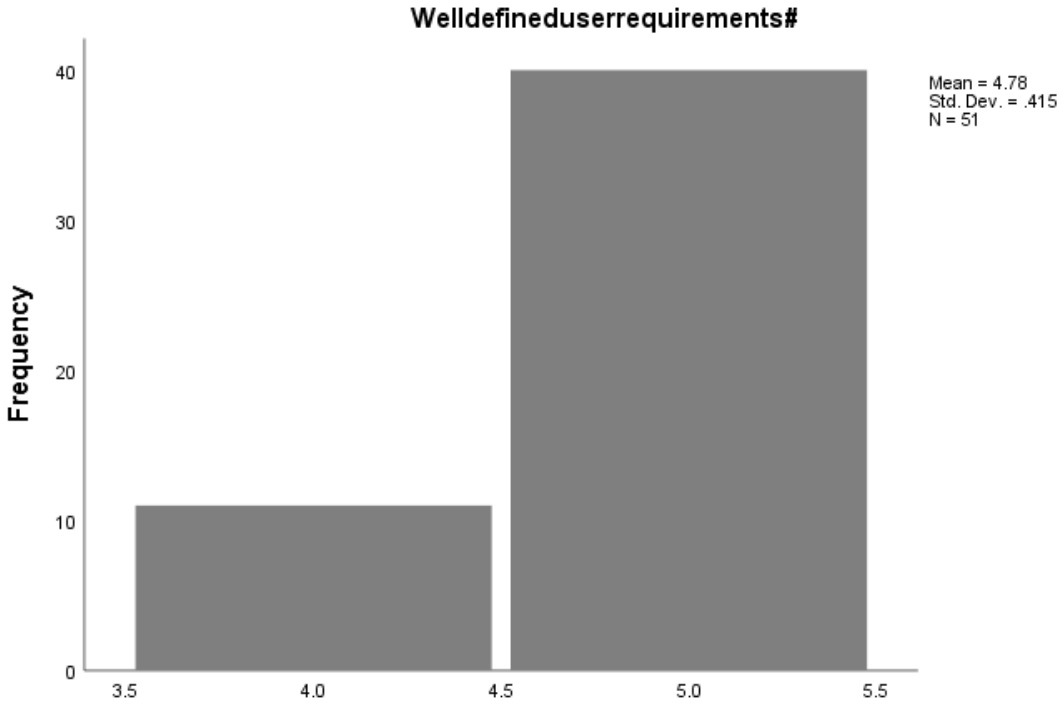

Clearbusinessunitvisionandplan#
Mean = 3.94
Std. Dev. = 1.066
N = 51
Frequency
25
20
15
10
5
0
0
1
2
3
4
5
6

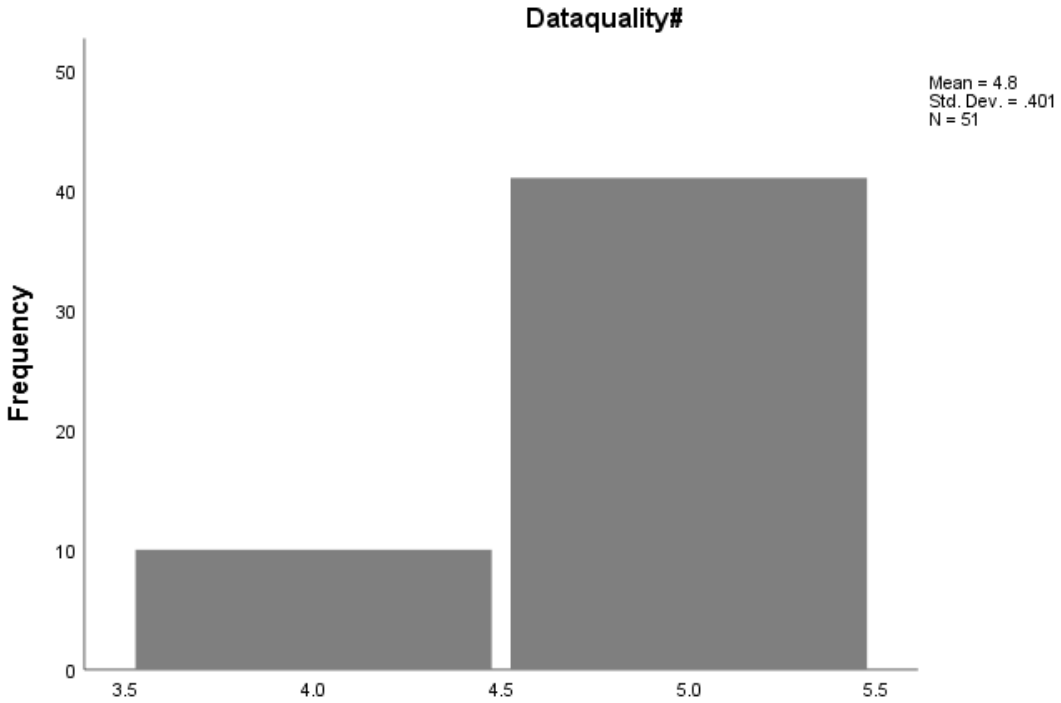

AlignBIstrategywithorganizationsobjectives#
Mean = 4.47
Std. Dev. = .674
N = 51
Frequency
30
20
10
0
1
2
3
4
5
6

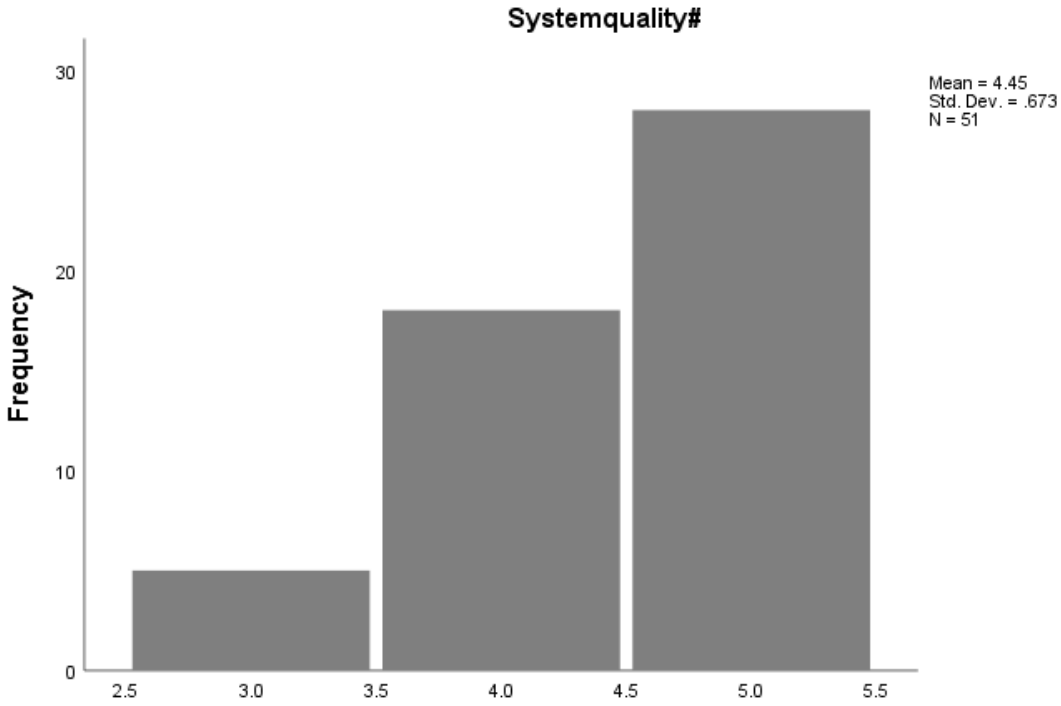

Adequatebudget#
Mean = 4.35
Std. Dev. = .82
N = 51
Frequency
25
20
15
10
5
0
0
1
2
3
4
5
6

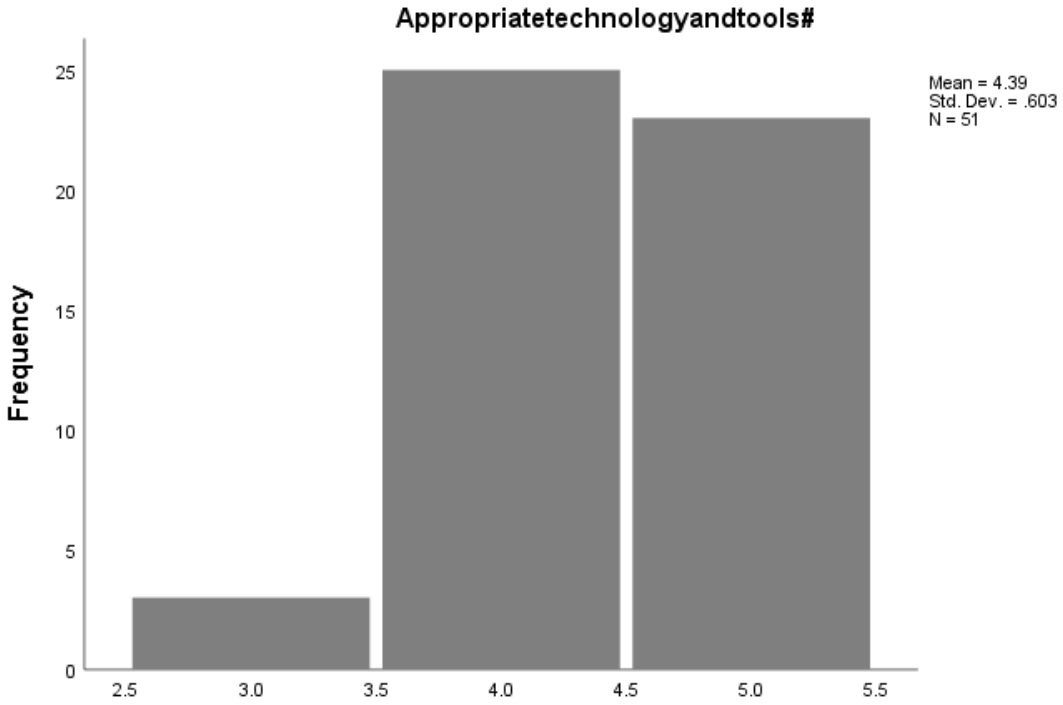

Stafftraining#
Mean = 4.29
Std. Dev. = .756
N = 51
Frequency
25
20
15
10
5
0
1
2
3
4
5
6


Effectivechangemanagement#
Mean = 4.41
Std. Dev. = .638
N = 51
Frequency
25
20
15
10
5
0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
Effectivechangemanagement#


Welldefineduserrequirements#
Mean = 4.78
Std. Dev. = .415
N = 51
Frequency
40
30
20
10
0
3.5
4.0
4.5
5.0
5.5


Dataquality#
Mean = 4.8
Std. Dev. = .401
N = 51
Frequency
50
40
30
20
10
0
3.5
4.0
4.5
5.0
5.5


Systemquality#
Mean = 4.45
Std. Dev. = .673
N = 51
Frequency
30
20
10
0
2.5
3.0
3.5
4.0
4.5
5.0
5.5


Appropriatetechnologyandtools#
Mean = 4.39
Std. Dev. = .603
N = 51
Frequency
25
20
15
10
5
0
2.5
3.0
3.5
4.0
4.5
5.0
5.5

APPENDIX C: MANN-WHITNEY TEST RESULTS

Ranks

	Stakeholdergroup	N	Mean Rank	Sum of Ranks
Committedandinformedexecutivesponsor#	IT	23	24.41	561.50
	Business	28	27.30	764.50
	Total	51		
Committedmanagementsupport#	IT	23	28.30	651.00
	Business	28	24.11	675.00
	Total	51		
Projectchampion#	IT	23	27.48	632.00
	Business	28	24.79	694.00
	Total	51		
Skilledandqualifiedstaff#	IT	23	24.78	570.00
	Business	28	27.00	756.00
	Total	51		
Businessuserinvolvement#	IT	23	26.30	605.00
	Business	28	25.75	721.00
	Total	51		
CompetentBIprojectmanager#	IT	23	24.98	574.50
	Business	28	26.84	751.50
	Total	51		
Clearbusinessunitvisionandplan#	IT	23	23.46	539.50
	Business	28	28.09	786.50
	Total	51		
AlignBIstrategywithorganizationsobjectives#	IT	23	26.59	611.50
	Business	28	25.52	714.50
	Total	51		
Adequatebudget#	IT	23	26.61	612.00
	Business	28	25.50	714.00
	Total	51		
Stafftraining#	IT	23	26.17	602.00
	Business	28	25.86	724.00
	Total	51		
Effectivechangemanagement#	IT	23	25.04	576.00
	Business	28	26.79	750.00
	Total	51		
Welldefineduserrequirements#	IT	23	27.07	622.50
	Business	28	25.13	703.50

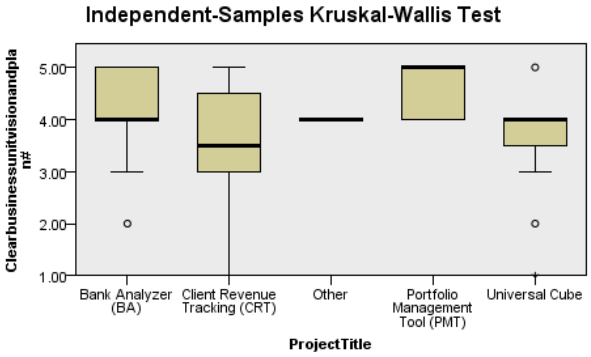
	Total	51		
Dataquality#	IT	23	26.57	611.00
	Business	28	25.54	715.00
	Total	51		
Systemquality#	IT	23	26.00	598.00
	Business	28	26.00	728.00
	Total	51		
Appropriatetechnologyandtools#	IT	23	24.17	556.00
	Business	28	27.50	770.00
	Total	51		

APPENDIX D: KRUSKAL WALLIS TEST RESULTS

Hypothesis Test Summary

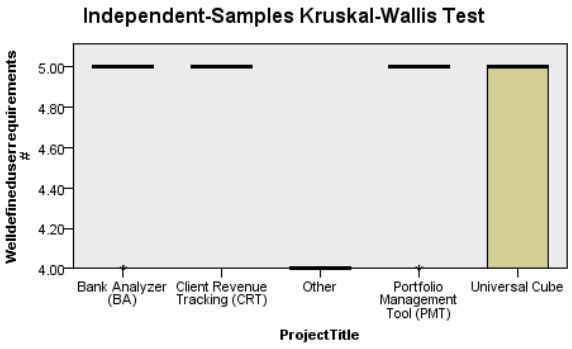
	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Committedandinformedexecutivespo nsor# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.516	Retain the null hypothesis.
2	The distribution of Committedmanagementsupport# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.502	Retain the null hypothesis.
3	The distribution of Projectchampion# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.597	Retain the null hypothesis.
4	The distribution of Skilledandqualifiedstaff# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.060	Retain the null hypothesis.
5	The distribution of Businessuserinvolvement# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.064	Retain the null hypothesis.
6	The distribution of CompetentBlprojectmanager# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.392	Retain the null hypothesis.
7	The distribution of Clearbusinessunitvisionandplan# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.028	Reject the null hypothesis.
8	The distribution of Align Blstrategywithorganizationsobjectiv es# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.067	Retain the null hypothesis.
9	The distribution of Adequatebudget# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.927	Retain the null hypothesis.
10	The distribution of Stafftraining# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.760	Retain the null hypothesis.
11	The distribution of Effectivechangemanagement# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.076	Retain the null hypothesis.
12	The distribution of Welldefineduserrequirements# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.028	Reject the null hypothesis.
13	The distribution of Dataquality# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.512	Retain the null hypothesis.
14	The distribution of Systemquality# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.122	Retain the null hypothesis.
15	The distribution of Appropriatetechnologyandtools# is the same across categories of ProjectTitle.	Independent-Samples Kruskal-Wallis Test	.929	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.



Total N	51
Test Statistic	10.850
Degrees of Freedom	4
Asymptotic Sig. (2-sided test)	.028

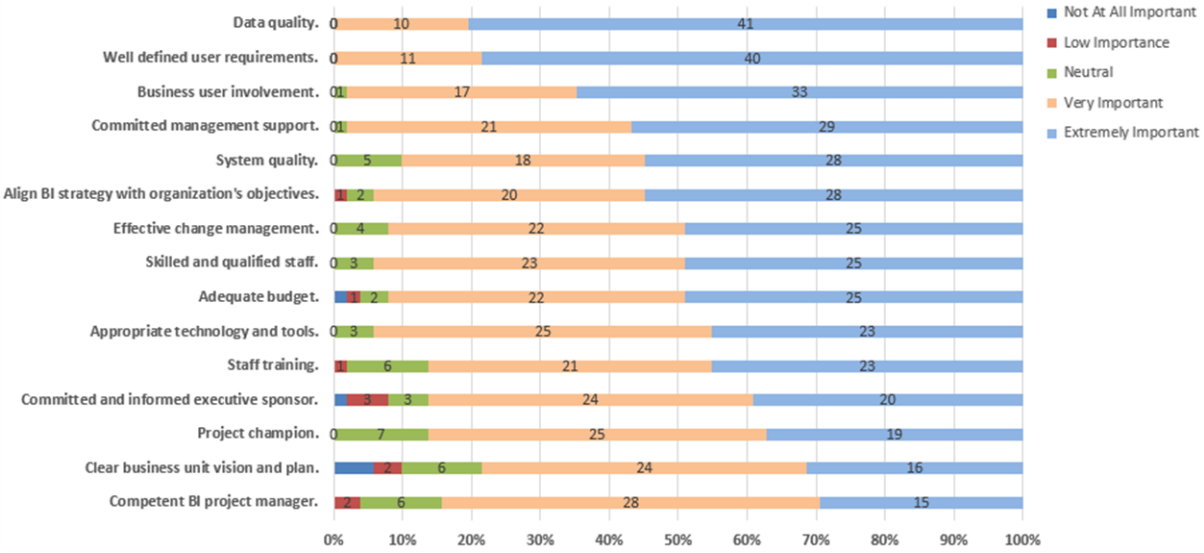
1. The test statistic is adjusted for ties.



Total N	51
Test Statistic	10.885
Degrees of Freedom	4
Asymptotic Sig. (2-sided test)	.028

1. The test statistic is adjusted for ties.

APPENDIX E: CSFS RANKED BY EXTREMELY IMPORTANT



APPENDIX F: INTRODUCTORY EMAIL

Dear Sir/Madam,

As part of my MBA programme at the Wits Business School, I am currently undertaking a research study which aims to identify the CSFs (CSFs) for BIin the South African Banking sector.

You are invited to participate in a survey to help me gather information for this study.

It will take you approximately 10 minutes to complete the questionnaire, please read the questions carefully and attempt to answer as accurately as possible.

Please note that the Information you will provide in this survey shall be treated with utmost confidentiality and anonymity is guaranteed.

To complete the questionnaire please copy the below link into your web browser or scan the QR code:

https://www.surveymonkey.com/r/58LPPTC

OR



APPENDIX G: QUESTIONNAIRE

Questionnaire for investigating critical success factors for Business Intelligence in the South African Banking Sector

1. Demographic Information

1. **Project Title:** Please indicate your BI project.
   - **a.** Portfolio Management Tool (PMT)
   - **b.** Client Revenue Tracking (CRT)
   - **c.** Universal Cube
   - **d.** Bank Analyzer (BA)
   - **e.** Other (Please Specify)

2. **Stakeholder group:** In the context of the project you selected, please indicate which of the two stakeholder groups closely match the group you belong to. (**i.e.** IT encapsulates any enabling function involved in your project.)
   - **a.** IT
   - **b.** Business

3. **Job Title\ Job Level:** Which of the following most closely matches your job title?
   Graduate
   Junior Analyst
   Analyst
   Senior Analyst
   Consultant
   Junior Manager
   Manager
   Senior Manager
   Executive
   - **a.** Other (Please specify)

4. **Total Work Experience:** How long is your overall work experience\career?
   Less than 3 years
   3-5 years
   6-10 years
   11-20 years
   21-30 years
   Over 30 years

5. What type of BIsystem do you use?
   - **a.** Cloud-Based
   - **b.** Locally-Installed (Own Server)
   - **c.** Hybrid system (Cloud based and local server based)

Questionnaire for investigating critical success factors for Business Intelligence in the South African Banking Sector

2. CSFs for BI

Based on the extensive literature review conducted, a framework with a list of 15 CSFs (CSFs) that could impact the success and delivery of strategic BIprojects in the South African banking industry was established. Please indicate your opinion on the degree of importance on each of the CSFs identified.

6. In the context of a **general BI project**, please specify the level of importance on each Critical Success Factor.

Committed and informed executive sponsor.
Committed management support.
Project champion.
Skilled and qualified staff.
Business user involvement.
Competent BI project manager.
Clear business unit vision and plan.
Align BI strategy with organization's objectives.
Adequate budget.
Staff training.
Effective change management.
Well-defined user requirements.
Data quality.
System quality.
Appropriate technology and tools.

7. In the context of **your BI project**, please identify the level of importance on each Critical Success Factor.

Committed and informed executive sponsor.
Committed management support.
Project champion.
Skilled and qualified staff.
Business user involvement.

Competent BI project manager.

Clear business unit vision and plan.

Align BI strategy with organization's objectives.

Adequate budget.

Staff training.

Effective change management.

Well-defined user requirements.

Data quality.

System quality.

Appropriate technology and tools.

8. In the context of a **general BI project**, please specify any other CSF that you consider as important but is not included in the above list.

9. In the context of **your BI project**, please specify any other CSF that you consider as important but is not included in the above list.

APPENDIX H: GRAMMARIAN LETTER

22 Krag Street
Napier
7270
Overberg
Western Cape

27 March 2019

WITS Business School
JOHANNESBURG

LANGUAGE & TECHNICAL EDITING

Cheryl M. Thomson

Critical success factors for Business Intelligence in the South African banking sector

Supervisor: Max MacKenzie

This is to confirm that I, Cheryl Thomson, executed the language and technical editing of the above-titled Applied Research Project for proposed publication in the South African Journal of Information Management, of BOIPELO RATHEBE, student number 1756596, at the WITS BUSINESS SCHOOL, in preparation for submission of this assignment for assessment.

Yours faithfully



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