A consulting strategy dealing with management constraints of self-service business intelligence

by

Sedigilwe Vincent Gaorekwe

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Declaration

DECLARATION

I certify that the *minor dissertation/dissertation/thesis* submitted by me for the degree *Master's of Commerce (Information and Knowledge Management)* at the University of Johannesburg is my independent work and has not been submitted by me for a degree at another university.

SEDIGILWE VINCENT GAOREKWE

(Name in block letters – no signature)

ABSTRACT

For many organisations, as business needs change, the need for better decision support systems increases. Which is why many organisations today embark on a journey of transitioning from traditional way of doing business intelligence to self-service business intelligence (SSBI). As is with many a new technology, SSBI presents different challenges to companies, therefore, to effectively deal with these challenges, it is critical to align IT and business strategies. To get real value out of the investment made on SSBI, companies tend to outsource the implementation and management of the solution to known consulting firms to assist them with effective ways of dealing with challenges posed by the solution.

Which is why this study embarked on a journey of developing a practical working framework for a consulting firm named C-firm, which can then be used as a strategy to deal with management constraints of SSBI for its clients. A single case study was conducted between C-Firm and its clients to explore management constraints of SSBI, which include data governance and management, supporting infrastructure, context, and systems integration, and to subsequently develop a practical working framework for implementing and managing SSBI solution.

The interactive approach model by Maxwell Loomis (2003), informed this case study research design. The flexibility of the interactive approach model best suited this study because it allowed different components of the study to interact with each other. A conceptual framework, which is one of the components of the interactive approach model, helped the researcher to focus on those factors that could assist in gaining understanding of the management issues associated with SSBI and how C-Firm can assist its clients in dealing with those issues.

The research choice for this study was mixed method, mixed-model research. This means quantitative and qualitative data were collected, and researcher used quantitative analysis procedures to report on the findings. Data collection instruments used were semi structured interviews and an online questionnaire with open-ended and close-ended questions. The empirical study involved gathering data from both C-Firm's employees and its clients. The research participants were nineteen (19) BI developers from C-Firm, and from C-Firm's clients' nine (9) BI developers and five (5) BI managers.

The key findings of the empirical study in terms of data governance and management, supporting infrastructure, context, and systems integration were then used to develop a

practical working framework for C-Firm. To development a framework, assumptions from each management constraints were explored, and conclusion and recommendation were given based on the key findings of the study. Based on the reasons given by the participants why organisations outsource their SSBI implementation and management of the solution to BI consulting firms, it became clear that it is important that for C-Firm to be effective in addressing management constraints of SSBI, it needs to have a practical working framework to successfully deploy and manage SSBI for their clients. The framework will inform C-Firm's strategy for dealing effectively with the implementation and management of SSBI solutions.

The framework builds on the analogy of a fabric fastener (zipper), which means that C-Firm and its clients are separate pieces of fabric, and data governance and management is the zipper. For a consulting firm to be effective in implementing this framework, a consulting firm and its client's strategies must align. The components of the framework include, (1) IT as enabler in the framework that integrates people, process, and technology, (2) facilitating collaboration as a strategy, (3) stakeholder management to ensure that the solution caters for the entire organisation, and (4) the scope of SSBI to ensure that C-Firm knows its role in the project.

In conclusion, though the framework applies to C-Firm, it has potential value to inform any consulting firm's SSBI strategy. The most important thing for a consulting firm adopting this framework, is to ensure that it has all the required skills to facilitate strategy alignment, which will lead to the execution of SSBI implementation and management strategy.

Keywords: Business intelligence; self-service business intelligence; context; data governance and management; supporting infrastructure; system integration; practical working framework

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List of abbreviations

BI.....business intelligence

cf .....compare further

CRM .....customer relationship management

DGM.....data governance and management

DSS.....decision support systems

ERP.....enterprise resources systems

et al .....and others

i.e. .....that is

IT.....information technology

KM.....knowledge management

MDM .....meta data management

SSBI.....self-service business intelligence

viz.....to be exact

Chapter 1

Introduction and problem statement

1.1 Introduction

Recent developments in business intelligence services entail the introduction of self-service business intelligence (Imhoff & White, 2011a; Buytendijk *et al*, 2016). Self-service business intelligence (SSBI) opens up new prospects to business intelligence (BI) companies as well as to the clients of BI companies. However, with these developments occurring, BI companies now also have to deal with management issues with respect to BI governance.

This study explores and measures management constraints of SSBI by investigating how factors such as, BI governance, system integration, context and supporting infrastructure, contribute to effective management of SSBI at a specific BI consulting firm and its clients. The aim of the study was to develop a strategy to be used by a consulting firm in ensuring effective implementation and management of its clients' SSBI solution. In order to achieve the aim of the study, this chapter firstly contextualises the research topic, explains the motivation of the study, and states the research problem. Secondly, an alignment of the research objectives and research problem follows, stated in line with the scope and delineation of the study. Thirdly, the research methodology follows with an introduction of the research design.

This chapter presents the interactive approach model, based on Maxwell's (2012) model, that was developed for this study in order to operationalise the research objectives (*cf* Figure 1.1). The purpose of an interactive model, explains Maxwell (2012:218), is to identify the contextual factors influencing the research design. These factors are prominent in the background of this study.

1.2 Background

Business intelligence has been around for many years. It is defined as an analytical tool or a system that is used to deliver information and knowledge and ultimately insights derived from data analysis, which allows an organisation to improve its decision-making (Azevedo & Santos, 2011:109; Wieder & Ossimitz, 2015:1165; Larson & Chang, 2016:700). To uncover hidden insights from data, BI has transitioned from being report-centric to more analysis-centric (O'Brien & Kok, 2006:3; Liebowitz, 2013:5; Larson & Chang, 2016:701; Mwilua, Wattiaua & Prat, 2016:108). Any BI consulting firm that aims to effectually assist clients to realise long-term value and achieve return on their BI

investment, has to develop a strategy. Without a strategy, *viz* a practical working framework, a BI consulting firm will not be able to deal with governance and management constraints of SSBI.

Management constraints have to be measured and dealt with in order for clients' SSBI to be effective (Buytendijk *et al*, 2016). According to global study done by Forbes Insight (QlikTech, 2016), nearly sixty percent of companies are planning to invest in SSBI capabilities. This study, which surveyed over four-hundred information technology (IT) and business professionals, found that most business users want to take control of their own analytics and decision-making. The survey found that two-thirds of respondents believed that self-service data analysis would create competitive advantage, and half of the respondents believed SSBI would reveal some valuable insights (QlikTech, 2016). It is for these reasons SSBI governance should be performed by departments that have strategies in place dealing with management constraints.

In previous years, IT departments were responsible for BI and decision makers were reliant on IT to provide them with BI reports (Moro, Cortez & Rita, 2014; Larson & Chang, 2016:703). Lately, due to growing enthusiasm for the notion of "big data", decision makers want to be in control of their own data, they need better access to the data and in the right format (Schmarzo, 2016:135-136). Business users' perception of seeing BI as an IT department's responsibility is changing and they now want to do more in-depth analysis on their data with less IT interventions (Rassom, 2007:5; Peters, Wieder, Sutton & Wakefield, 2016:2). Because of business users' demand of having control of the data, the industry started seeing a shift from traditional IT-led BI to SSBI, which was led by the business itself and no longer the responsibility of an IT department (Imhoff & White, 2011b). To transition successfully to business-led BI, management constraints associated with the BI solution have to be managed by following a "practical working framework" strategy (Wieder & Ossimitz, 2015:1164).

The gap identified in the BI industry presents a need for a practical working framework that deals with management constraints of SSBI. Though SSBI is a topic of global research interest, this study has a South African background. Doyle (2016), in an article published on the South African ITWeb quoted Anand, senior director of Product Marketing at MicroStrategy, saying, "IT and business teams need to work closely and re-organise the way analytics is delivered". A suggestion by Anand (Doyle, 2016), is to build a practical working framework which will be used to govern and control data access to ensure good data quality. In both the national and international arena, IBM (2010), suggests that for organisations to achieve its BI goals, it needs to have a practical working framework that provides a blueprint for successful BI.

The success of BI links directly to BI capabilities such as, data type quality, data source quality, flexibility, interaction with other systems, and user access quality, but these capabilities have inherit complexities (Kokin & Wang, 2013:754). Because of the complexities and lack of a clear practical working framework associated with implementation and management of SSBI, many organisations prefer to outsource its implementation and management of SSBI to third parties or consulting firms (Thomas, 2009; Harmann, 2013). The core business of BI consulting firms is to assist customers with implementation and management of BI solutions and their clients perceive them as experts in this field (Buytendijk *et al*, 2016). BI consulting firms are trusted by most organisations to help them achieve required business value from SSBI investments, yet the issue of management constraints seems inevitable (Peters *et al*, 2016:2; Harmann, 2013).

To effectually address issues of governance and management of SSBI, consulting firms need to have a clear practical working framework on how to deploy and manage SSBI for their clients (Brooks, El-Gayar & Sarnikar, 2015; Wieder & Ossimitz, 2015). They, together with other researchers mentioned in the literature review (*cf* Chapter 2), suggest building on the concepts of BI governance, system integration, context and supporting infrastructure, to develop a practical working framework. Also, the literature review will elaborate on issues of data security, governance, structure, processes and systems required for deployment and effective management of customers' SSBI solution.

Against this background, this study developed a consulting strategy dealing with management constraints of SSBI. For the purpose of this study, strategy refers to a 'practical working framework', either to serve as a consulting strategy in itself; or, the framework could inform a consulting firm's strategy on how to enable its clients to manage their SSBI solution effectively. In order to develop the framework, this study used qualitative and quantitative research methods to investigate governance aspects and factors contributing to successful implementation and management of SSBI. The motivation of the study originates from an information management perspective to implement and manage SSBI solutions.

1.3 Motivation of this study

Developing a practical working framework for a BI consulting firm is rooted in the field of information management. BI has evolved over the years and it is operating in the area of decision support systems (DSS). Its aim is to improve decision making in an organisation (Azevedo & Santos, 2011:110; Chang, 2014:513; Larson & Chang, 2016:700). DSS is found in information systems discipline and its objective is to support business decision-making processes (Azevedo & Santos,

2011:110). BI solutions consist of business processes, procedures, and technological components, supported by operational data sources, data warehouse, and analytics (O'Brien & Kok, 2006:3; Brooks *et al*, 2015). Besides having an organisation wide access to one trusted central information system for decision-making, another objective of a BI solution is to have easy-to-use reporting and analysis tools that help users to have better business insights and to uncover issues quickly (IBM, 2010).

Many BI vendors, including Tableau and MicroStrategy, are of the view that BI has changed significantly in the last few years (Anand, 2014; Godimho & Sharma, 2017:132). Earlier, Imhoff and White (2011b) found that, with the introduction of SSBI, users became less dependent on IT departments. Users describe SSBI's convenient features as firstly, ease of access to source data, secondly, easier and improved support for data analysis, and thirdly, faster deployment and ease of use of end-user interface (Imhoff & White, 2011a). These features add to the motivation of this study.

Motivation also builds on existing studies, such as Rassom (2007:5), at The Data Warehousing Institute (TDWI), stating "BI is expanding to accommodate BI search and text analytics", and Azevedo and Santos (2011:13) who went further by motivating what they called "adaptive BI" as a new approach to BI. Adaptive BI refers to self-learning BI systems, which integrates BI with artificial intelligence (Azevedo & Santos, 2011:12). Self-learning and self-service technologies can improve the quality of service that a firm provides, and at the end increase its efficiency, only if it really enables business users to make more informed decisions without relying on IT departments (Bitner, Ostrom, Meuter & Clancy, 2002:96; Hsieh, 2005; Azevedo & Santos, 2011; Anand, 2014). It is therefore important to acknowledge that successful implementation of SSBI requires strong partnership and commitment between business units and IT departments (Meyers, 2015).

This study is motivated by the many factors that have an effect on the successful implementation and management of SSBI, mentioned in literature (Hsieh, 2005; Reinders, Hagen & Frambach, 2007; Azevedo & Santos, 2011; Marín-Ortegaa, Dmitriyevb, & Gómezb, 2014; Meyers, 2015; Stevens, 2014; Kubina, Koman & Kubinova, 2015; Peters *et al*, 2016; Wang, Xu, Fujita & Liu, 2016, *cf* Figure 2.2). These factors include BI models and frameworks, data management and governance (DMG), data quality, business-IT partnership, ease of use, big data, executive machine learning, and other technology issues. Especially the factor mentioned first motivated this study, that is, the need for a practical working framework to inform the consulting strategy of a BI consulting firm to deal with management constraints of SSBI successfully.

According to IBM (2010), an organisation's success depends on its focus on people, processes, and technology that need to be integrated and aligned in order to have a strategic approach to BI solution. SSBI relies on people, process, and technology in order to enable governance workflows (Doyle, 2016). Both IBM (2010) and Doyle (2016) explain that the goal is to have IT and business departments working together for the successful deployment and management of SSBI. QlikTech, (2016) adds that for SSBI to be successful, a BI model must ensure data security, integrity and it must be able to give business users confidence that their analysis works with complete and accurate data sets.

Users' SSBI confidence is another key motivation of this study. Once a SSBI solution is implemented, organisations must ensure that they manage the system as effective as possible. Some organisations cannot implement the solution by themselves, they rely on BI consulting firms to assist them with deployment of the solution (Harmann, 2013). According to IBM (2010), most organisations use a combination of vendors, products and services to provide BI solutions. BI consulting firms are supposed to have expertise required to assist clients achieve BI objectives. To ensure successful implementation and effective management of SSBI for the organisation, a practical working framework that integrate people, process and technology with vendors and services must be established (IBM, 2010).

Given the above motivation of the study, the focus then was to develop a practical working framework for a specific BI consulting firm. In accordance with the University of Johannesburg Code of Academic and Research Ethics (2007:5), a generic name, namely C-Firm, replaces the actual name of the BI consulting firm throughout the dissertation. C-Firm's need to address its clients' BI management constraints provided the foundation for this study's research problem.

1.4 Research problem statement

Mouton (2001:74) emphasises the importance of knowing the nature of the problem well in order to minimise the gap identified in a subject area. A research problem usually stems from a practical, real-world problem (Mouton, 2001:139). In this study, the research problem stems from C-Firm's need to be effective in assisting its clients to realise long-term value and achieving return on their BI investment. C-Firm requires a consulting strategy to deal with governance and management constraints of self-service business intelligence.

This study aimed to answer the main research question:

How will a consulting firm deal effectively with the management constraints of self-service business intelligence?

Four sub questions were derived from the research question:

- How does C-Firm support its clients to implement and manage their self-service business intelligence solution?
- How important and to what extent do BI governance, system integration, context, and supporting infrastructure factors affect management of the SSBI solution?
- What are the BI governance, system integration, context, and infrastructure management constraints experienced by C-Firm consultants and clients?
- How can a consulting firm assist clients in dealing with the SSBI constraints?

The research aim and objectives identify the purpose for solving the above research problem.

1.5 Research aim and objectives

The research aim was to explore how BI governance, system integration, context, and supporting infrastructure factors contribute to effective management of SSBI, and subsequently develop a strategy to be used by C-Firm in ensuring effective implementation and management of its clients' SSBI solution.

In order to ensure a tangible answer to the research question and satisfy the research aim, the research objectives were:

1) To identify how BI governance, from traditional BI to SSBI standards and procedures, contribute to effective management of SSBI solution.
2) To demonstrate how outsourcing strategies deployed by BI firms contribute to effective management of clients' SSBI solution.
3) To explore the level of importance and the extent to which management constraints factors affect management of SSBI.
4) To determine the perception held by SSBI consultants from C-Firm and its clients' SSBI developers regarding what BI governance, system integration, context, and infrastructure management constraints exist?

The précised objective was to identify how a consulting firm can assist in dealing with clients' SSBI constraints. Each of the four objectives tie back to the research aim, which was to explore BI

governance, system integration, context, and supporting infrastructure factors in order to develop a consulting strategy dealing with management constraints of SSBI.

The objectives provide researchable units that assist with answering the main research question. The first and second objectives were addressed by analysing qualitative data collected from an online questionnaire and an interview, the third objective used quantitative data from the same online questionnaire's structured questions, and the fourth objective used both quantitative and qualitative data collected as described next in the research design section.

1.6 Research design

The interactive approach model of Maxwell and Loomis (2003), which Maxwell (2012) later refined, informed the research design of this mixed method study. Figure 1.1 presents, by means of the interactive approach model, a detailed map of the interactive approach of this study.

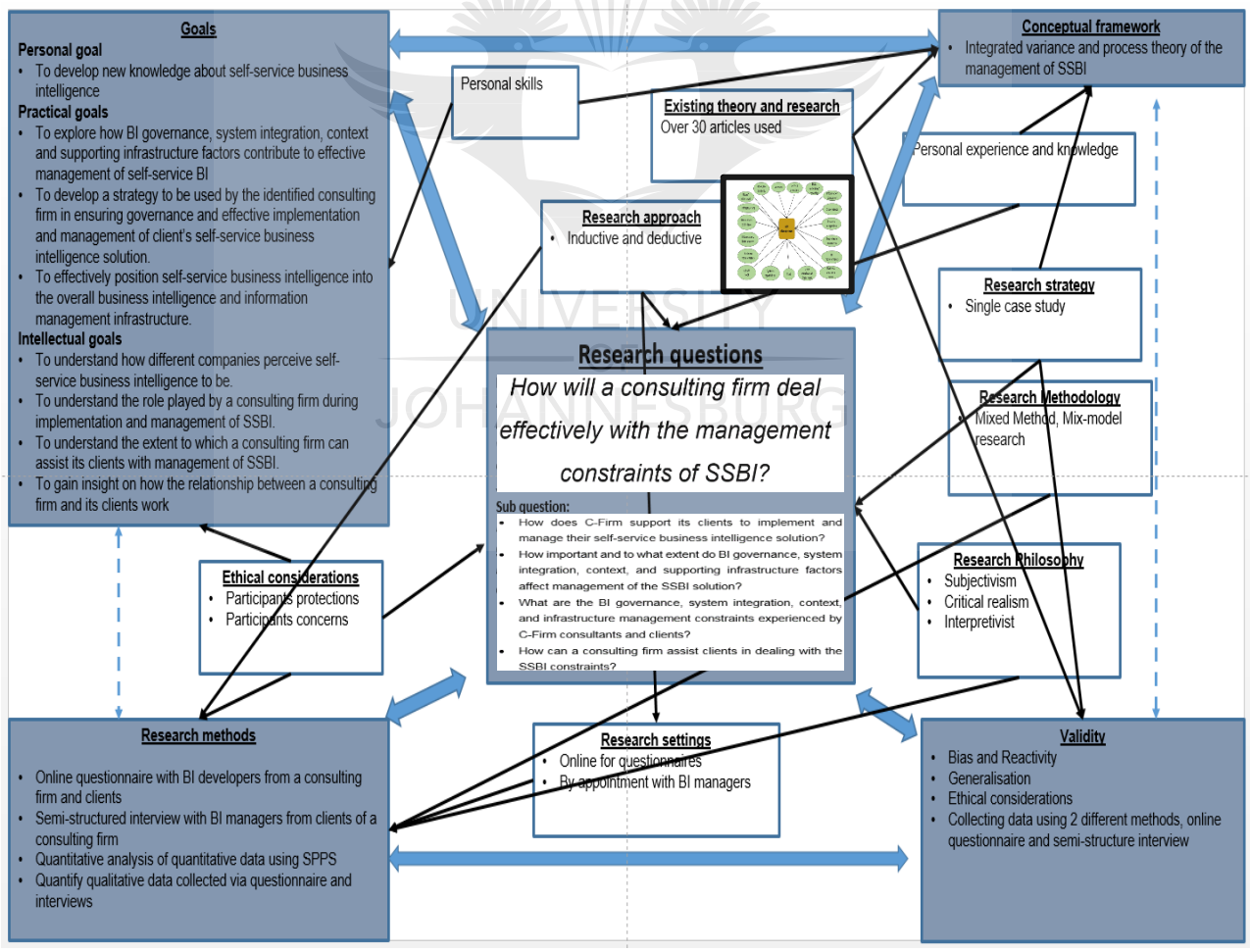

Figure 1.1: Contextual factors influencing a research design (adopted from Maxwell, 2012:218)

Figure 1.1 indicates the contextual factors that influenced the research design. It gives a compacted view, which will be further unpacked in Chapter 3. The study used the quantitative approach to understand the level of importance and extent to which BI governance, system integration, context, and supporting infrastructure factors affect SSBI, and the qualitative approach was adopted to explore how C-Firm should assist its clients in managing those factors.

The interactive approach model was best suited for this study because it allows a flexible process where components of the model are compatible and work effectively with each other, operating through every stage of a research project (Maxwell & Loomis, 2003:244; Maxwell, 2012:214). In the interactive approach model, researchers have to contemplate a number of components and factors, discussed below.

1.6.1 Main components of the interactive approach model

The interactive approach model consists of five components (*cf* Figure 1.1), namely:

- Goals
- Conceptual framework
- Research questions
- Research methods
- Validity

Central to all these components are the research questions. The other four components of the model connect directly to the research questions. Maxwell and Loomis (2003) acknowledge that there are factors other than these five components, which could affect the research design. These factors form part of the research environment within which the research exists, and those factors include research methodology, research philosophy, research strategy, researcher's skills and knowledge, ethical considerations, and settings among other factors.

1.6.2 Factors affecting the interactive model

The philosophical assumptions of this study follow a subjectivist stance of ontology and interpretivist stance of epistemology. The reason is to integrate human interest into a study by making sense of data collected from the BI industry's experts. According to Saunders, Lewis and Thornhill (2009:116), "interpretivist advocates that it is necessary for the researcher to understand differences between humans as social actors" and "subjectivism is about understanding the meaning that individuals attach to social phenomena" (Saunders *et al*, 2009:111).

The purpose of this study is to understand the relationship between variables as well as to understand and gain insight about management constraints of SSBI, which is why explanatory and exploratory purpose is relevant. According to Saunders *et al* (2009), explanatory aims at establishing relationships between variables and exploratory study aims at understanding what is happening and finding new insights. Due to the explanatory and exploratory nature and aim of this study, a combination of deductive and inductive approach was adopted. Deductive approach explored the assumptions identified in literature as well as experiential observations made by the researcher in this field. Inductive approach was used to develop a consulting strategy using results of data analysis on how to effectively management SSBI.

In order to gain rich understanding of SSBI, multiple data collection techniques, focusing on a single critical case was used to ensure that collected data is correct. Saunders *et al* (2009:146), describe this approach as mixed-method, mixed-model research. A semi-structured interview was used to collect data from BI managers of C-Firm's clients, and an online self-administered questionnaire was used to collect data from C-Firm's employees as well as from clients' BI team members. Semi-structured interview was preferred because the study aimed at understanding governance and effective management of BI solution for an organisation through outsourced services. The interview was one-on-one, face-to-face, and written response interview with BI managers from C-Firm's clients. The reason for selecting an online questionnaire as a second data collection instrument was that data had to be collected from research participants employed by client organisations that were located in many different locations.

Lastly, the time factor that affective the interactive model has to be noted. The study was cross-sectional, based on management constraints at a particular moment and the study was completed in less than a year.

1.7 Research methods

Data were collected and analysed using a combination of quantitative and qualitative methods in order to develop a practical working framework for SSBI. Techniques entailed semi-structured interview and questionnaire. To analyse collected data, data were summarised and categorised together. Saunders *et al* (2009:491), say that these two processes are relevant for both data collection techniques chosen for this research. Data collected through questionnaire were analysed using the quantitative data analysis software tool, SPSS. Data collected through semi-structured interview were summarised and categorised into multiple units on data, quantified, and analysed by using same quantitative data analysis software tool (Saunders *et al*, 2009:493).

In order to reach the objectives of this study, purposive sampling was used (*cf* Section 3.6.4.2). As mentioned above and in more detail in Chapter 3, data were collected from BI managers by interview, then by questionnaire collecting data from BI developers located in different client organisations. This was done by means of the purposive sampling technique, specifically critical case sampling as explained by Saunders *et al* (2009:240). Critical case sampling was appropriate for three reasons. Firstly, the goal was to understand what was happening in each critical case, secondly, the sample was small given the number of expert BI developers, and thirdly, the specific focus on SSBI determined the selection of critical cases.

Formal permission was obtained from C-Firm to use its employees to gather data for this research, which was a requirement of conducting this study (*cf* Appendix A). The study did not subject the research population to any harm or embarrassment and briefed all participants on the purpose of the study. Participants could withdraw at any time. Their participation was anonymous and their identities not revealed in this dissertation nor reports that may result later. Participants' privacy and other rights were observed in order to make sure this research is done ethically.

To ensure credibility of this study, Maxwell and Loomis (2003), Saunders *et al* (2009), and Miles, Huberman and Saldaña's (2013) guiding principles were applied in designing the research in a manner that would make it possible for other researchers to use its measures and yield same results on a different occasion, for example:

- Giving relevant information regarding different themes to be discussed during the interview to participants in advanced
- Keeping records of audio recordings
- Applying systematic note-taking techniques during interviews with BI experts

Section 3.6.4.4 and Section 4.3 elaborate further on the above steps making it possible to re-analyse data. Chapter 3 and Chapter 4 further describe the processes of thematic analysis and quantification of qualitative data as well as statistical analysis in order to test the validity of the research.

1.8 Scope and delineation of study

The scope of the study is BI and specifically the management constraints that may possibly affect the successful implementation of clients' SSBI solution. The aim was to develop a practical working framework for a specific BI consulting firm, which meant that the unit of analysis, *viz* management

constraints of SSBI, and units of observation, *viz* BI managers and BI developers, added to the study's delineation. The sample was small given the number of expert BI developers with specific focus on SSBI. In addition, the location of research participants at client organisations had some bearing on the methodological choices, for instance, an online questionnaire was best suited to collect data from dispersed research participants.

1.9 Chapter layout

The study consists of five chapters:

Chapter 1 – Introduction: Introduces the concept of business intelligence and SSBI, specifically how self-service business intelligence opens up new prospects to BI companies as well as to the clients of BI companies. It gives a background and motivation of conducting this study and introduces the research design. The study was designed to develop a strategy to be used by a consulting firm in ensuring effective implementation and management of its clients' SSBI solution.

Chapter 2 – Conceptual framework: Develops the constructs to be included in the conceptual framework used for this study. It discusses the steps followed to construct the framework, as well as different sources of information used. The discussion leans on previous research and literature regarding SSBI and its future. The chapter follows interactive research design procedure and explains the three phases of the conceptual framework with the assumptions relating to each phase.

Chapter 3 – Research methodology: Explores the interactive approach model and explains how the study was conducted in order to develop a strategy to be used by a consulting firm in ensuring effective implementation and management of its clients' SSBI solution

Chapter 4 – Research findings: Presents what the study has found from analysing the data collected and from critically reviewing the literature. Data were analysed using both qualitative and quantitative data analysis techniques. The reporting of research findings utilises quantitative reporting, with incorporation of qualitative research findings. A quantitative reporting manner was chosen, taking caution in line with Maxwell's (2010:475) advice "to make statements such as 'some', 'usually', and 'most' more precise". This chapter discusses the data on which the practical working framework builds.

Chapter 5 – Conclusion and recommendation: Synthesises the outcome of interactive research in the form of a practical working framework for SSBI. It recommends possible considerations for

inclusion in the consulting strategy of a BI consulting firm. The chapter lays out the limitations of the study, indicates future research considerations, and ends the study by summarising the potential value of the study.

1.10 Summary

The research topic is a consulting strategy dealing with management constraints of self-service business intelligence. Management constraints have to be measured and dealt with in order for a BI consulting firm's clients' SSBI solution to be effective (Buytendijk *et al*, 2016). This study utilises an interactive approach model, which integrates information from literature in a conceptual framework and knowledge from BI experts in order to develop a practical working framework to measure management constraints of SSBI. This study is limited to one BI consulting firm's BI managers and BI developers of client organisations.

Chapter 2

Conceptual framework

2.1 Introduction

In Chapter 1, the background to the study was set within the context of information management, and more specifically the context of business intelligence (BI). A practical working framework is required in order to address management constraints of self-service business intelligence (SSBI). Firstly, a conceptual framework is required that will look at the relationship between factors affecting implementation and management of a BI consulting firm's clients' SSBI solution in order to produce a practical working framework. The conceptual framework is the initial stage of developing a consulting strategy, which may possibly be used to deploy a SSBI solution tailored for a specific organisation's information needs while addressing the main objective of SSBI.

This chapter discusses the development of a conceptual framework used for the study of SSBI management constraints affecting a BI consulting firm's clients. A conceptual framework is one of the five components of the interactive approach model of research design adopted for this study (*cf* Chapter 3). A conceptual framework, according to Maxwell (2009:222), "is the system of concepts, assumptions, expectations, beliefs, and theories that support and inform your research". Either it explains graphically or narratively things studied, *viz* factors and variables, and presumed interrelationships among them (Miles *et al*, 2013:20). It gives directions to the researcher before and during fieldwork, by clarifying what one wants to find out from whom and why (Miles *et al*, 2013:37). Maxwell (2013:40) says that some researchers refer to 'conceptual framework' as 'literature review', but cautions that it is a dangerous term to use in some instances. For instance, studies based on the interactive approach model such as this study, draws on the literature as a source of ideas from which the conceptual framework develops.

This chapter begins with an overview of the benefits of a conceptual framework. Secondly, it explains the conceptual framework by means of graphical illustration and full narration. Lastly, the chapter summarises the assumptions explored by this study based on the conceptual framework.

2.2 Benefits of conceptual frameworks

The conceptual framework is used throughout the research process; it gives structure to research from the beginning to end and is an integral part of identifying the contextual factors influencing a research design (*cf* Figure 1.1, Figure 2.1, Figure 2.2 and Figure 2.4). In this study, the conceptual

framework informed and influenced the research problem, objectives, research questions, and data collection techniques. The conceptual framework, through research questions and goals, focused on factors that could assist in gaining understanding of management constraints associated with SSBI and ideas surfaced of how a BI consulting firm could assist clients in dealing with those issues. Figure 2.1 illustrates two benefits of conceptual framework, namely, having a clear outline of goals linked to a single unit of analysis.

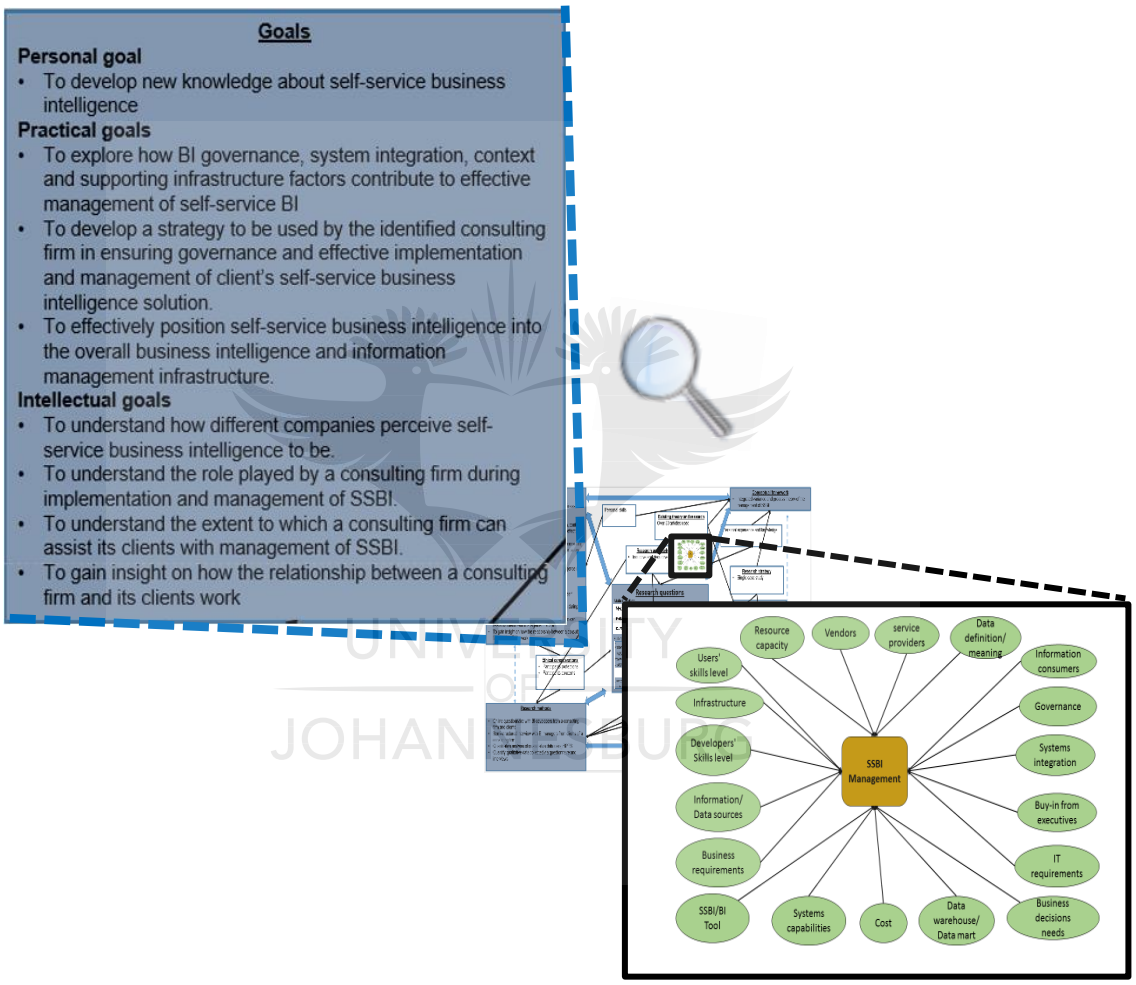

Figure 2.1: Benefits of conceptual framework (own source)

Utilising a conceptual framework in an interactive approach model assists in understanding how the research process developed. For example, Figure 2.1 magnifies the goals and positions the unit of analysis, with its detail in Figure 2.2 and onwards to Chapter 3. The conceptual framework helped the researcher to see and critically analyse problems and shortcomings of own and other people's research. According to Maxwell (2013:41), when developing a conceptual framework, a

researcher's role is not only to be descriptive, but to be critical as well. The aim of using previous theories or literature is to identify holes, and use your study to fill in those holes (Maxwell, 2013:41). The benefit of using the conceptual framework is to reflect on the holes and formulate goals of how best to fill those holes. Figure 2.1 illustrates how the conceptual framework influenced the research design and helped formulate goals aimed at addressing the gap.

Firstly, the conceptual framework helped develop the researcher's personal goal, namely, to develop new knowledge about SSBI. The process of identifying goals was part of the first step of four steps of developing this study's conceptual framework.

2.3 Conceptual framework development

A conceptual framework is not something "found pre-built", it is rather "constructed" (Maxwell, 2013:41). There are different sources of information and approaches that can be used to construct the framework. The construction of this study's conceptual framework involved four initial steps:

- **Step 1 –** Choose a topic and state the research problem
- **Step 2 –** Find sources of information and factors which could assist in understanding the research problem
- **Step 3 –** Identify relationships between factors and variables from Step 2
- **Step 4 –** Construct a conceptual framework

Chapter 1 resulted as an outcome of Step 1, in brief iteration, the research topic is a consulting strategy dealing with management constraints of SSBI. The problem pertains to a specific BI consulting firm (C-Firm), but other companies may possibly relate to this problem: For C-Firm to be effective in assisting clients to realise long term value and achieving return on their BI investment, it needs to have a practical working framework to deal with the management constraints of SSBI.

Developing a conceptual framework entails a purpose statement to put things into perspective. Already the motivation for the study (*cf* Section 1.3), and research objectives (*cf* Section 1.5), show how the conceptual framework evolved and influenced the research. Chapter 1 outlined the aim of the study, to explore how BI governance, system integration, context, and supporting infrastructure factors contribute to effective management of SSBI, and to develop a strategy to be used by C-Firm in ensuring effective implementation and management of its clients' SSBI solution. It is important to "engage expert guidance" in order to ensure that a SSBI product pays off, says Vince

(2014). Understanding how to ensure the SSBI product pays off, formed part of the next step of conceptual framework development.

2.4 Sources informing the concept of self-service business intelligence

The second step of the conceptual framework was to identify sources of information to use in order to find factors or anything that could assist in answering the research question. Maxwell (2009:223) identifies four sources, of which two applied for this study:

- Researcher's own experiential knowledge (*applied*)
- Existing theory and research (*applied*)
- Pilot and exploratory studies
- Thought experiments

Though the researcher's own experimental knowledge in the BI field played an important role to identify the research problem, the researcher relied equally on other sources, which helped clarify and understand the research topic. SSBI is relatively new in South Africa and therefore a combination of inductive and deductive strategies applied to combine testing of existing theory as well as collect data to develop theory that would fill in the gap.

Traditionally, what researchers bring to the research is their own background knowledge that could likely be "biased", yet Maxwell (2009:225) contends that experiential knowledge can bring insights and validity checks to the project. Saunders *et al* (2009:25), support this notion, which was also the notion of this study of SSBI, namely, previous research and existing theory was used just to gather ideas and to identify which problems were solved previously, but existing theory and research findings were not used as an "authority to be deferred to" (Maxwell 2013:41).

Over thirty sources, which included different research articles and journals, magazines, blogs, conference presentations and other people's perspectives were evaluated. These sources helped in identifying different factors that could possibly affect management of SSBI. These factors form part of Step 3 of conceptual framework development.

2.5 Self-service business intelligence management

Step 3 of conceptual framework development begins by indicating relationships between factors and variables relevant to SSBI management. Figure 2.2 depicts people, things, factors, systems, concepts, and processes that may potentially affect the management of SSBI based on the

researcher's experiential knowledge. A direct line from each circle, pointing to central point, SSBI Management, reveals the researcher's initial conception of factors that may possibly have an effect on the successful implementation and management of SSBI solution. These 19 factors are not an exhaustive list of SSBI management factors; instead, it illustrates the initial phase of conceptual framework development.

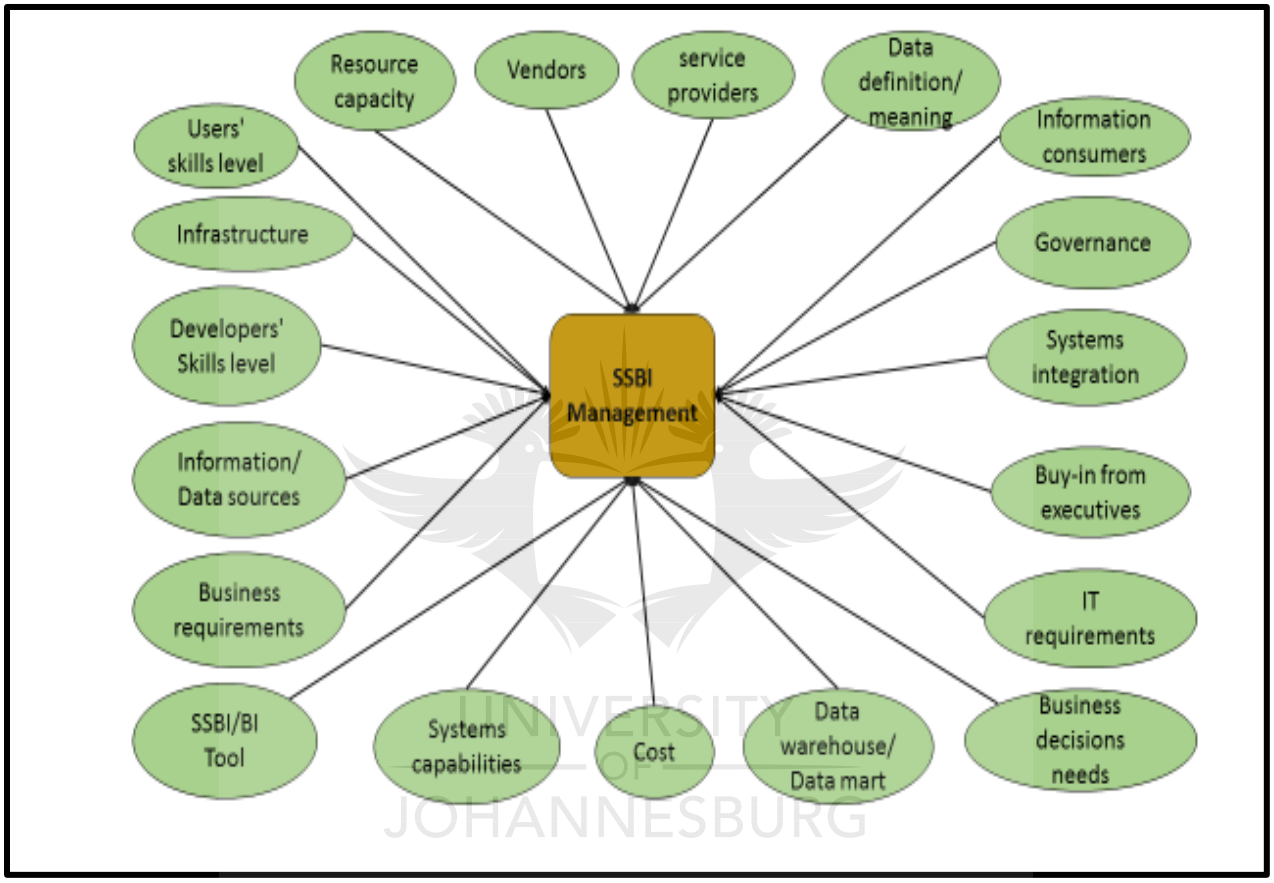

Figure 2.2: Conceptualisation of SSBI management (own source)

Figure 2.2 is included in Figure 1.1 as part of the interactive approach model, which illustrates the contextual factors influencing the research design. Figure 2.2 represents the first draft of conceptual framework with a description of each factor in Table 2.1. It illustrates the initial conceptualisation of SSBI management as part of the process of developing a practical working framework for a specific BI consulting firm. Firstly, a rough outline of SSBI was necessary in order to understand facets of the unit of analysis, *viz* management constraints of SSBI. Secondly, a description of factors was necessary in order to establish a common understanding among the study's units of observation, *viz* BI managers and BI developers. Both these initial actions, the

conceptualisation and description of factors derived from the researcher's experiential knowledge, followed by ideas and theories in literature (*cf* Section 2.6).

Table 2.1: Description of SSBI management factors

Factors	Description
1. Business decisions needs	Understanding of business decisions needs, both by users and developers, what their needs are in terms of their business
2. Business requirements	Clarity on business expectations and requirement of SSBI
3. Buy-in from executives	Level of support from management and other executive stakeholders
4. Cost	Cost of SSBI application/solution versus the value it adds to the business
5. Data definition/meaning	Level of understanding of business terms, or language applied to SSBI (context)
6. Data warehouse/Data mart	Efficiency, reliability and accessibility of data warehouse, data marts, source systems to SSBI
7. Developers' skills level	Technical capabilities of SSBI/BI developers, architects, managers, analysts
8. Governance	Effectiveness of procedures, policies and standards implemented
9. Information consumers	Any other application, beside users, that consumes data from SSBI solution
10. Information/Data sources	Number and types of sources used to feed SSBI, specifically whether those sources are reliable and providing quality information
11. Infrastructure	Feasibility and capabilities of the overall infrastructure where SSBI is deployed
12. IT requirements	Clear IT requirements in terms of managing or hosting SSBI solution
13. Resource capacity	Number of people, financial resource, and time involved/required to ensure smooth running of SSBI
14. Service providers	Level of involvement of service providers and type of services and assistance they offer
15. SSBI/BI tool	Understanding the application/solution's capabilities, features, level of sophistication, accessibility
16. Systems capabilities	Processes and procedures implemented, including process to be followed in regards to request of new reports, new data source or new user
17. Systems integration	The extent to which SSBI integrates with other systems including source systems, data warehouse, analytics application, etc.
18. Users' skills level	Level of understanding of business needs and what BI/SSBI can offer, technical capabilities of SSBI/BI users
19. Vendors	Accessibility and available of vendors when required

Before constructing the final conceptual framework, a study of literature reflects how BI has developed over the years from traditional BI to SSBI.

2.6 Development of decision support tool

The dimensions of decision support tools develop as IT becomes more advanced. The literature describes the development from traditional BI to SSBI. BI has evolved over the years in its operation in the area of decision support systems (DSS). The aim of DSS is to improve decision-making in an organisation (Chang, 2014:513; Wieder & Ossimitz, 2015:2; Bacis & Fadlalla, 2016:77; Larson & Chang, 2016:700). DSS is found in information systems discipline and its objective is to support the decision-making process for business (Azevedo & Santos, 2011:110).

There are different definitions of BI in literature. This study adopted the definition by Godimho and Sharma (2017:132), namely:

> Business intelligence is a set of techniques and tools for the transformation of raw data into meaningful and useful information for the purpose of business analysis.

Based on this definition, BI is an umbrella term that incorporates tools and techniques, collectively referred to as a BI solution that consists of different processes, procedures, and technological components. BI solution relies on operational data sources, data warehouse, and analytics to support decision-making using business data (O'Brien & Kok, 2006:3; Moro *et al*, 2014:22; Brooks *et al*, 2015; Godimho & Sharma, 2016:26). Besides having an organisation wide access to one trusted central information system for decision-making, another objective of BI solution is to have easy-to-use reporting and analysis tool that assists users to have better business insights and to uncover hidden issues quickly (IBM, 2010; Imhoff & White, 2011a). BI solution supports decision makers by providing them with tools and methods to access and manage their data easily (Brichni, Dupuy-Chessa, Gzara, Mandran & Jeannet, 2017:97).

Data is vital to an organisation's success and sustainability and the "BI world" is adapting to the modern world of business by ensuring effective use of data and information (Brichni *et al*, 2017:97). Rapid growth in business needs contributes to the change in BI, which in turn makes organisations to re-evaluate their BI operations and systems to ensure continuous business performance. Organisations respond positively to business growth by adopting a self-service approach to BI. Traditionally, BI was largely for IT specialists; in recent times, decision makers in the organisation can have access to BI insights without relying on IT (Moro *et al*, 2014; Larson & Chang, 2016:703). Decision makers want to be in control of their own data and as business users, they need better access to the data and in the right format.

Business users' perception of seeing BI as an IT department's responsibility is changing and they want to do more in-depth analysis on their data with less IT interventions (Rassom, 2007; Imhoff & White, 2011b). Because of business users' demand of having control of data, the industry started seeing the shift from traditional IT-led BI to SSBI, which is led by the business (Peters *et al*, 2016:2). According to Evelson (2012), 80% of BI requirements must be carried out by the business and only 20% by IT. Moving beyond traditional BI means that business itself takes responsibility of managing SSBI.

2.6.1 Business intelligence led by business

In recent years, new frameworks, models, and software describe and facilitate the transition to business-led BI. To distinguish modern BI solutions, Wieder and Ossimitz (2015:1164), mention three shifts:

1. Shift to involve system integration and management of structured and unstructured data
2. Shift to discover new opportunities for data, information and knowledge discovery due to the sheer size of available data (big data)
3. Shift to self-service capabilities

Self-service, according to Horwit (2011), refers to business decision makers' ability to access and interact with corporate data, to ask business questions quickly without technical help from BI experts. Imhoff and White (2011b), describe self-service as "a facility within BI environment that enables users to become more self-reliant and less dependent on the IT departments". Wieder and Ossimitz (2015:1165) expand on these explanations and emphasise the importance to have IT and business strategies aligned to ensure proper management of the solution. An SSBI implementation team should create an infrastructure that permits free flow of information from all systems (Imhoff & White, 2011a).

The advantage of SSBI is that it brings information to business users quicker and it improves decision-making process (Horwit, 2011). The implementation and management of SSBI requires knowledgeable experts to assist businesses to transition from traditional BI. According to Vince (2014), implementation of SSBI requires expert engagement to guide the organisation throughout process. Though implementation and management of SSBI can be outsourced, Wieder and Ossimitz (2015:1168) maintain that means beyond IT department is also a required.

SSBI should not be looked as an independent solution (Vince, 2014). Horwitt (2011) views SSBI as part of the larger functional BI solution. SSBI does not mean zero IT involvement; there may be

certain aspects of traditional BI that SSBI will not be able to address. SSBI, for instance, may or may not satisfy quality and integration of data sources used by business user to blend reports. Assessment and verification of data sources is part of a larger BI function. SSBI cuts down the turnaround time of reports and dashboards to business users and it is vital for IT to work with business to ensure the right information is available in SSBI when needed and in the right format.

Business-led BI requires a bridge between business and IT in delivering quality information to the business decision makers. Vince (2014), Wieder and Ossimitz (2015), and Peters *et al* (2016), opine that SSBI implementation requires expert engagement to guide the organisation throughout process of realising business-led BI.

2.6.2 Business-led BI requires expert management

SSBI is not a plug and play solution, it requires strategies and commitment from all stakeholders to realise its true value proposition. The Data Warehouse Institute (TDWI) developed a BI maturity model, which describes good practice leading to business-led BI as an indication of maturity (Eckerson, 2007). Mature organisations find themselves on adult or sage level and reap the advantages of modern BI (*cf* Figure 2.3).

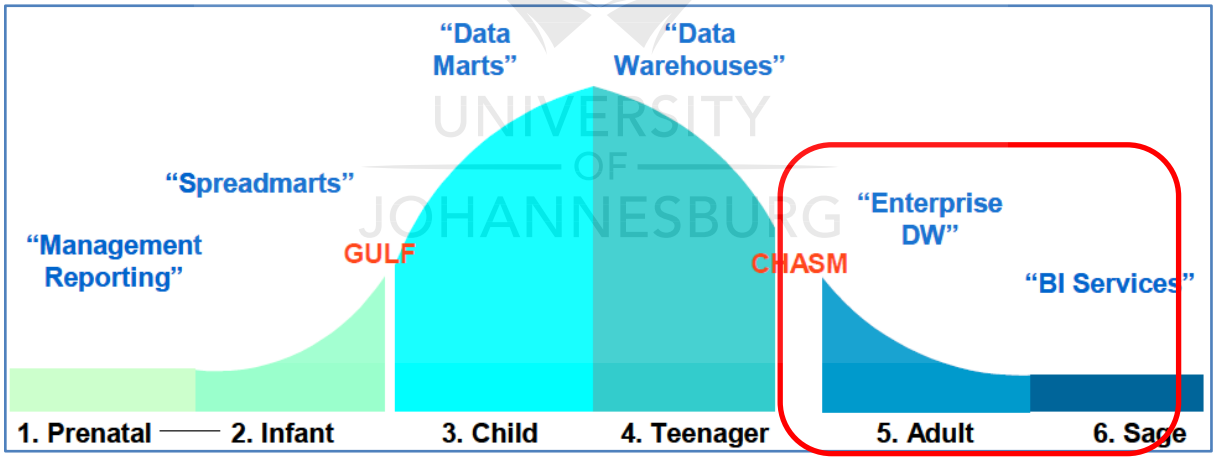

Figure 2.3: Business intelligence maturity model (adopted from Eckerson, 2007)

Figure 2.3 highlights two post-chasm phases in relation to studying management constraints of SSBI because this is where BI becomes "mission-critical systems" to business (Eckerson, 2007). Failing to deal with management constraints could affect core processes and weaken BI as a utility to solve business problems. Business users, processes, and technologies involved in production and management of business data and information should not be neglected when formulating SSBI

strategies (Eckerson, 2007; Doyle, 2016). IBM (2010) and SAS (2005) link the potential to increase business performance and create a competitive advantage for an organisation to SSBI consumers.

The consumers of SSBI solutions are business users; they play a vital role during SSBI solution implementation and management. It is important that IT and business consider SSBI consumers when they, i.e. IT and business, make decisions to implement SSBI. Once implemented, SSBI has the potential to enable business users from different functions within the organisation to collaborate in building a sustainable solution according to their needs (Horwitt, 2011). To ensure a true benefit of SSBI, literature above suggests that SSBI strategies should integrate people, process, and technology in its development and execution. Next, experiential knowledge as well as concepts found in literature are utilised to construct the conceptual framework.

2.7 Construction of conceptual framework component

Many activities contribute to SSBI development. All these activities relate to the objective of SSBI, namely to give business decision makers the ability to access and interact with corporate data without the assistance of an IT department (Vince, 2014). This section constitutes the final step of conceptual framework development. It groups different factors from Figure 2.2 above together and subsequently assesses consolidated factors to see how and to what extent they affect the successful implementation and management of SSBI.

Conscious of the many activities of SSBI and its objective, the construction of this study's conceptual framework looks at the relationship between factors affecting implementation and management of SSBI solution in order to produce a practical working framework. Ultimately, the framework could serve as a strategy to deploy a SSBI solution tailored for a specific organisation's information needs. In order to achieve this outcome, the construction of conceptual framework components distinguished between variance and process theory. Variance focuses on measurement of variables and correlation between them whereas process theory on the other hand is concerned with events and processes that connects those (Maxwell & Loomis, 2003:248-252).

Implementation and management of SSBI solution is conceptualised in three phases as depicted in Figure 2.4. In this conceptual framework, the first phase deals with management constraints of SSBI. In order to be comprehensive, the conceptual framework also depicts two related phases, although these phases relates to the scope of SSBI, and the implementation and management framework. The second and third phases form part of the conceptual framework in order to present

a holistic view of SSBI. Figure 2.4 also illustrates the relationship of the third phase to the first and second phases, discussed further below.

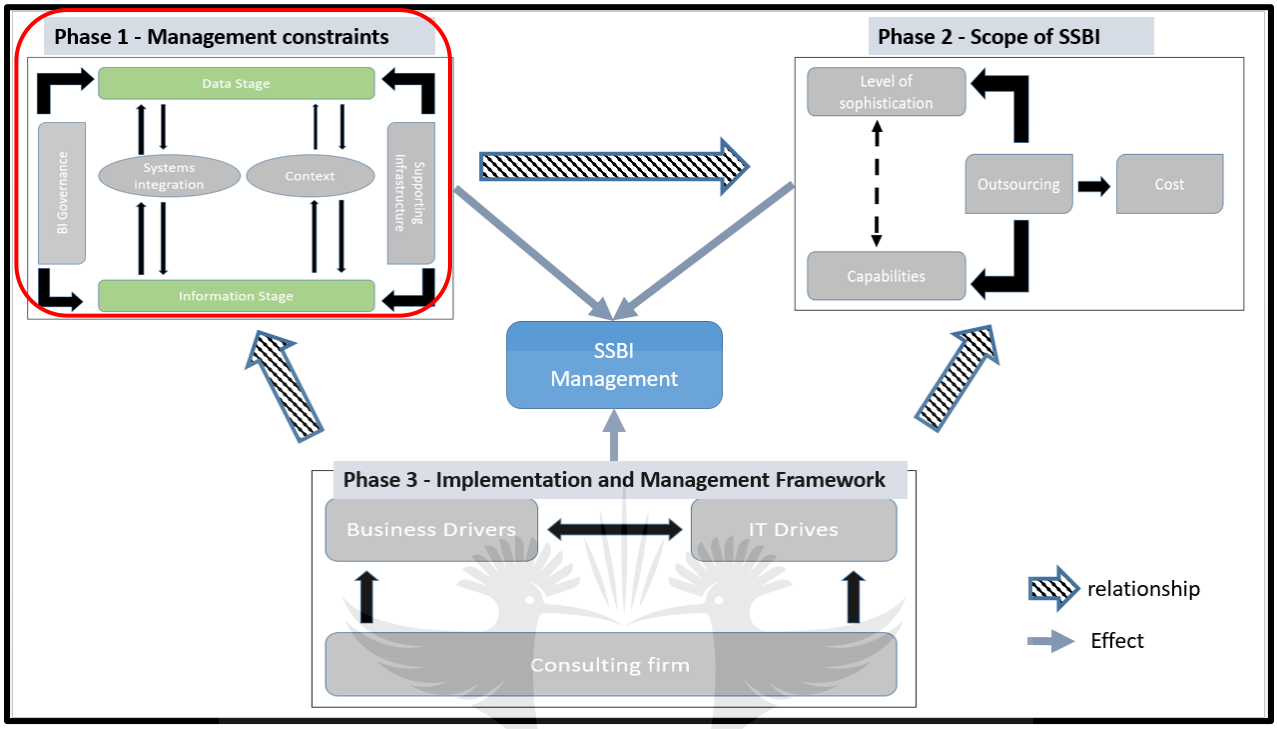

Figure 2.4: Conceptual framework (own source)

Figure 2.4 presents the conceptual framework constructed for this study. The unit of analysis is management constraints (Phase 1). Both Phase 1 and Phase 2 use information from Phase 3. All three these phases are interdependent. The limited scope of a minor-dissertation influenced the decision to focus on Phase 1, though Phase 2 and Phase 3 also receive brief exploration. For example, Assumption 10 (discussed later) was also tested against Phase 1 (Assumption 1 to Assumption 4) to find out if indeed C-Firm can help clients see desired value from their SSBI investment. The study's assumptions stem from Phase 1, Phase 2, and Phase 3.

2.7.1 Phase 1: Management constraints of SSBI

For the purpose of this study, reference to 'SSBI solution' does not imply a specific BI software; instead, it refers to collective BI tools and related technologies, application, and processes used in support of the main objective of SSBI. To achieve this objective, there are two distinctive stages, namely data stage and information stage.

During data stage, required data is identified, collected, stored, and managed (Wieder & Ossimitz, 2015). Data warehouse and data marts support this first stage. How data is managed during the first stage is very significant to the second stage. The second stage deals with how data from the first stage converts to information. This stage deals with retrieving, processing, and presentation of data from data warehouse and data marts (Wieder & Ossimitz, 2015). It is at this stage when factors affecting management of SSBI begin to occur, illustrated in Figure 2.5.

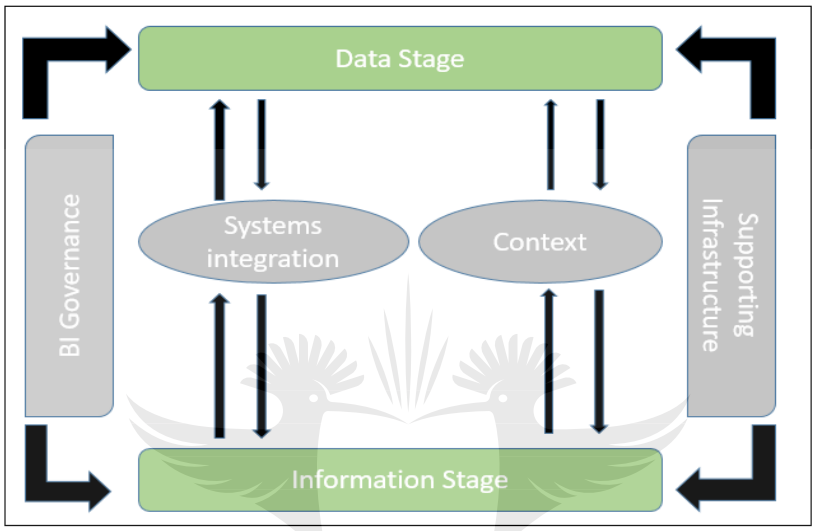

Figure 2.5: Phase 1 – Management constraints of SSBI (own source)

Figure 2.5 illustrates four management constraints identified from different research articles (Imhoff & White, 2011a; Isik, Jones & Sidorova, 2013; EY, 2014; Meyers, 2015). A discussion of each factor follows in more detail, which leads to the assumptions that underlie this study.

2.7.1.1 Systems integration

Systems integration deals with the factor of connectivity. Due to increase in data and variety of data formats and sources, modern BI integrates with different systems to provide relevant information to business users (Isik *et al*, 2013:14). To ensure that business users access and interact with corporate data with less IT interaction, it is important for SSBI to connect with different data sources to ensure that relevant and quality information is delivered. Integration can be at data level, user level, business process level, or application level but these levels are not isolated (Isik *et al*, 2013). It is significant for an organisation to ensure there is connectivity to all identified sources of information.

Integrating required systems, if not managed properly can be challenging (Isik et al, 2013). Godinho and Sharma (2017:138) also mention that one of the challenges of BI implementation is reporting across multiple systems. SSBI should be able to connect to most available systems including flat files. SSBI architecture must support free data flowing from different systems. BI as a solution is technology based and it interacts with different systems at different levels and stages. Sources of information could be data from data stage or information stage. To achieve this, it is important for business to work together with IT to create a SSBI environment that satisfies business needs (Imhoff & White, 2011a; Godihno & Sharma, 2016:27).

Therefore, this study explores the assumption that:

A1	*SSBI solution, which integrates with other systems, improves efficiency of management of SSBI*

2.7.1.2 Context

Only when information presented to business users has context, does it become intelligence (Imhoff & White, 2011b; Vince, 2014). In order to deliver information that has context, it is important that SSBI solutions produce outcomes that are reliable and sustainable for decision-making (Burke, Simpson & Staples, 2015:33). Contextual information is important to ensure users' trust (Burke *et al*, 2015:35). SSBI programs sometimes fail because users mistrust information it provides (Godinho & Sharma, 2016). For SSBI to be trusted and information consumed by decision makers, it has to be presented to the user in a friendly format that is easy for a user to understand. Users must be able to comprehend information presented to them via SSBI without any confusion. Context ensures that information is able to provide common understanding of what this connected data and information mean, and how it can be used to answer business questions. Context must be built from both data stage and information stage of a SSBI solution.

Therefore, this study explores the assumption that:

A2	*For SSBI solution to be effective to business users, it has to provide contextual information in addition to SSBI contents*

2.7.1.3 BI governance

Having proper controls and measures in place is very significant for the success of SSBI. Business users have power in their hands to do many things with corporate data, so it is imperative to have processes and procedures guiding SSBI users on how data must be accessed and consumed to ensure optimal operation of solution (Imhoff & White, 2011b; Vince, 2014). Organisations need to develop data management and governance procedures and policies throughout the SSBI environment to ensure the appropriate use of SSBI.

Business and IT need to formulate strategies to ensure SSBI provides quality information. According to Imhoff and White (2011a), this is important because it will give information workers peace of mind knowing the information they are using is from quality-governed sources. Meyers (2015:25) explains that, by establishing data management and governance (DMG) programs, organisations define policies and standards that are necessary to ensure consistency and quality of data and information. With DMG programs in place, Meyers (2015:25) says, decision makers can consume SSBI information at ease knowing that information is governed sources and it also minimises the risks.

According to EY (2015) reporting on "changing the way business compete", BI governance and management form part of the risks associated with big data. Burke *et al*, (2015:33) find that lack of processes and governance validating SSBI solution is one of the reasons why organisations find their SSBI environments complex and difficult to govern. Schmarzo (2016:147-148) say that good governance is vital for the success of big data initiatives in any business. When giving business users access to corporate data, it is very important for business and IT to ensure and guarantee that proper controls and monitoring are in place (Imhoff & White, 2011b; Horwitt, 2011).

Therefore, this study explores the assumption that:

A3	*Effective SSBI governance and management improve efficiency of SSBI solution*

2.7.1.4 Supporting infrastructure

Successful implementation of SSBI requires proper infrastructure. Peters *et al* (2016) emphasise that BI solution is a collection of BI tools together with related technologies, applications, and processes used collectively. There is a direct relationship between systems integration factor and supporting infrastructure (Peters *et al*, 2016). Infrastructure, for the purpose of this study, refers to

technical skills required, business processes, IT infrastructure (i.e. hardware and software), and all parties involved to support and accomplish the objective of SSBI.

Infrastructure succeeds when IT and business work together, not against each other (Moro *et al*, 2014:24). IT and business structures must be aligned to ensure effective implementation and management of SSBI, especially when process entails a SSBI infrastructure service provider (Vince, 2014). A service provider is an expert contracted by an organisation to assist with implementation of SSBI, Vince (2014) explains, and assist with management of SSBI. BI consulting firms are contracted (outsourced) to facilitate processes to ensure that organisations get return on their investment. An outsourced company does not work alone, it needs to work with the organisation to ensure that organisation strategy is in support and aligned with SSBI solution and vice versa. Usually companies consider outsourcing due to the skills, knowledge, capability, and capacity to implement and manage SSBI (Burke *et al*, 2015:37).

Therefore, this study explores the assumption that:

A4	*SSBI supporting infrastructure is the backbone of SSBI solution, which means infrastructure supports both the data stage and information stage of BI*

In summary, Phase 1 deals with how the extent of effective management of SSBI is dependent on these four factors:

1) SSBI's capability to integrate with other systems
2) SSBI's capability to provide information that has context
3) BI governance
4) Supporting infrastructure

Conceptual framework Phase 1 presents the source of four assumptions of this study, which aims to understand management constraints of SSBI. The next phase deals with the scope of SSBI, because the level of sophistication of SSBI tools and its capabilities may possibly have an influence on the management of SSBI.

2.7.2 Phase 2: Scope of SSBI – Differentiators

The outcome of Phase 1 influences Phase 2. Here the conceptual framework incorporates factors that potentially differentiate SSBI solution to other solutions. Figure 2.6 illustrates these differentiators, referred to collectively as the scope of SSBI.

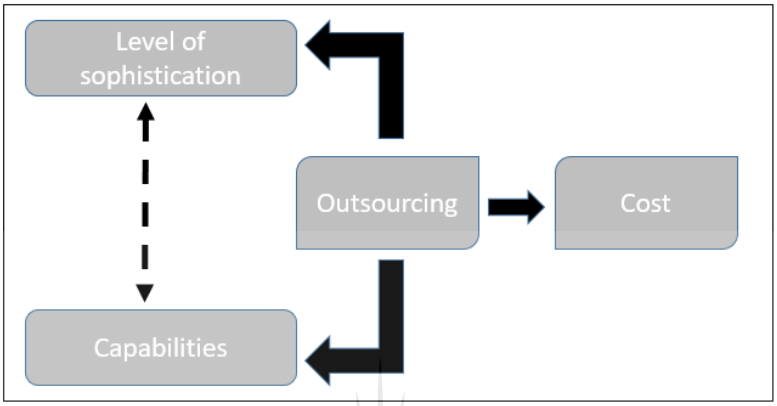

Figure 2.6: Scope of SSBI

Different companies deploy SSBI for varied reasons, therefore, before implementing the solution, it is imperative for an organisation to identify their specific needs and understand how the solution is going to be utilised to meet the need. Many different BI tools provide assorted self-service capabilities for different purposes and needs in the market (Wieder & Ossimitz, 2015:1163). These BI tools differ in many things including level of sophistication and capabilities. Figure 2.6 illustrates the potential of these two differentiators to influence choices that organisations make concerning their preferred SSBI product. The decisions made on Phase 1 influence an organisation's choices on Phase 2 (*cf* Figure 2.4 and Figure 2.5). Before considering implementing SSBI, an organisation should first evaluate their current BI solution based on their requirements and expectations (Evelson, 2012). It could be that their solution already has self-service features, in which case the organisation should avoid unnecessary cost.

Specifically, the reasons for including the above factors in the conceptual framework were as follow:

a) Simple and ease of use

Level of sophistication is associated with ease of use, which is a key differentiator. What is easier to an IT professional might not be easier to a business user. Organisations need a tool that is user friendly and simple for its business users as well as developers (Godiho & Sharma, 2017:133).

b) Features of SSBI tool

Features give an indication of a tool's capabilities. Even though organisations need simple and easy to use SSBI tools, these tools have to meet the expectations of not only so-called average business users who want to do ad hoc querying and building their own report, but also more advanced users. Different levels of users within the organisation have to have their needs met to virtualise their data and manipulate it when needed to answer complex business questions. For example, Kho (2007), Horwitt (2011), Evelson (2012), Gordinho and Sharma (2016), and Peters *et al*, (2016), explain:

- Search analytics, virtual analytics and data analytics and mining are important in providing actionably data insight
- Natural language for queries and searches that enable the work of knowledge workers
- Drag and drop interfaces are not enough and the same applies to SSBI; users want the advantage of natural language processing (NLP) and search with graphical user interface (GUI), which requires less training as compared to drag and drop and it is better suited for unstructured data.

NLP and GUI enabled searches have become standard features of BI (Kho (2007:50). Modern business users need to explore and find 'things' the same way as they do at home, and for this reason, they prefer natural language query approach to explore corporate information assets instead of waiting for reports from BI applications (Kho, 2007:50).

Therefore, this study explores the assumption that:

A5	*Management of SSBI is influenced by the level of sophistication of SSBI tools and its capabilities*

c) Outsourcing

Organisations have to consider outsourcing software as service. The decision to outsource, according to Burke *et al* (2015:32), derives from an organisation's requirements of SSBI's level of sophistication and its capabilities. Organisation can consider outsourcing due to internal lack of skills, knowledge and capability or capacity to implement and manage SSBI. Besides outsourcing

SSBI services to a consulting company, organisations can consider implementing SSBI on the cloud. These decisions have management implications.

Therefore, this study explores the assumption that:

A6	*Decisions to outsource SSBI implementation and management is directly related to organisation's perception of SSBI's level of sophistication and its capabilities*

d) Cost

Cost could be a deciding factor when it comes to SSBI choices. Depending on the capabilities and level of sophistication of the tool, the cost of deploying the tool can be very high (Isik *et al*, 2013). The other deciding factor deals with level of expertise and skills required to deploy and manage the solution. This is where outsourcing, mentioned above, comes in, firstly referring to contracting a service provider to assist with implementation and/or management of SSBI solution, and secondly, the ability to implement solution on a cloud as a service.

Therefore, based on a), b), c), and d) the assumption is that:

A7	*The cost of SSBI is dependent on adopted SSBI tools as well as the decisions to outsource (or not) SSBI implementation and management functions*

In summary, Phase 2 deals with the scope of SSBI, and identifies these four differentiating factors:

1) SSBI's level of sophistication
2) SSBI's capabilities
3) Outsourcing
4) Cost

Conceptual framework Phase 2 presents three assumptions in addition to the four assumptions stated in Section 2.7.1. The next section covers the last phase included in the conceptual framework, namely, implementation and management framework.

2.7.3 Phase 3 – Implementation and management framework

Conceptual framework Phase 3 deals with SSBI's objective to create a platform that will enable business users to access business data anytime without relying on IT department. When an organisation makes the decision to implement SSBI, it follows in large that the organisation itself has to implement the solution and be able to manage it effectively to ensure it delivers the expected results. Organisations generally need IT support, especially in the SSBI context. A BI consulting firm's practical working framework should be able to address the business drivers and IT drivers, illustrated in Figure 2.7.

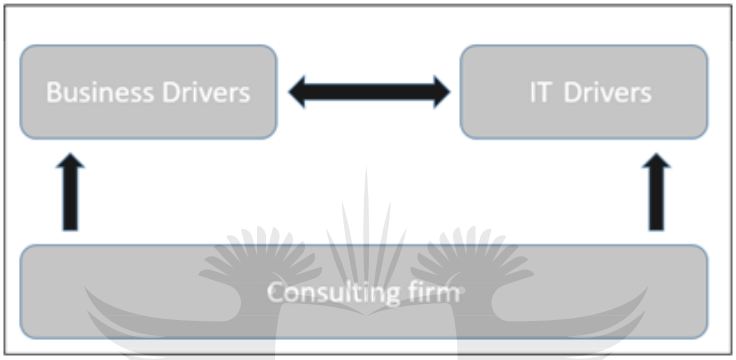

Figure 2.7: Implementation and management framework of SSBI

Figure 2.7 presents Phase 3 of the conceptual framework (*cf* Figure 2.4 and Figure 2.8), which deals with the implementation and management framework of SSBI. A BI consulting firm's practical working framework, i.e. its implementation and management framework, has to address business drivers and IT drivers.

a) Consulting firm

Good consulting firms are experts at overseeing the partnership between business and IT. Even though the expert guidance component facilitates the implementation and management of SSBI for an organisation, all three these components should work together, and neither should function on its own:

1) Business
2) IT department
3) Consulting firm

For instance, this means that when business lacks required skills and knowledge, time and patience to perform tasks related to BI implementation, they sometimes decide to outsource

services. Organisations expect timely high quality service from service providers, which they could not have produced themselves (Harmann, 2013; Burke *et* al, 2015:37). Most organisations use a combination of vendors, products, and services to provide BI solution and outsourcing is common practice (IBM, 2010). A common drawback of outsourcing is that appointed consulting firm will likely lack legacy knowledge and strategic insight that exist with in-house teams (Burke *et al*, 2015:32). It is important that outsourced service providers acquaint themselves with an organisation's legacy knowledge and strategic goals.

For this reason, the assumption is that:

A8	*Outsourced service providers act as bridge between business and IT drivers if they ensure effective implementation and management of SSBI solution*

b) Business drivers

Users play a vital role in modelling SSBI solution to ensure that the solution meets their requirements in terms of high quality and timeliness (Burke *et al*, 2015:32). Business drivers are the objectives and goals of implementing SSBI. Business drivers include all business needs and expectations regarding the BI solutions. Users' involvement is vital during the implementation and management of the solution through BI governance.

c) IT drivers

There must be separation of power when it comes to management of BI (Kokin & Wang, 2013:754). One of the key reasons why SSBI solutions fail is because organisations expect people who consume SSBI information to be the ones that are responsible in maintaining that information (Burke *et al*, 2015:32; EY, 2015). Either, IT has a continuous support role, or it may be responsible for most of the work; irrespective, they still need to ensure that IT infrastructure is available and in fact supports SSBI. Overall, SSBI and business strategy should be aligned to IT strategies.

Therefore, based on b) and c), the assumption is that:

A9	*Effective management of SSBI is dependent of alignment of business drivers and IT drivers*

In summary, Phase 3 primes the ideal outcome of this study, namely, subsequent to investigating management constraints of SSBI, a strategy materialises for C-Firm for implementation and management of SSBI. By *in*creasing user *in*dependence from IT, C-Firm and their clients' IT departments will be able to shift its focus on more technical matters with high value add to the business. With this in mind, the summary of the conceptual framework presents the last two of eleven assumptions of this study.

2.7.4 Summary of the conceptual framework

The three phases in the conceptual framework illustrate the relationship and effect of various BI governance factors. Four assumptions of Phase 1 underlie this study, noting that the effective management of SSBI is dependent on SSBI's capability to integrate with other systems, SSBI's ability to provide information that has context, and on good governance, and a solid supporting infrastructure. To achieve this, as argued above, may require the input of a service provider.

Therefore, the assumption of this study is that:

A10	*Outsourced service providers play a vital role in implementing effective SSBI solution for its clients*

Conceptual framework Phase 1 deals directly with the unit of analysis, namely, management constraints of SSBI. Yet, all three phases are interrelated. For example, A10 tested against Phase 1's four assumptions to find out if indeed a consulting firm can help clients see desired value from their SSBI investment. Also, the interview schedule included a separate section focusing on business managers' perceptions of Phase 2 and Phase 3's assumptions [A5 to A9], though these assumptions were not explored in detail given the scope of this study. The research aim was to explore BI governance, system integration, context, and supporting infrastructure factors in order to develop a consulting strategy dealing with management constraints of SSBI.

Therefore, the final assumption of this study is that:

A11	*A practical working framework for implementing and managing SSBI is dependent on clients' supporting infrastructure, data governance and management, outsourcing decisions, as well as cost*

The study used the interactive approach model (*cf* Section 1.6), taking into consideration various contextual factors (*cf* Figure 1.1), to develop a conceptual framework and transparent assumptions.

2.8 Conceptual framework with assumptions

Figure 2.8 gives a graphic representation of all assumptions to illustrate how the conceptual framework developed from Figure 2.2 to Figure 2.4.

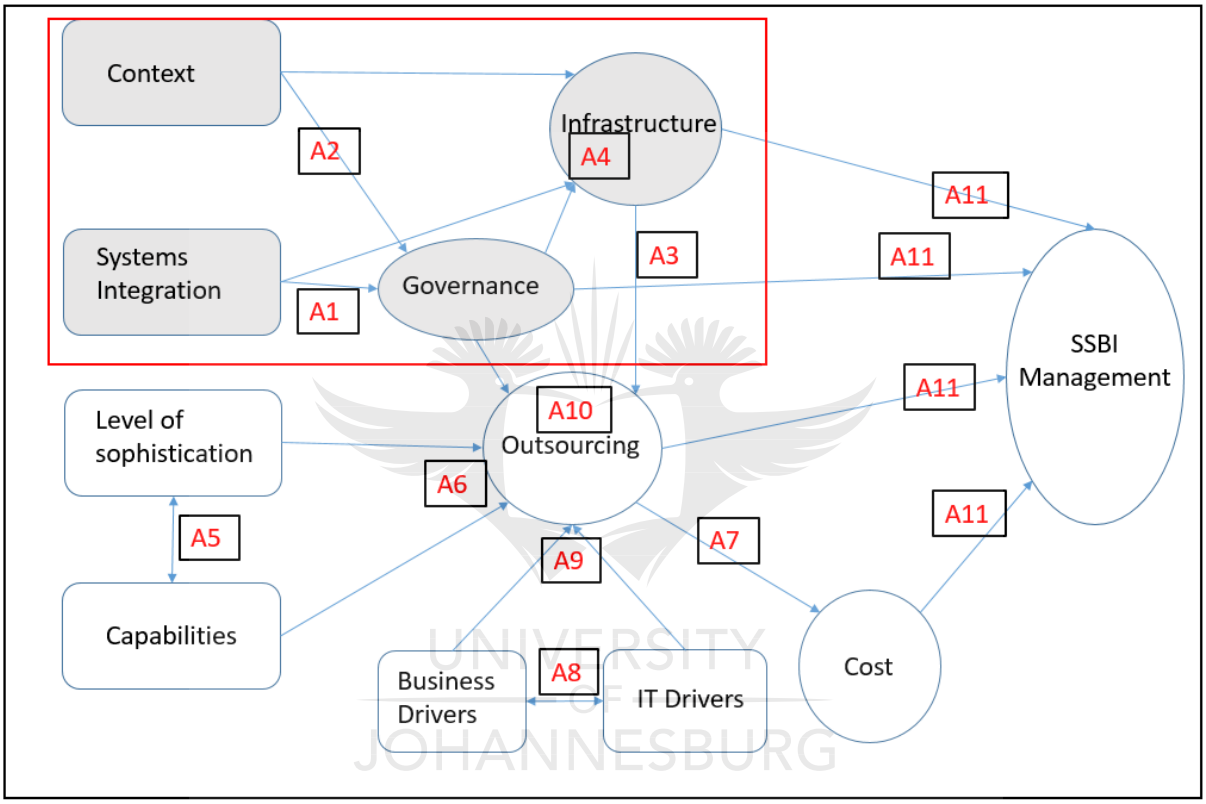

Figure 2.8: Conceptual framework with assumptions

The assumptions in Figure 2.8, as they appear in three phases, are as follow:

Phase 1

A1: SSBI solution, which integrates with other systems, improves efficiency of management of SSBI

A2: For SSBI solution to be effective to business users, it has to provide contextual information in addition to SSBI contents

A3: Effective SSBI governance and management improve efficiency of SSBI solution

A4: SSBI supporting infrastructure is the backbone of SSBI solution, which means infrastructure supports both the data stage and information stage of BI

Phase 2

A5: Management of SSBI is influenced by the level of sophistication of SSBI tools and its capabilities

A6: Decisions to outsource SSBI implementation and management is directly related to organisation's perception of SSBI's level of sophistication and its capabilities

A7: The cost of SSBI is depended on adopted SSBI tools as well as the decisions to outsource (or not) SSBI implementation and management functions

Phase 3

A8: Outsourced service providers act as bridge between business and IT drivers if they ensure effective implementation and management of SSBI solution

A9: Effective management of SSBI is dependent of alignment of business drivers and IT drivers

Therefore, to ensure that business users access and interact with corporate data with less IT interaction, the last two assumptions are:

A10: Outsourced service providers play a vital role in implementing effective SSBI solution for their clients.

A11: A practical working framework for implementing and managing SSBI is dependent on clients' supporting infrastructure, data governance and management, outsourcing decisions, as well as cost.

2.9 Summary

This chapter discussed how the conceptual framework was developed and how it adopted both variance and process theory in its construction. Construction involved four steps; it explored BI as a decision support tool, giving background on traditional BI, the emergence of SSBI, and the factors potentially linked to management constraints of SSBI. Literature and experiential knowledge were the combined source to identify existing theories and assumptions that underlie this study. The conceptual framework consists of three phases; Phase 1 deals with management constraints of SSBI, Phase 2 deals with scope of SSBI, and Phase 3 deals with implementation and management

framework. The factors associated with each of these three phases align to the research aim, namely, to explore BI governance, system integration, context, and supporting infrastructure factors in order to develop a consulting strategy dealing with management constraints of SSBI.

The next chapter explains the research methodology. It gives detail of the interactive approach model applied in order to develop a practical working framework for C-Firm as part of its consulting strategy.

Chapter 3
Research methodology

3.1 Introduction

This chapter presents the research design and methodological choices used in conducting the study as well as its philosophical assumptions. Research philosophy plays an important role in research design. Philosophy depicts how the researcher perceives the world. In the process of developing a new knowledge in the area of self-service business intelligence (SSBI), it was necessary to reflect on philosophy that was applicable to studies of the same nature as this one. The study has a subjectivist stance of ontology and interpretivist stance of epistemology. Equipped with clear philosophical assumptions, this chapter identifies design limitations that are in accordance with the study's scope.

The research approach was a combination of deductive and inductive approach, which Douven (2011), says is abductive, which is common to the interactive approach model. The deductive approach explored assumptions identified in literature as well as observations made by the researcher in this field. Inductive approach was useful for gaining insight on what to include in a practical working framework that deals with the management constraints of SSBI. Qualitative and quantitative methods applied to data collection and data analysis. The study focused on a single critical case, as described by Saunders et al (2009:146).

The chapter begins with an introduction of the interactive approach model, secondly, identifies the dimensions of research philosophical assumptions, thirdly, it describes the research methodology and research design, giving attention to research approach and strategy respectively. A detailed discussion of the interactive approach model concludes the chapter.

3.2 Interactive approach model

Maxwell's (2012) interactive approach model informed the research design of this study. The study modelled on a mixed method study; it incorporated a flexible process where components of the model were compatible and worked effectively with each other, operating throughout every stage of research (Maxwell & Loomis, 2003:244; Maxwell, 2009:214). This approach complements other mixed method approaches by providing insights that other approaches would perhaps fail to provide (Maxwell & Loomis, 2003:243). For example, Williams (2007:66) states that quantitative research "begins with a problem statement and involves the formation of a hypothesis, a literature

review, and a quantitative data analysis", which would possibly be unsuitable for some research problems (Maxwell, 2009). Other mixed method approaches take a typological view of research design (Maxwell & Loomis, 2003:244), but for the purpose of this study the approach was to approach the components illustrated in Figure 3.1 as interacting parts of a whole.

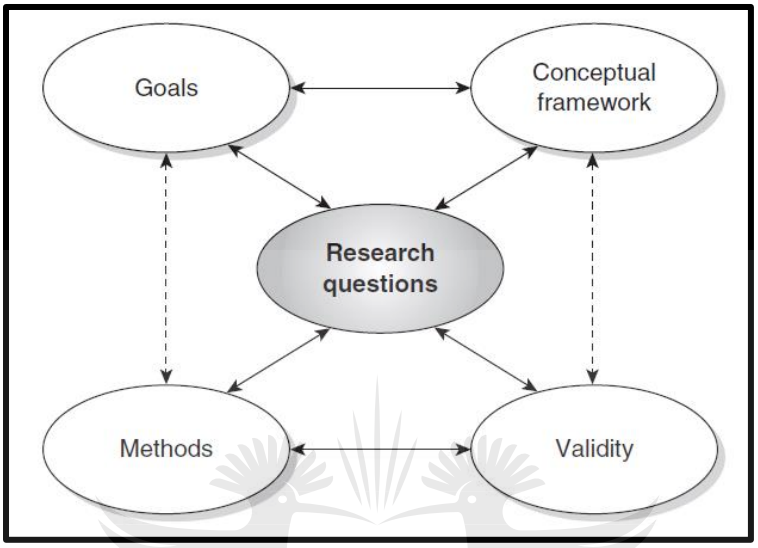

Figure 3.1: An interactive model of research design (Maxwell, 2009:217)

The interactive approach model allows the researcher to modify any decision made during any step of the research, being at data collection, data analysis, formulation of conceptual framework, or refocusing research question (Maxwell, 2009). Each component illustrated in Figure 3.1 affects and can be affected by any other component. The components of the interactive approach model are:

1. Goals or purpose
2. Conceptual framework
3. Research questions
4. Methods
5. Validity

Central of all components are the research questions; the other four components of the model connect directly to the research questions. This does not mean that other factors do not influence the research design, say Maxwell and Loomis (2003), only that these five components are an integral part of interactive research design. Moreover, Maxwell (2009) explains, the components do not represent what is external to the study but instead, "they represent the decisions and actions

which must be addressed" by the researcher. Figure 3.2 presents the first layer of decisions and actions outlined for this study.

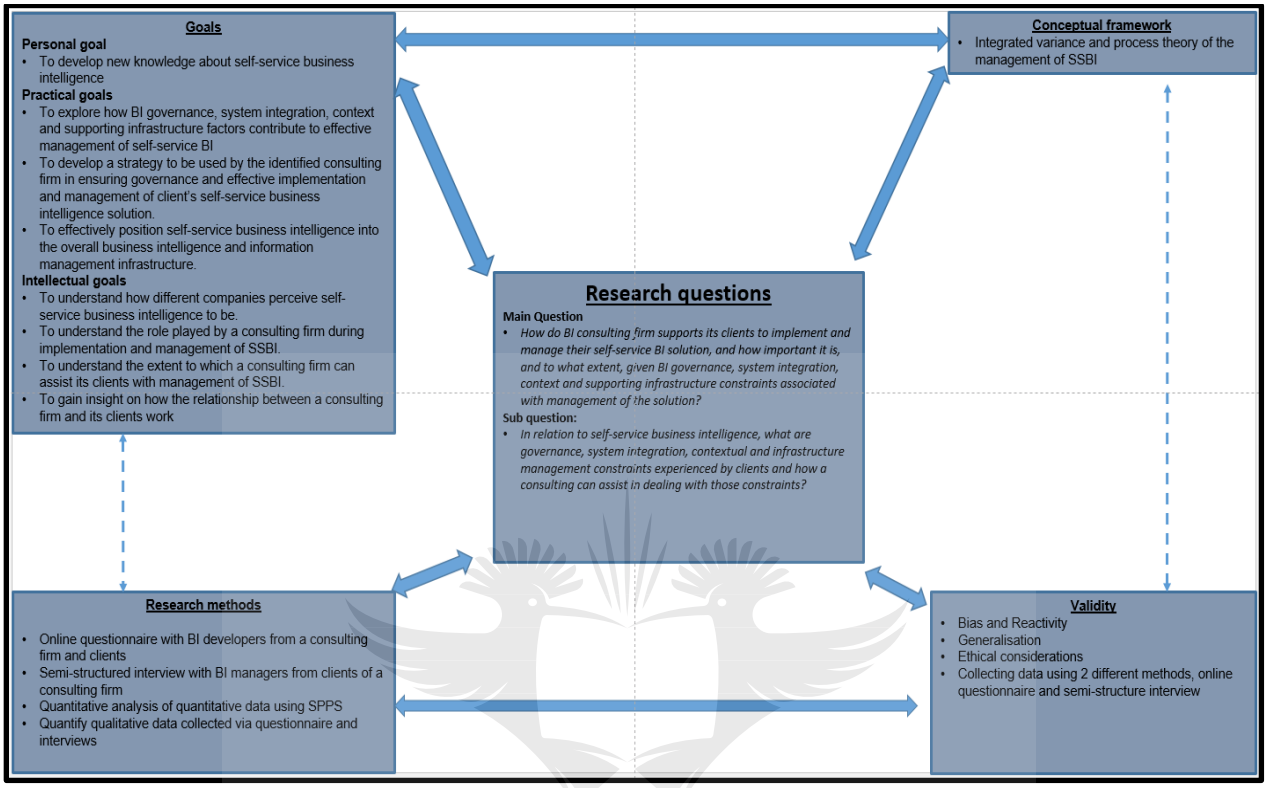

Figure 3.2: First layer of interactive approach model to explore management constraints of SSBI (adopted from Maxwell, 2012:218)

Detail of Figure 3.2 and subsequent layers follow later (*cf* Figure 3.4 and Figure 3.6). Before discussing the interactive approach model in detail, first the research approach, research philosophy and research strategy give shape to the contextual factors that formed part of research design. Other factors also form part of the research environment, for instance, researcher's skills and knowledge, ethical considerations, and validity among others. These are discussed once the importance of research philosophy is understood.

3.3 Importance of research philosophy in research

Research philosophy plays an important role in research design, for example, the data collection techniques used in this study were directly influenced by the philosophy that the researcher adopted. Philosophy depicts how a researcher perceives the world. In developing a new knowledge in the area of SSBI, it was imperative for the researcher to reflect on other researchers' worldviews, in studies of similar nature. This gave the researcher an idea of how other researchers in the same

field view SSBI, and how to use existing knowledge to develop an effective research or develop a new knowledge. According to Saunders *et al* (2009:108), philosophy assists in understanding the role of a researcher in a research and ensuring that we understand what it is that is being studied.

It is important to adopt a philosophy that assists in answering or exploring the research questions. There are different ways of viewing the world, and three classifications apply:

- **Ontology:** Concerned with nature of world or reality
- **Epistemology:** Concerned with how we understand the world
- **Axiology:** Concerned with researcher's value in research

These philosophical assumptions, according to Maxwell (2009:224), assist in guiding research decisions and allow you to build a well-developed approach to your research.

3.3.1 Ontology

Two philosophical stances are objectivism and subjectivism. Objectivism assumes that social entities exist in reality external to social actors whereas subjectivism is of the view that social phenomena are created from perceptions and meanings that social actors or individuals attach to social phenomena (Saunders *et al*, 2009:111).

- **Objectivism:** Seemed difficult to adopt for this study because the research aim was to look at how a consulting firm can assist its clients by dealing effectively with management constraints of SSBI. SSBI solutions differ and the expectations of it differ for each customer. Thus, the researcher could not take a stance that SSBI exists externally to a consulting firm, its clients, and users' perspective.
- **Subjectivism:** This research had a subjectivism stance of ontology. The reason is that SSBI might mean different things to the consulting firm's clients, to the consulting firm itself, and also to the SSBI users. For example, users' expectations differ, and some users are more technically fluent compared to others. Based on this, users that are more comfortable with using advanced BI tools will be able to create sophisticated reports, and dive deeper into company's data better and more as compared to those that are less technically competent.

Maxwell (2009:221) argues that how participants in a study make sense of situations, and how their understanding influences their behaviour is part of the reality that the researcher aims to understand. It is for this reason why it was expected that BI developers or managers would have different expectations of what is SSBI and how it should be managed.

Subjectivism is associated with social constructionism because it follows interpretivist philosophy. Accordingly, in order to understand the actions of social actors, it was imperative for researcher to gain a clear understanding of subjective meaning that motivate social actors (Saunders *et al*, 2009:111). Which is why this study focussed on both the consulting firm and clients' perspective of SSBI and its management constraints.

3.3.2 Epistemology

Different researchers perceive knowledge in different ways. Choosing what is acceptable knowledge in a particular field of study is very important in research. Epistemology is all about what is regarded as an acceptable knowledge in a particular field (Saunders *et al*, 2009). In this study, there were many factors, aspects, and people, which could affect how SSBI should be managed. Example of those are SSBI tools, BI managers, developers and other technologies and systems that integrate with SSBI, like data warehouse and data integration tools. All these could be used to develop knowledge in this study. In deciding which philosophical stance to take, researcher could either follow positivism, or realist, or interpretivist philosophy, or choose to combine philosophy.

- **Positivism:** Philosophy more concerned with facts and associated more with natural science. Saunders *et al* (2009) explain that for a researcher who follows positivism, material objects like computers and trucks represent reality. The reason for this is because it is easy to separate and minimise the influence of researcher from these objects, as compared to when humans are used. If this approach were to be used in this research, data would be collected from SSBI tools and other systems which integrate with it, almost like analysing the data from an airplane's black-box, and not from the passengers, which was not the philosophy of this study.
- **Realism:** Philosophy of what the senses show us is a reality, is the truth (Saunders *et al*, 2009:114). It means reality constructed from our senses is independent of the mind. Looking at this philosophy from a perspective of this study, it means that what is seen as good or bad management of SSBI, or what people say about SSBI is considered as accurate reality. This way of knowledge creation is known as direct realism.
    - → **Direct realism** says what we see or what we experience through our senses is accurate reality (Saunders *et al*, 2009).
    - → **Critical realism** argues that senses can be deceiving because what we see and experience are just sensations but not necessarily real (Saunders *et al*, 2009). This approach acknowledges that the world is constantly changing, and many things

could influence our perception. In this study, various data sources had an effect on how a new knowledge developed.

- **Interpretivist:** Philosophy advocates understanding of the differences between humans in their roles as social actors (Saunders *et al*, 2009). Everyone involved in SSBI solution, being either the client or service provider, view management of solution based on what they individually understand and what they deem appropriate, in conjunction with other people's understanding of whom they interact.

This research was mostly influenced by interpretivist philosophy because the researcher aimed at understanding how developers from a consulting firm as well as those from its clients view or understand management constraints of SSBI solution. Even though the researcher had his own view and perspective of SSBI, he became part of the research subjects, seeking to understand and see SSBI from their worldview and perspective.

A little bit of critical realism played a part as well in a sense that researcher believes the world is dynamic and the reality we see or experience should not be viewed in isolation, instead, it should be seen as just the impression it bears.

3.3.3 Axiology

It was not an easy task for researcher to be completely excluded from research. Axiology is concerned with acknowledging and understanding the roles that personal values play in research (Saunders *et al*, 2009:19). Understanding of your own values in a research is very critical, it assists in guiding and achieving an effective research. The whole research project, from start to finish reflects a researcher's axiology. Maxwell (2009) says, carrying a researcher's personal experience in to empirical research were criticised in the past, but now it is valued for the additional insight and validity check it brings to research. Researchers should not be carried away or overwhelmed by this but rather use it to achieve effective research – this was the stance taken by the researcher of this study (*cf* Section 3.6.3). The interactive approach model suited this stance and the research decision was mixed method, mixed model, explained next.

3.4 Research Methods

To understand the world of BI, and how a consulting firm, together with its clients view management of SSBI, the researcher chose to collect data regarding the level of importance of factors affecting management of SSBI (quantitative data) as well as descriptions of those factors (quantitative data). It is for this reason why mixed method, mixed-model was chosen as data collection and analysis

technique. The research methodology guidelines offered by Saunders *et al* (2009), the interactive approach model of Maxwell (2012), the qualitative research techniques described by Miles *et al* (2013), and quantitative research techniques described by Blaikie (2000:286), guided this study.

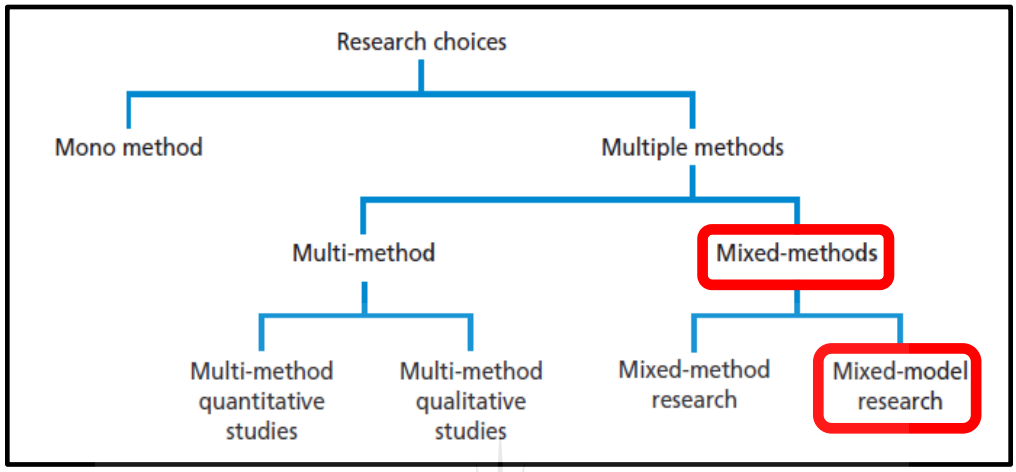

Figure 3.3 - Research choice (Saunders et al, 2009:152)

Johnson and Onwuegbuzie (2004:15) explain that research is becoming complex, dynamic and multidisciplinary, therefore, researchers need to use different methods to complement each other. In research, there are two data collection techniques and those are qualitative and quantitative methods; or, a combination of the two. Each of these methods has its own advantages and disadvantages (Williams, 2007:70). To utilise strength and minimise the weakness of the other, mixed method approach applied for this study. According to Miles *et al* (2014:43), linking qualitative and quantitative data can be productive for an exploratory and explanatory study like this one.

3.4.1 Qualitative methods

Saunders *et al* (2009) refer to qualitative methods as those data collection and analysis techniques and procedures, which generate or use non-numerical data. In the quantitative method, data are collected and analysed mostly using words but it can include pictures and videos among others. For this study, data collected were in the form of words, through semi-structured interview and questionnaire's open questions. Data were analysed using thematic analysis (*cf* Section 3.6.4.4). The study pulled on the strengths of qualitative methods, described by Miles *et al* (2014:11):

- Qualitative data focus of naturally occurring, ordinary events in natural settings
- Qualitative data is rich and holistic, with strong potential for revealing complexity
- Qualitative data is able to locate meaning that people place on the events and processes

The study encountered two disadvantages, mentioned by Johnson and Onwuegbuzie (2004:20) and did the following: Firstly, though it could be time consuming to collect qualitative data, the researcher carefully planned the interview schedule and arranged appointments with research participants. Secondly, the researcher had to acquire new knowledge on how to quantify qualitative data and apply it to theory building.

3.4.2 Quantitative method

Quantitative method refers to research techniques and procedures that generate or use numerical data, sometimes referred to as categorical data (Maxwell & Loomis, 2003; Williams, 2007; Saunders *et al*, 2009). Categorical data is easily quantified; it relies on comparison of frequencies or measurements across categories (Blaikie, 2000; Maxwell & Loomis, 2003). Johnson and Onwuegbuzie (2004:19) describe the strengths, marked for this study:

- Testing and validating existing theories
- Data analysis was less time consuming
- The research results were relatively independent of the researcher

Its limitation, in a sense, was that the knowledge produced was for direct application to the specific situation, though knowledge could also inform the strategies of other BI consulting firms.

3.4.3 Mixed method

Mixed method approach is term used when both qualitative and quantitative data collection and analysis techniques are used (Saunders *et al*, 2009; Miles *et al*, 2013). Figure 3.3 illustrated earlier, divides research choices into categories (Saunders *et al*, 2009:152-153), which the researcher interpreted in this manner:

- With mixed method research, even though both qualitative and quantitative data collection and analysis apply at the same time *or* sequentially, they are analysed separately. Meaning qualitative data is analysed qualitatively, and quantitative data is analysed quantitatively.
- Mixed model on the other hand, permit a researcher to take quantitative data and qualities to analyse it qualitatively, or conversely, take qualitative data and quantities to analyse it quantitatively.

This study chose the second approach, mixed model, to understand how a BI consulting firm and its clients view management of SSBI. Data were collected regarding level of importance of factors affecting management of SSBI (quantitative data) and descriptions of those factors (quantitative

data). The reason behind this decision was to help gain clear understanding of quantitative data during analysis phase. Williams (2007) maintains that mixed method provides the researcher the ability to address questions about complex nature of phenomena from participants' point of view and at the same, addressing relationship between subjects or variables. Qualitative data collected from questionnaire and semi-structured interview were used to validate and interpret quantitative data. Miles *et al* (2013), are of the view that methodological decisions should be driven by your study needs to ensure that the research approach meets ethical and validity requirements.

3.5 Research approach and research strategy

The two research approaches that a researcher can use and they are deductive approach and inductive approach. In the deductive approach, theory and categorical hypotheses exist and a research strategy developed in order to test the theory and hypotheses. In an inductive approach, the researcher collects data and then develops a theory as an outcome of data analysis (Saunders *et al*, 2009:124). Blaikie (2000:277-305) gives examples of these approaches and explains how to combine inductive and deductive approaches, which Saunders *et al* (2009:124) find advantageous.

The approach of this study was a combination of deductive and inductive approach. Deductive approach applied to explore assumptions identified in literature as well as observations made by the researcher in this field. Inductive approach applied to gain insight on what to include in a practical working framework that deals with the management constraints of SSBI. The combined approach best suited a study of SSBI, though it is not a new concept, there is not enough in literature about it, especially looking at the role played by the service provider, specifically in dealing with the management constraints of SSBI. Context was every important in this research, therefore the purpose was to explore assumptions outlined in Chapter 2 and to understand management constraints of SSBI.

The research strategy was a single case study. Single case study was seen as a better strategy to assist in understanding how a BI consulting firm could assist clients with management constraints associated with SSBI. A single case study, according to Saunders *et al* (2009:146), "provides an opportunity to observe and analyse a phenomenon which few have considered before". In order to observe the management constraints of SSBI, the research methodology for this study consisted of five components of the interactive approach model.

3.6 Five components of interactive approach model

Section 3.2 introduced the first layer of interactive approach model to explore management constraints of SSBI. Now, each of the five components illustrated in Figure 3.1, add to the next layer of the interactive approach model.

3.6.1 Purpose and goals

Maxwell (2009) only talks about goals, but Saunders *et al* (2009:138) distinguish purpose and goals. If one does not make a distinction, goals and purpose could refer to anything that led a researcher to conduct a study. For this study, Maxwell's (2009) view of goals was fitting in that goals were those things that led the researcher to conduct the study. However, the purpose was clear, which Saunders *et al* (2009:138) describe as "the way in which you asked your research question would result in either descriptive, explanatory or exploratory answer".

Now this research started as just an idea but it later developed into the need to achieve certain objectives and goals. Research goals are important for many reasons, but mainly to show a clear sense of purpose and direction. According Maxwell (2009), research goals can be personal, practical, or intellectual. Maxwell and Loomis (2003), and Maxwell (2012) explain:

- Personal goals are those that inspire and motivate the researcher to keep on going. These goals are much closer to what the researcher believes in – *axiology driven*[1]
- Practical goals focus on accomplishing something, meeting some need, or archiving some goals. They are not far from personal goals, but they are closer to help in answering the research question – *ontology driven*
- Intellectual goals are more into helping the researcher and others to gain understanding and insight about a particular phenomenon – *epistemology driven*

Whatever the goals for doing research are, they help the researcher make the study worth doing, and they give direction to the researcher (Maxwell & Loomis, 2003). Saunders *et al* (2009:138) say there are three purposes a research can take, namely, descriptive, explanatory, and exploratory. Descriptive study aims at portraying the accurate profile of the event (Saunders *et al*, 2009:140). This study was not descriptive; simply describing the management constraints experienced by a BI consulting firm in a cross-sectional study would not add value. The latter two classifications of research purposes where more applicable, and they were adopted by this study. The purpose was to understand the relationship between variables as well as to understand and gain insight about

[1] The researcher added in italics the derivatives from learning research methodology.

management of SSBI, which is why explanatory and exploratory purpose was relevant. According to Saunders *et al* (2009:139), explanatory study aims at establishing relationships between variables and exploratory study aims at understanding what is happening and finding new insights.

The research purpose statement was:

Purpose

> This study aims to explore how BI governance, system integration, context, and supporting infrastructure factors contribute to effective management of self-service business intelligence, and to develop a strategy to be used by a studied consulting firm in ensuring effective implementation and management of its clients' self-service business intelligence solution.

Goals are statements of what the researcher aims at achieving (Maxwell, 2009). Exploratory study fits very well with interactive approach model because it allows the research the flexibility and adaptability to change. Saunders *et a*l (2009) affirm that as an exploratory researcher, you must be willing to change your directions as new information comes to light. This complements the interactive approach model because the model acknowledges that every component affects or is affected by other components of the model.

The three goal categories were:

Personal goal

> To develop new knowledge about self-service business intelligence

Practical goals

- To explore how BI governance, system integration, context and supporting infrastructure factors contribute to effective management of self-service BI
- To develop a strategy to be used by the identified consulting firm in ensuring governance and effective implementation and management of client's self-service business intelligence solution
- To effectively position self-service business intelligence into the overall business intelligence and information management infrastructure

Intellectual goals

- To understand how different companies perceive self-service business intelligence to be

- To understand the role played by a consulting firm during implementation and management of SSBI
- To understand the extent to which a consulting firm can assist its clients with management of SSBI
- To gain insight on how the relationship between a consulting firm and its clients work

The research purpose was a combination of all these goals. If achieved, it would help the researcher gain understanding of the level of importance and the extent to which a BI consulting firm and its clients agree or disagree with assumptions of the conceptual framework (*cf* Chapter 2 and Section 2.8).

3.6.2 Conceptual framework

This component of the interactive approach model refers to the "system of concepts, assumptions, expectations, beliefs, and theories that supports and informs [the] research" says Maxwell (2009:218). Conceptual frameworks are graphic and/or narrative illustrations of things studied, which portray the "presumed interrelationships" between factors and variables (Miles *et al*, 2013:20). It gives directions to the researcher before and during fieldwork, by clarifying what the researcher wants to find out from whom and why (Miles *et al*, 2013:37). In this study, variance and process theories influenced the conceptual framework since its aim was to understand the meaning of factors and the extent to which these factors influence management of SSBI. Variance theories focus on measurement of variables and correlation between them whereas process theories is concerned with events and processes that connects them (Maxwell & Loomis, 2003:248). Figure 3.4 illustrates how the conceptual framework for this study developed.

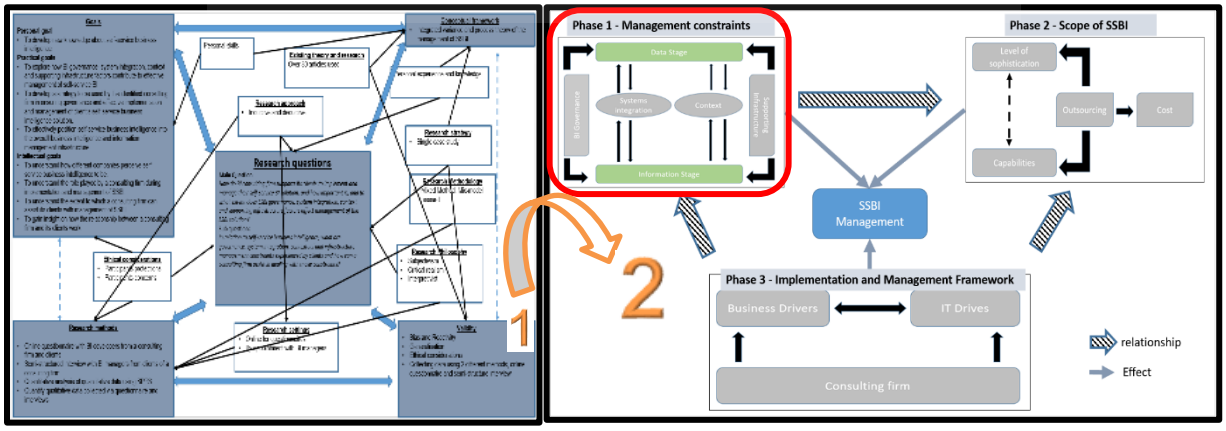

Figure 3.4: Developing the conceptual framework of this study

The conceptual framework developed from the beginning of the study (1) and kept evolving as the study progressed (2). The factors and variables that could potentially affect the management of SSBI are present in three phases (*cf* Chapter 2). In terms of methodology, the focus was on Phase 1. At the centre of the interactive approach model, the research questions derived during the process of developing the conceptual framework, evident by comparing Figure 1.1 and Figure 3.2.

3.6.3 Research questions

Research questions give a clear picture of what is it what the research is trying to accomplish. According to Miles *et al* (2013), research questions are the facets of enquiry that the researcher aims to explore. It is at the centre of the interactive research design model. This component connects directly with all other components of the model. It helps to focus the study by linking research goals with the conceptual framework, and it provides guidance by linking methods with research validity components. Because of the direct relationship between the components, the research questions below changed every time there were changes made on the goals and conceptual framework. It is for this reason why Maxwell (2009) and Saunders *et al* (2009) say that research is a process – the researcher keeps on revisiting stages of the design.

In this study, the progression was from formulating a main question and sub question, to finalising the main research question and four sub questions:

- **Initial main question:** How does a BI consulting firm support its clients to implement and manage their self-service business intelligence solution and how important is SSBI, and to what extent do SSBI governance, system integration, context, and supporting infrastructure factors affect management of the SSBI solution?
- **Initial sub question:** In relation to self-service business intelligence, what are the governance, system integration, context, and supporting infrastructure management constraints experienced by clients and how can a consulting firm assist in dealing with those constraints?
- **Research question:** How will a consulting firm deal effectively with the management constraints of self-service business intelligence?
- **Sub questions:**
  - → How does C-Firm support its clients to implement and manage their self-service business intelligence solution?
  - → How important and to what extent do BI governance, system integration, context, and supporting infrastructure factors affect management of the SSBI solution?

→ What are the BI governance, system integration, context, and infrastructure management constraints experienced by C-Firm consultants and clients?

→ How can a consulting firm assist clients in dealing with the SSBI constraints?

Above initial questions were formulated in what Creswell (2014:164) calls “hybrid” or “integrated” questions. Then, by formulating four sub questions, it was possible to link each sub question to an appropriate research method.

3.6.4 Research methods

This section explains the techniques and procedures used to collect and analyse data. Maxwell (2009), Saunders *et al* (2009), and Creswell (2014), say that the choice of research methods links to the researcher’s ability to answer research questions. In the interactive approach model, Maxwell (2009), includes four parts, discussed below with respect to this study.

3.6.4.1 Researcher’s relationship with participants

The relationship that a researcher has with research participants affects research instruments and other components of the study (Maxwell, 2009). This was true, because when deciding which data collection method to use, some of the concerns that came up was issues of access and trust, especially from the client BI developers. Remote client BI developers were included by email, requesting their consent to participate in an online self-administered questionnaire that was made easily accessible (*cf* Appendix B).

3.6.4.2 Population and sampling

Population refers to a “full set of cases from which a sample is taken” (Saunders *et al*, 2009:212). Sampling decisions involve any decision which deals with where, how and what type of information to collect as well as questions concerning research settings and social process (Miles *et al*, 2013).

Since the research strategy was a single case study, the population was all C-Firm employees responsible for rendering BI services to clients, including those employees who were responsible for BI and data warehouse tools and services. The reason for including data warehouse was that these people prepared data for the BI system. The population was twenty-five (25) employees from a BI consulting firm.

The client component of the population was ten (10). They were C-Firm’s clients that had used SSBI as well as those who were looking into implementing SSBI. Each client had between one and three permanent BI developers (including the manager), supported by between one and three of

C-Firm's BI developers. Therefore, the population from client's side was all clients that implemented or were looking in to implementing SSBI.

Based on the size of the population, it seemed practical and theoretically possible to collect data from the entire population, both from C-Firm employees and clients. As such, the sampling technique that best describes the sample is purposive, since the researcher used judgment to select the sample that would allow him to answer research questions. Considering that the population consisted of people with BI experience and knowledge, the questionnaire was distributed to the entire population from C-Firm as well as to ten (10) C-Firm clients. Of these ten, five (5) were managers, and a semi-structured interview served to collect data from them for the purpose of triangulation.

Interviewees were identified by using the purposive sampling technique called critical case, which Saunders *et al* (2009:240), suggest in order to obtain data from participants "on the basis that they can make a point dramatically or because they are important". This characteristic applied to C-Firm's clients' BI managers. Each of the five BI managers (1 for each client) understood the BI environment, SSBI requirements, and users' needs, which was why they were selected as interview participants. The idea behind this decision was to collect rich information to be used to supplement and put more context to data collected via questionnaire as well as useful for testing research findings.

Prior to data collection, permission to collect data from C-Firm was first obtained as a prerequisite of conducting research (*cf* Appendix A). An email, sent to the population, explained the purpose of the research and contained a request to participate, with a link to the questionnaire (*cf* Appendix B), and an email to business managers (*cf* Appendix C). Three weeks after sending the email, another email was sent to all participants, requesting BI developers of C-Firm and clients to participate if they had not yet done so. Individual BI developers signed a consent form as part of the online questionnaire (*cf* Appendix F).

3.6.4.3 Data collection methods

Data collection methods refer to the means of collecting data to answer research questions (Maxwell, 2009:236). It is important for a researcher to know what needs to be known before deciding on a data collection method. For this study, considering the characteristics of the population, as well as conceptual framework, research goals and research questions, an online questionnaire and semi-structured interview were the best option to collect data. Questions from

both questionnaire and semi-structured interview were formulated in such a way that it would gather information to answer research questions.

The two data collections methods were:

- **Online self-administered questionnaire:** A questionnaire is a data collection technique in which each person is asked to respond to the same set of questions in a predetermined order (Saunders, 2009:360). Data were collected from teams[2] using an online self-administered questionnaire, which consisted on both qualitative and quantitative questions (*cf* Appendix F).
- **Semi-structured interview:** Interview is a "purposeful discussion between two or more people", which can assist to gather valid and relevant information to answer research questions and meet research objectives (Saunders *et al*, 2009:318). The type of interview used for this study was semi-structured interview. It was not highly formalised and standardised, though the researcher used the conceptual framework and defined list of themes and questions (*cf* Table 2.1 and Appendix E), the process was not necessarily the same for each participants. It is not unusual, explain Saunders *et al* (2009:230), to omit certain questions or ask more questions depending of setting and context of the interview. The five BI managers from C-Firm's clients were interviewed, face to face, addressing similar themes as those on questionnaire.

The interview schedule and questionnaire were based on Phase 1 assumptions (*cf* Section 2.8). A summary of the four assumptions in Phase 1 is that effective management of SSBI is dependent on SSBI's capability to integrate with other systems [A1], SSBI's ability to provide information that has context [A2], on good governance [A3], and solid supporting infrastructure [A4]. The questionnaire and interview schedule both had five sections and each section had questions aimed at measuring the same assumption. This approach was chosen to enhance validity of qualitative research, that is, the results are "confirmed by more than one data collection instrument measuring the same thing" (Miles *et al*, 2013:307). The five sections of the data collection instruments were:

1. Biographic information
2. SSBI supporting infrastructure
   [**Assumption 4** – SSBI supporting infrastructure is the backbone of SSBI solution]
3. Governance and data management

[2] 'Teams' is the term adopted by this study to include C-Firm consultants / BI developers / client BI developers / business managers / remote BI developers / other designation of client's internal business environment.

[**Assumption 3** – Governance and management improve efficiency of SSBI solution]

4. Context

   [**Assumption 2** – For SSBI solution to be effective to business users it has to provide contextual information in addition to SSBI contents]

5. Systems integration

   [**Assumption 1** – SSBI solution, which integrates with other systems, improves efficiency of management of SSBI]

A separate section in both the interview schedule and questionnaire was included in order to collect data focusing on Outsourcing [**Assumption 10** – Outsourced service providers play a vital role in implementing effective SSBI solution for their clients]. The interview schedule included a separate section focusing on Phase 2 and Phase 3 assumptions [A5 to A9].

3.6.4.4 Data analysis methods and techniques

Data were analysed quantitatively using the Statistical Package for the Social Sciences (SPSS) version 24 and Microsoft Excel. First, the qualitative data had to be categorised by using what Miles *et al* (2013:74) call the "in vivo coding" and "descriptive coding". The researcher made audio recordings of each interview and, in pragmatic manner, transcribed data from audio to text according to the structure set prior to the interview. This means, even though the exact question sequence and same follow-up questions were not necessarily asked, the same structure was used afterwards to transcribe data and assign codes before being analysed quantitatively.

Questionnaire respondents' answers to open ended questions as well as data collected via interview were categorised and analysed quantitatively. To analyse the quantitative data, the researcher re-coded the SurveyMonkey rating scale (*cf* Figure 3.5), to a Likert-scale and each number had an assigned descriptive category.

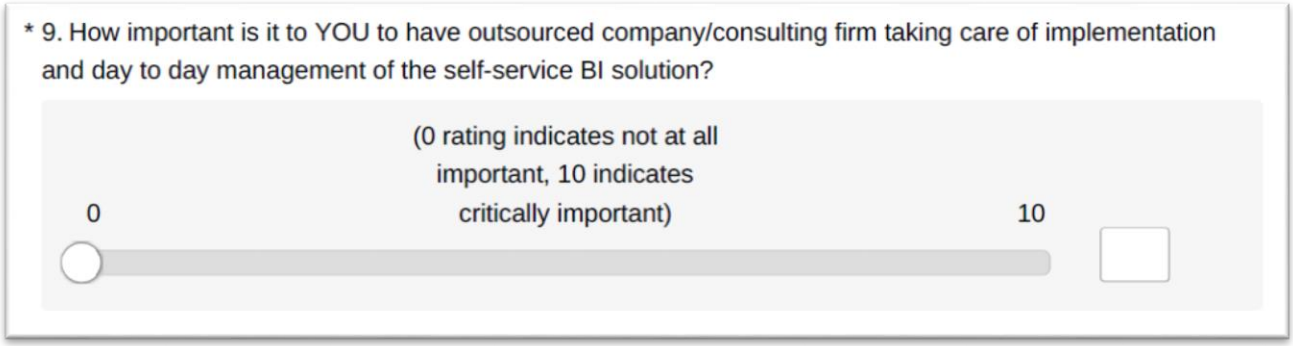

Figure 3.5: SurveyMonkey rating scale (own source)

Figure 3.5 illustrates the SurveyMonkey rating scale, and Chapter 4 and Table 4.1, explain the recoding process to descriptive categories for level of importance, and level of agreement. Re-coding of SurveyMonkey rating scale was one of the measures to ensure reliability and validity.

This section concludes the fourth component of Maxwell's (2012) interactive approach model. The components are; goals, conceptual framework, research questions, methods, and lastly, validity.

3.6.5 Validity

Validity deals with threats, which could influence the conclusion of the study, and it is concerned with ensuring that the research findings are exactly as what they claim to be (Maxwell, 2009; Saunders *et al*, 2009; Miles *et al*, 2013). A researcher needs to identify possible threats during the course of the research and come up with strategies on how to deal with those threats to ensure validity of the study. It is impossible to completely eliminate all threats, especially in a "practitioner-researcher" case, as a "part-time student [...] surrounded by exciting opportunities to pursue business and management research" (Saunders et al, 2009:150-151). When using the interactive approach model, Maxwell's (2009:243) advice is to turn potential threats into productivity:

- **Bias and reactivity:** Bias refers to the "ways in which data collection or analysis are distorted by the researcher's theories, values, or preconceptions", and reactivity is concerned with the "effect of the researcher on the settings or individual studied" (Maxwell, 2009:243). To deal with bias and reactivity, researcher applied "critical subjectivity" to ensure that his personal values did not cloud his judgement or allowed to be overwhelmed by them but to use them productively and ethically.
- **Generalisation:** This was a single case study involving one (1) consulting firm and its clients. The findings and conclusions of this study cannot be generalised. The findings were only used to explain what was happening in this particular case and propose a practical working framework for dealing with management constraints of SSBI for C-Firm.
- **Ethics:** The researcher ensured that research participants were not subject to any harm, embarrassment, or discrimination. Permission was requested from the case organisation to use its employees as participants of this study. Only after C-Firm granted permission in writing did Research Ethics Committee approve the study (*cf* Appendix A). Furthermore, online questionnaire participants were given a choice to participate (or not) in the study and interview participants were also given a consent form, outlining research ethics (*cf* Appendix D). Online participation was anonymous, and those interviewed, their names, the actual name of C-Firm, and names of clients were anonymised and will not be published.

This concludes the discussion of the five components of the interactive approach model. Figure 3.6 shows how the model applied to this study.

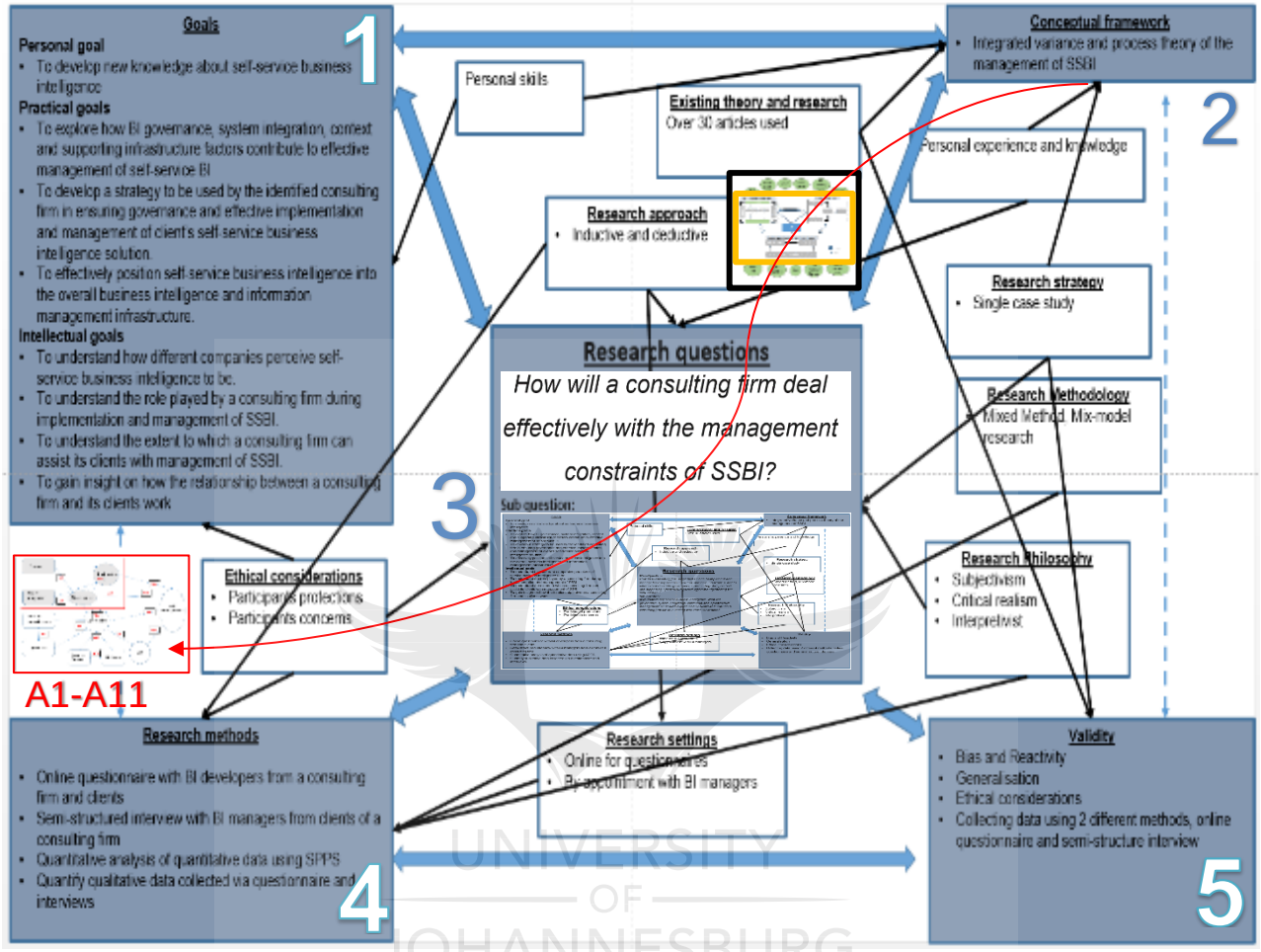

Figure 3.6: Five components of interactive approach model (adopted from Maxwell, 2009:218)

Figure 3.6 builds on the first layer of interactive approach model of Figure 3.2. It shows the interconnection of five components of the model, as well as external factors and environmental factors which exists within the design.

3.7 Summary

This chapter explained the research design of the study, using the interactive approach model. The five components of the model are the goals, conceptual framework, research questions, methods, and validity. It also discussed different factors that affected the design, for example, the study had a subjectivist stance of ontology and interpretivist stance of epistemology. The reason was to

integrate human interest into the study by making sense of data collected from BI industry experts. The purpose was both explanatory and exploratory.

Explanatory aims at establishing relationships between variables whereas the exploratory purpose was to gain understanding of SSBI management constraints and finding new insights. The next chapter presents the findings of data collected using instruments explained in this chapter.

Chapter 4
Research findings

4.1 Introduction

This chapter looks at the analysis of data collected for this study. The approach adopted by this study was a mixed method research. Both qualitative and quantitative data were collected, and it was analysed quantitatively using Statistical Package for the Social Sciences and Microsoft excel. The two data collection methods were semi-structured interview, used to collect qualitative data from business managers; and questionnaire, to gather both quantitative data and qualitative data from BI developers from a consulting firm as well as from the firm's clients. Data collection methods were executed in parallel.

The previous chapter discussed research methodology, giving detail of the interactive approach model. This chapter reports the empirical study findings and analysis, while also giving detail of procedure. The chapter begins with notes in terms of sample, data collection, and data analysis procedure. The bulk of this chapter reports the research findings, and ends with a summary note.

4.2 Sample notes

For semi-structured interviews, two of five business managers could not avail themselves to do face-to-face interviews and they requested to reply to interview questions in writing. The interview questions were sent per email; the central questions were mandatory, and sub questions were optional (*cf* Appendix E). One manager responded only to central questions on all themes, and the other manager only answered one theme (outsourcing) and could not answer the rest of the questions.

The questionnaire data collection instrument received 80% response rate, which means 28 out of 35 participants responded to the online questionnaire. As discussed in Chapter 3, the sample total was 35, which consisted of 25 C-Firm employees and 10 C-Firm clients, the latter represented by five business managers and five BI developers.

4.3 Data collection notes

For face-to-face interviews, the researcher made notes and audio recordings during the interview. Recordings were later transcribed into text, and the transcribed version was used to generate themes. As mentioned in Section 3.6.4.4, researcher followed a pragmatic approach in that the order of transcribed data in some cases differed from audio recordings in order to match the

sequence of interview questions and not everything was transcribed – only those sections that dealt with pre-structured themes, were transcribed.

4.3.1 Notes on questionnaire design and procedure

The first version of the questionnaire was sent to three BI developers as well as the supervisor as a pilot test. They provided their feedback regarding the structure of the questions as well as grammatical errors. With feedback provided, the second version of the questionnaire was developed, and the supervisor reviewed it, gave comments. With incorporation of feedback from the pilot phase, the final draft of the questionnaire was designed. The online questionnaire was distributed to participants using SurveyMonkey. The first page of the questionnaire was a letter of informed consent (*cf* Appendix F), and participants were given a choice to accept or decline to participate in the research. The final draft of the questionnaire consisted of 36 questions in total. The questions were divided according to the following themes:

- **Section A –** Biographical information
- **Section B –** Outsourcing
- **Section C –** Data governance and management
- **Section D –** Support infrastructure
- **Section E –** Context (Common understanding)
- **Section F –** System integration

Each section consisted of both open and closed-ended questions to collect qualitative and quantitative data respectively. Open-ended questions are used to explore different factors affecting management of SSBI. On the other hand, closed-ended questions were designed to assist in understanding the level of importance of factors affecting implementation and management of SSBI, and the extent to which respondents agreed with research assumptions made in Chapter 2 (*cf* Section 2.8).

The rating scale of SurveyMonkey was comparable to an 11 point Likert-scale. The scale for collecting level of importance data, ranged from 0 rating indicated “not at all important”, and 10 indicated “critically/extremely important”. To collect the extent to which respondents agreed with assumptions made, the rating scale ranged from 0 indicated “fully/strongly disagree”, and 10 indicated “fully/strongly agree”.

4.3.2 Notes on interview design and procedure

Business managers were identified as those people who would have in depth knowledge with respect to interaction between the consulting firm and its clients. They would have knowledge and experience of management of SSBI. The interview was designed to collect information to complement the questionnaire. This approach was chosen to enhance validity of research, that is, the results are "confirmed by more than one data collection instrument measuring the same thing" (Miles *et al*, 2013:307). Interview consisted of the same themes as questionnaire but the questions were open-ended questions.

For each theme, there was one central question and few sub or follow-up questions. The central question was mandatory to be asked every manager, and depending on how the respondent answered the central question, one or more of the sub or follow-up questions were asked. The interview schedule included a separate section focusing on Phase 2 and Phase 3 assumptions [A5 to A9] (*cf* Figure 2.8). This was important not only to provide more context for this study, but also to lay a foundation for the next researchers who would like to pursue research in this area.

This method received 100% response rate, which meant all five managers responded to the interview. The initial plan was to have face-to-face interview with all of them, but due to tight schedules of two of the business managers, they opted to respond to interview in written format. The interview was sent to them, together with the consent form via email, and they sent their answers back via email. However, one of the managers who opted to reply to interview questions via email, only answered one theme (outsourcing) and left the other themes unanswered.

4.4 Data analysis notes

Specifically, mixed method, mixed-model research permits a research to benefit from quantitative data and qualities to analyse it qualitatively, or to take qualitative data and quantities to analyse it quantitatively (Saunders et al, 2009:153).

4.4.1 Qualitative data analysis technique

To analyse the interview data, the audio recording was first transcribed to text before analysis. All responses to central questions, and some of the follow-up questions were transcribe to text in order to be analysed quantitatively. This means the researcher discerned themes and in pragmatic manner, transcribed only sections of recordings relating to themes. Responses were captured in Microsoft excel spreadsheet. Some lengthy responses were correctly paraphrased. Qualitative

data gathered both by questionnaire as well as interview were categorised according to themes, quantified, and analysed quantitatively using IBM SPSS statistics version 24.

The approach used for categorising the data is what Miles *et al* (2013:74) call the "in vivo coding" and "descriptive coding". This approach of coding "uses words or short phrases from the participants' own language in the data records as codes", and it "assigns labels to data to summarise in short words or phrase the topic from a qualitative data" (Miles *et al*, 2013:74). Categories were defined inductively from the collected data. The five steps of qualitative data analysis were:

Step 1: Get familiar with the data – Researcher read all answers for each question three times. The first time was just to understand each individual answer, the second time was to identify common themes or categories with the data, and third time was to identify and clarify any misunderstanding related to the data.

Step 2: Focus the analysis – Researcher reflected on goals and purpose (*cf* Section 3.6.1), and on responses and how these would best answer research questions. During this step, the decision also had to be made whether the analysis should be done per question (general), section, or case (participant). Questionnaire open-ended questions data were analysed in general and per case. The case analyses were per vocation of the respondents, which means responses of BI consulting firm's employees were analysed and compared to those of clients' in likewise manner (developers with developers).

Step 3: Categorise information – Each answer was read and unitised in a category. Researcher added narrative text, that is, direct quotation from the data, and coding with descriptive and in vivo coding.

Step 4: Reassess – Testing of data to see if there was duplication. For some questions, defined categories were then compared and mapped to the conception framework concept. Reorganising of data occurred in this step.

Step 5: Identify patterns and relationship between and within categories – Review of re-organised data to find patterns and see how each category relates to each other.

The above qualitative data analysis steps were mostly guided by Saunders *et al* (2009:480-499). Also, this research leaned on Maxwell and Loomis (2003), Miles *et al* (2013), and Creswell (2014), as guide for using the correct qualitative and quantitative data analysis technique.

4.4.2 Quantitative data analysis technique

Researcher converted the original SurveyMonkey rating scale to a 7-point Likert scale. A descriptive category was assigned to each number. Table 4.1 below shows how the re-coding was conducted, and how numerical values were assigned to each category.

Table 4.1: Re-coding SurveyMonkey rating scale to 7-point Likert-scale

Level of importance			**Level of agreement**		
Original rating scale	**Re-coded value**	**Category**	**Original rating scale**	**Re-coded value**	**Category**
0	0	Not at all important	0	0	Strongly disagree
1 and 2	1	Low importance	1 and 2	1	Disagree
3 and 4	2	Slightly important	3 and 4	2	Somewhat disagree
5	3	Neutral	5	3	Neither agree or disagree
6 and 7	4	Moderately important	6 and 7	4	Somewhat agree
8 and 9	5	Very important	8 and 9	5	Agree
10	6	Extremely important	10	6	Strongly agree

Table 4.1 shows the re-coded value, as well as the categories assigned to each new re-coded value for level of importance, and for level of agreement.

4.4.3 Notes on phases of analysis

To analyse the data, the researcher followed two phases. The first phase of data analysis focused on the questionnaire data, which included qualitative and quantitative data. This was the data from BI developers. Then the second phase of data analysis focused on the interview data, which was data collected from BI managers. Interview data, collected face-to-face, were first transcribed in to text. After transcribing, the researcher listened to the audio recording to verify whether the transcribed version was correct. The transcribed version was then used to generate codes using the in vivo coding approach.

Although data from each data collection instrument was analysed separately, later in the analysis, the relationship between the outcomes of each analysis were compared to validate the results of each data collection instrument. For each theme or section of the data collection instruments, both

qualitative and quantitative data collected using previously discussed methods, was analysed to understand the effect of each theme on effective management of SSBI, then later the relationship between each theme was explored. Finally, the general perspective of participants on how BI governance, system integration, context and supporting infrastructure factors contribute to effective management of SSBI, and how C-Firm can assist its clients to manage these factors. The research findings follow next.

4.5 Research findings

4.5.1 Questionnaire results and analysis

4.5.1.1 Demographics

The participants of this research consisted of 16 males and 12 females of the age from 21 upwards. Together they represented most industries including consulting, financial institutions, fast moving consumer good (FMCG), health, IT, and insurance industries. The majority of respondents (48%), came from the IT industry. Figure 4.1 below shows respondents' distribution industry by gender.

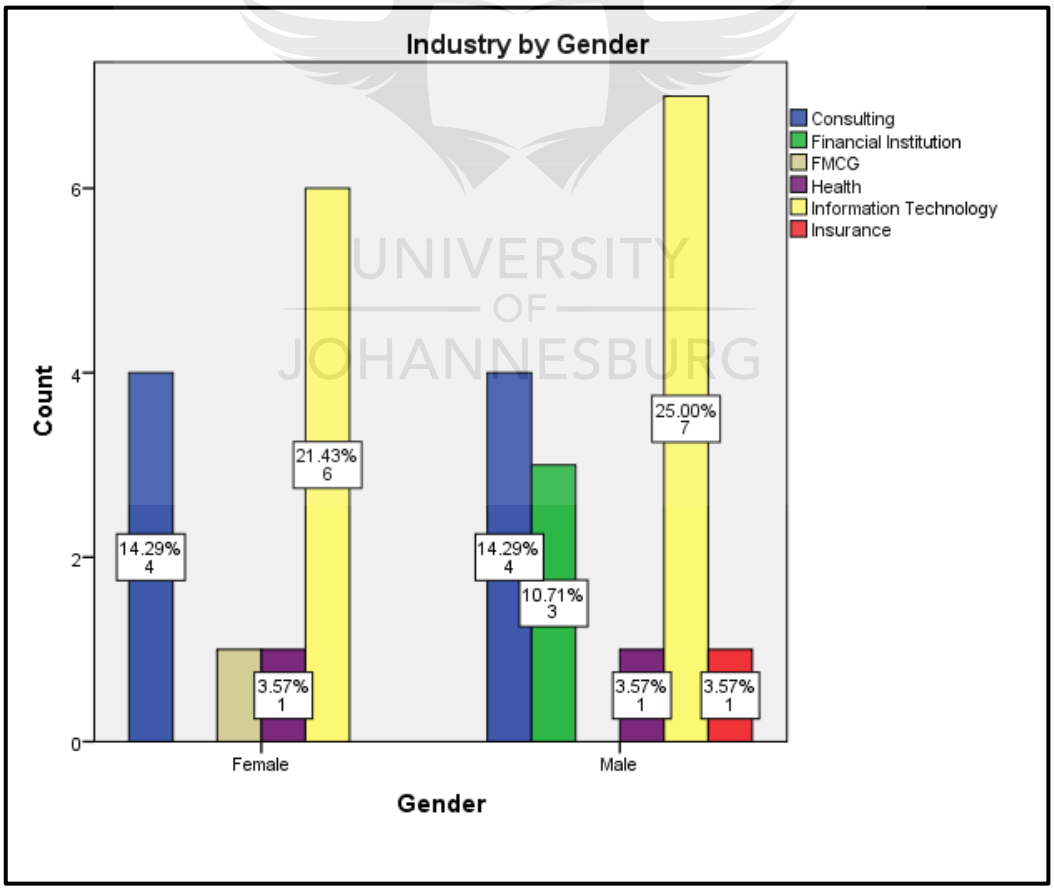

Figure 4.1: Respondents' industry by gender

Figure 4.1 shows that 25% of male respondents were from the IT industry in comparison to 21.43% females in the same industry. There were not any female representatives from financial institution and insurance industries, and no male respondent from FMCG. Respondents described their team roles, positions, or job titles as follow:

- BI Developers
- BI Consultants
- Principle Consultant
- Business Analysts
- Data warehouse/ETL Developers
- Executive/BI Managers

As expected, 19 respondents (68%) were working for C-Firm and nine respondents (32%) were clients of C-Firm.[3] The aim of questionnaire Question 7 (*cf* Appendix F), was to determine whether clients, outsourced the implementation and management of BI solution to an external party. Table 4.2 shows clients with BI solution managed by an outsource firm.

Table 4.2: Clients with BI solution managed by an outsourced firm

		If working for a corporate, is the implementation and management of BI solution outsourced to external party?					
		Not answered	No	Not sure	Partially outsourced, partially internal	Yes	Total
Vocation	Consulting	13	2	2	0	2[4]	19
	Corporate	0	6	0	2	1	9
Total		**13**	**8**	**2**	**2**	**3**	**28**

Of the nine respondents working for corporate companies, six respondents have indicated that the implementation and management of BI is not outsourced to an external party, one respondent

[3] For reporting purposes, labelled per vocation: C-Firm employees are 'Consulting', and clients 'Corporate'.
[4] Generally, respondents in the consulting vocation would skip this question, though it was possible that some consultants could have dual roles. Here, only corporate's responses were relevant, highlighted in Table 4.2.

indicated that the company has outsourced BI, and the other one indicated that BI is partially outsourced and partially implemented and managed in-house.

4.5.1.2 BI developers' definition of self-service business intelligence

Respondents were asked to give their definition of SSBI. From the 28 answers, eight categories were formulated. These categories, together, gave an overview of respondents' perception of how different people view SSBI, reported in Table 4.3.

Table 4.3: Respondents' definition of self-service business intelligence

Category/Theme (N of comments)	Code - Description	Number of comments Total = (85)	Quotes
SSBI Description (28 comments)	APR - An approach	19	*"it is putting the benefits of analytics"* *"BI application"*
	TOO - BI tool	6	
	SOL - BI solution	1	
	UND - undecided	2	
Type of SSBI users (19 comments)	BUU - Business users	3	*"Users that understand data and know how to create reports"* *A business user "Without prior knowledge or experience"*
	GEN - General	8	
	NTU - Non-technical user	8	
Users' Actions (17 comments)	ATC - Ability to create own reports	11	*"Help themselves to do their own reporting and analysis"* *"Run their own reports"* *"Manage on their own with the requirements for the external consultation"*
	ATD - Access to the data	4	
	ATM - Ability to manage reports	1	
	ATR - Ability to run reports	1	
IT Involvement (12 comments)	ITD - IT dependent	1	*"Without the help of IT"* *"Everything to be customised"* *"Without necessarily knowing data analysis"*
	ITI - IT independent	11	
Enabler (5 comments)	ENA – Enabler	5	*"Enabling business users to analyse and work on corporate data"*
Value of data (2 comments)	BEN - Benefits	2	*"A joy for others"*
Development process (1 comment)	DEVP - Report development process	1	*"Length development process"*
System capability (1 comment)	LOS - Level of sophistication	1	*"To be used off the shelf"*

In Table 4.3, it can be seen that “Type of SSBI Users” and “Users’ action” categories received majority of comments, 19 (68%) and 17 (61%) respectively. When looking at the category that received the highest number of comments, “Type of SSBI Users”, the results indicate that SSBI is mostly tailored for non-technical users, and general users. This is also confirmed by number of comments received under “IT involvement” 12 (43%).

This results show that SSBI is to be used by specific user groups, who needs to perform different actions on the data. The “Users’ action” category, when looked together with “IT involvement” category, indicate that SSBI provides or caters for different needs of different users which include, the “ability of users to create their own reports”, “visualise reports as they want”, and “access to information they need, when they need it” with “little to no help from IT or BI technical resources”.

When looking at the results, it is noticeable how many respondents said that users need access to data with minimal or without IT or BI teams’ assistance. By looking at IT involvement category, out of 12 comments, only one respondent acknowledged IT/BI team involvement in this whole SSBI solution, 11 (91,6%) of respondents talked about less or No IT involvement.

There are many definitions of SSBI in literature, and they mostly refer to the same concept. In Chapter 2, it was noted how the concept of SSBI developed to what it is today. Figure 4.2 shows respondents’ view of SSBI solution.

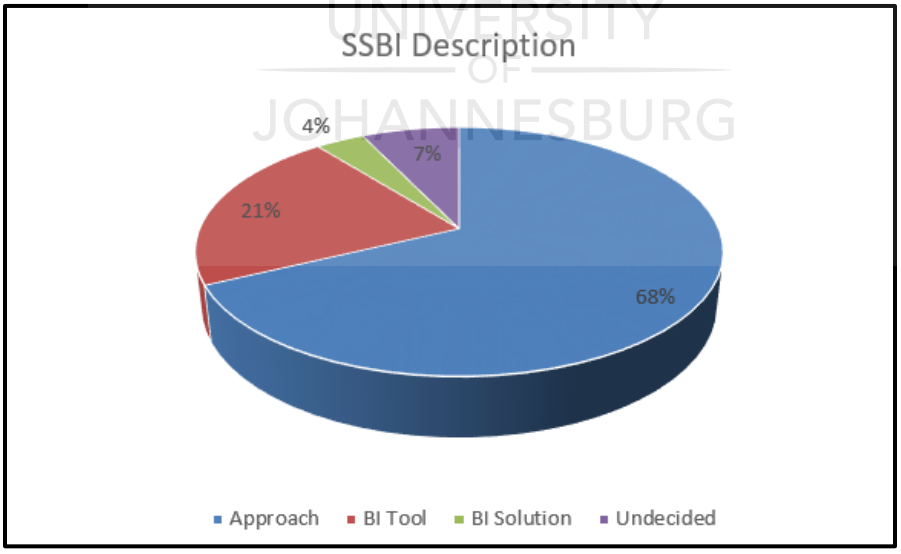

Figure 4.2: Respondents’ description of SSBI solution

Figure 4.2 illustrates how different respondents view SSBI. Most respondents (68%) see it as an approach to SSBI, some respondents (21%) see it as a tool while fewer respondents (4%) regard

it as a solution, and some respondents (7%) did not describe SSBI. Findings indicate that SSBI is not only about the tool, but it is the process or an approach on how users extract intelligence from the data.

4.5.1.3 Outsourcing

This section reports findings of Section B, Question 9 to Question 14 (*cf* Appendix F), aimed at understanding the following:

- Level of importance of having outsourced firm taking care of implementation and management of SSBI
- Client company's perception of importance of having outsourced firm taking care of implementation and management of SSBI
- Reasons why organisations outsource implementation and management of SSBI solution
- Perceived role of service provider or outsourced firm during implementation of SSBI solution
- What organisations should do to leverage outsourced firm's knowledge and experience

These questions looked at how respondents perceived the need of having an outsourced firm taking care of implementation and management of the SSBI. The response rate ranged between 85.7% and 92.9%, some respondents left some questions unanswered. Table 4.3 and Table 4.4 report findings to questions testing the role of outsourced service providers in implementing effective and efficient SSBI solution for their clients. Table 4.3 reports on respondents' level of importance assigned on having outsourced firm taking care of implementation and management of SSBI solution for its clients. In Table 4.3, the response rate was 85.7%, which means 24 of 28 respondents answered these questions, whereas response rate to Question 14 was 92.9%, which means 26 of 28 responses were received (*cf* Table 4.4).

Table 4.3: Level of importance of having outsourced firm implementing and managing SSBI solution

	Level of importance of having outsourced firm implementing and managing SSBI solution							
	Not at all important N (%)	Low importance N (%)	Slightly important N (%)	Neutral N (%)	Moderately important N (%)	Very important N (%)	Extremely important N (%)	Mean
Q9: To the individual	2(8.3%)	6(25%)	6(25%)	3(12.5%)	4(16.7%)	3(12.5%)	0(0.0%)	2.41
Q10: To the organisation	3(12.5%)	3(12.5%)	4(16.7%)	7(29.2%)	3(12.5%)	3(12.5%)	1(4.2%)	2.41

The results from Table 4.3 show that respondents believed that it is more important at an organisational level than an individual level to have their SSBI outsourced. At the individual level, 25% of respondents regarded it as low importance and 25% of respondents at slightly important, which means half of the respondents did not regard having an outsourced firm implementing and managing SSBI solution of importance. The minority, 16.7% of respondents said it is moderately important and 12.5% of respondents said it is very important. At organisational level, 12.5% of respondents said it was of no importance, 12.5% of respondents said it was of low importance, 16.7% of respondents said it was slightly important. The majority, 29.2% of respondents were neutral when it came to the importance of an outsourced firm from an organisation's perspective. Of those who viewed outsourcing important to the organisation, 12.5% of respondents said it was moderately important, 12.5% of respondents said it was very important, and 4.2% of respondents said it was extremely important. The importance of outsourcing is clearly not a decided matter, with more respondents leaning towards the negative side. Findings indicate that slightly more participants do not regard it as important to have an outsourced firm implementing and managing SSBI solution for its clients. It is important to note the large number of neutral responses, which could mean uncertainty.

Table 4.4: Outsourced service providers play a vital role in implementing effective and efficient SSBI solution for their clients

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	Mean
Q14 Outsourced service providers play a vital role in implementing effective and efficient SSBI solution for their clients	4(15.4)	2(7.7)	0(0.0)	5(19.2)	4(15.4)	8(30.8)	3(11.5)	3.8

In contrast to the analysis above, Table 4.4 indicates that more than half of the participants (58% combined) of respondents leaned more towards agreeing with the notion that outsourced service providers play a *vital* role in implementing effective and efficient SSBI solution for its clients. This indicates that even though the level of importance of outsourcing is lower, the notion that outsourcing is an essential option is valid.

There are different reasons why organisations outsource, but according to Burke *et al* (2015:33), it is because they lack required skills and knowledge, time and patience to perform the tasks themselves. This perception is confirmed by the results of open-ended questions below. Table 4.5 shows different reasons why organisations opt to outsource their SSBI solution.

Table 4.5: Reasons to outsource implementation and management of SSBI solution

Category/Theme (N of comments)	**Code - Description**	**Number of comments Total=49**	**Quotes**
Lack of resources	NIS - No internal skills	17	"Due to lack of internal skills" "does not necessarily have the resources"
	COS - No money	1	
	GEN - General resources	1	
Financial sense	REC - Reduce cost	8	"could be the more financially viable solution" "perception of cost saving"
Need for dedicated resources	FOC - Focused internal team	5	"keeping organisations employees focused on alternate day to day activities" "To focus on core function"
CF has experience	KNW - Knowledgeable	4	"organisation is experienced enough" "as they have access to a pool of consultants"
Need for quality service	QUA - Quality	4	"provide an excellent service" "to improve efficiency and productivity"
Leverage	LEV - Leverage	3	" to gaining access to world-class capabilities" "Skills transfer"
BI complexities	COM - Complexity	2	"They usually need a solution quickly" "BI is very complex to setup and administrate"
Labour law	LAB - Labour	1	"hesitant to hire staff due to labour laws"
Need for short turnaround time	TAT -Turnaround time	1	"They usually need a solution quickly"
Reasons not to outsource	NTO - Not to outsource	1	"outsource organisation sent incompetent consultants"
When to outsource	RTO - Reasons to outsource	1	"outsourcing should be done when it is not a core part of your business"

Analysis of 26 respondents' comments, (Consultants N = 16; Corporate N = 10), their responses produced a total of 49 comments or reasons for outsourcing SSBI to external parties. Consultants'

responses represented 61% (N=30) of the comments, and corporate consultants' responses represented 39% (N=19) of the comments.

In Table 4.5, comments are grouped into different categories/reasons, and the results show that the top three reasons why organisations outsource are: lack of resources (19 comments), financial reasons (8 comments), and also the need to have a dedicated team (5 comments) looking after their SSBI solution. These responses show that clients outsource because their internal staff do not have required skills, or sufficient knowledge to implement and manage SSBI solution. Some respondents indicated that it makes financial sense to bring external parties to focus on non-core functions like SSBI, as this will reduce the cost for the company.

What this indicates is that outsourced firm needs to ensure that it has required resources, including skills, tools, and be very knowledgeable in the area that the client is functioning on in order to be effective. When consulting firm improves in the areas or categories above, there is a high chance that level of importance will move towards the positive side (*cf* Table 4.3). This can be verified by reasons for outsourcing by vocation in Figure 4.3 below.

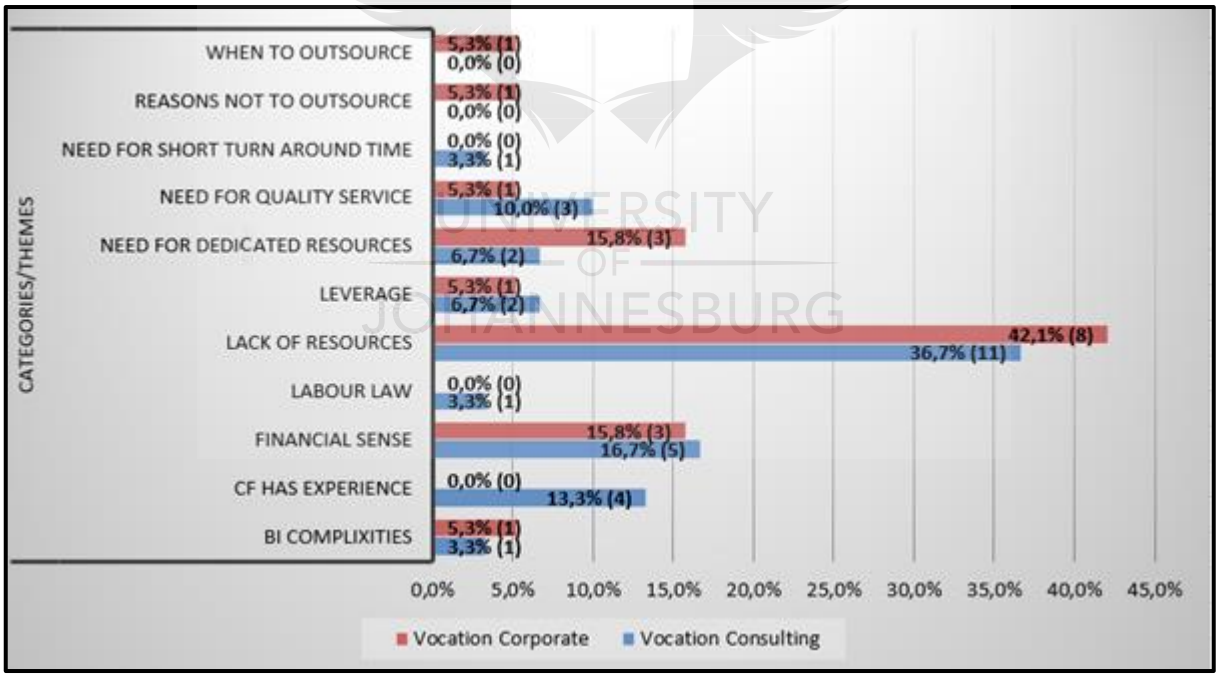

Figure 4.3: Reasons for outsourcing SSBI implementation

Figure 4.3 shows lack of resources as the biggest reason why both the Consulting and Corporate vocations see the need for outsourcing. For respondents, it made financial sense to outsource, by 16.7% in the Corporate and 15.8% of Consulting vocations; also, 15.8% of Corporate said that

reason for outsourcing was the need for dedicated resources. It was noted by 13.3% of Consulting vocation, that the reason for outsourcing was consulting firm has experience, whereas none of the Corporate vocation mentioned this reason, which makes it necessary to understand the role of a service provider (consulting firm) during SSBI implementation, and understand the view of both vocations, Consulting and Corporate.

Question 12 asked respondents to describe roles played by a consulting firm during the implementation of SSBI, and received 26 responses. Of this 26, 44 comments were derived regarding the role played by a service provider (i.e. consulting firm), during implementation of the SSBI, in Table 4.6.

Table 4.6: The role of a service provider during SSBI implementation

Category/Theme (N of comments)	**Code - Description**	**Number of comments Total=44**	**Quotes**
Smooth implementation (13 comments)	IMP - Implementation	13	"enable availability of resources during implementation" "to implement a working solution"
Advisors (11 comments)	ARC - Architecture	7	"Familiarising yourself with the organisations requirement" "changes are evaluated for their benefits and risks"
	GOV - Governance	2	
	RIS - Risks	2	
Meet customers' needs (8 comments)	QUA - Quality services	5	"meet customer expectations" "monitor the process of implementation"
	ADH - Ad hoc	2	
	MON - Monitoring	1	
Provides support (8 comments)	ONG – On going support	8	"initial training / handholding" "to ensure everything runs smoothly
Knowledge transfer (2 comments)	KNT - Knowledge transfer	2	" provide a base from which the organisation's BI team can continue " "Knowledge transfer "
Bridge - software vendor and client (1 comment)	BRI - Bridge	1	" important link between the BI software company and the organisation"
Provides resources (1 comment)	TOO - Tools	1	"provides application, storage, telecommunications services"

Table 4.6 shows the different roles of service providers (i.e. consulting firms) during SSBI implementation. Consultants contributed 68% of the observations/comments while 32% of observations/comments were from respondents working for a consulting firm's clients. The top

three roles in general were to *ensure smooth implementation* of SSBI, to *meet customers' needs*, and to *ensure support*. This, when looked together with reasons for outsourcing, shows that due to lack of skills, clients are unable to ensure smooth, effective implementation of the solution. Figure 4.4 shows these roles by vocation.

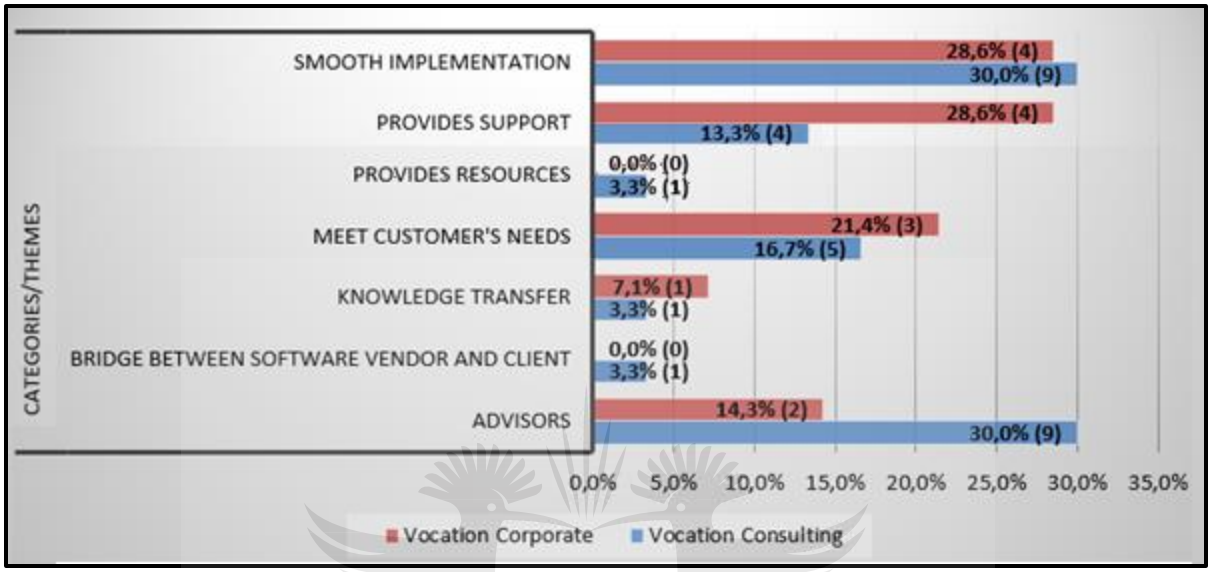

Figure 4.4: The role of a service provider during SSBI implementation

When analysing the results on Table 4.6, the majority in the Corporate vocation described the role of service provider as *provides support* and *smooth implementation*, with 28.6% of the observations each. This illustrates that respondents view the role outsourced service providers play as most important in terms of these two categories. Respondents in the Consulting vocation, described the role of service provider, mostly as *advisors*. Consulting firm therefore will have to work very hard to ensure smooth implementation and provide support, as well as to be advisors, as these were the top categories of responses.

Question 13 looked at ways in which clients can leverage consulting firm's knowledge. As it were noted above, consulting firm plays different roles, and depending on that role, and the need to outsource, the client will decide to outsource their SSBI. One of the roles indicated by respondents was *knowledge transfer*. Organisations have to ensure that they leverage the knowledge brought by the consulting firm to ensure they get value for their money. Table 4.7 shows the results of how to leverage this knowledge.

Table 4.7: Leveraging consulting firm's knowledge

Category/Theme (N of comments)	CODE - Description	Number of comments Total= 39	Quotes
Knowledge sharing (11 comments)	KAS - Knowledge and skill transfer	11	"ensure that transfer of knowledge is done" "By ensuring that the consulting firm does proper knowledge transfer"
Approaches of sharing knowledge (9 comments)	OOO - One on one sessions	3	"partner your BI consults with some of your best skilled resources in your own BI team" "sit with the consultant and ask questions"
	PCI - Partner consultants with internal stuff	6	
Having clear scope and mandate (6)	SCO - Scope	6	"make sure that the consulting firm has a clear mandate of creating a system" "Ensure that the scope of work is clearly defined"
Knowledgeable Consulting firm (6 comments)	EXP - Experienced resources	4	"a consulting firm has a good track record of delivering successful projects" "We look at previous projects that the consulting firm implemented and the success rate of them"
	REF - good references	1	
	EXR - Experienced resources	1	
Documentation (4 comments)	SOP - Standard operating procedures	4	"ensure there SOPs available" "ask for documentation as part of the implementation process"
Training (2 comments)	TRA - Training	2	"on job training" "Onsite training, preferably customised"
Building a good relationship (1 comment)	GRE - Good relationship	1	"By having a good relationship with them"

Reported in Table 4.7, Question 13 received response rate of 89% (N=25). From the 25 responses analysed, 39 comments were observed; 28 from Consultants, and 11 from Corporate. These observations were the grouped into seven categories. The top three categories were *knowledge sharing (*11 comments), *having clear scope and mandate* (6 comments), and *knowledgeable consulting firm* (6 comments). Table 4.7 shows that there are different approaches of sharing knowledge given by respondents, and this category received 23% of observations from the respondents (9 comments).

Analysis did not only indicate that respondents regard *knowledge sharing* as best way of leveraging consulting firm's knowledge, but they also gave different approaches on how to ensure that

knowledge is transferred efficiently to internal staff. These approaches include one on one interaction between consultants and internal BI staff, and partnering consultants with internal BI team. Other means of leveraging knowledge, reported in Table 4.7, include ensuring that the scope of implementation and management is clear, and by ensuring that the consulting firm has enough resources, including skills, and knowledge. Figure 4.5 shows how Consultants and Corporate vocations view the approaches of leveraging knowledge.

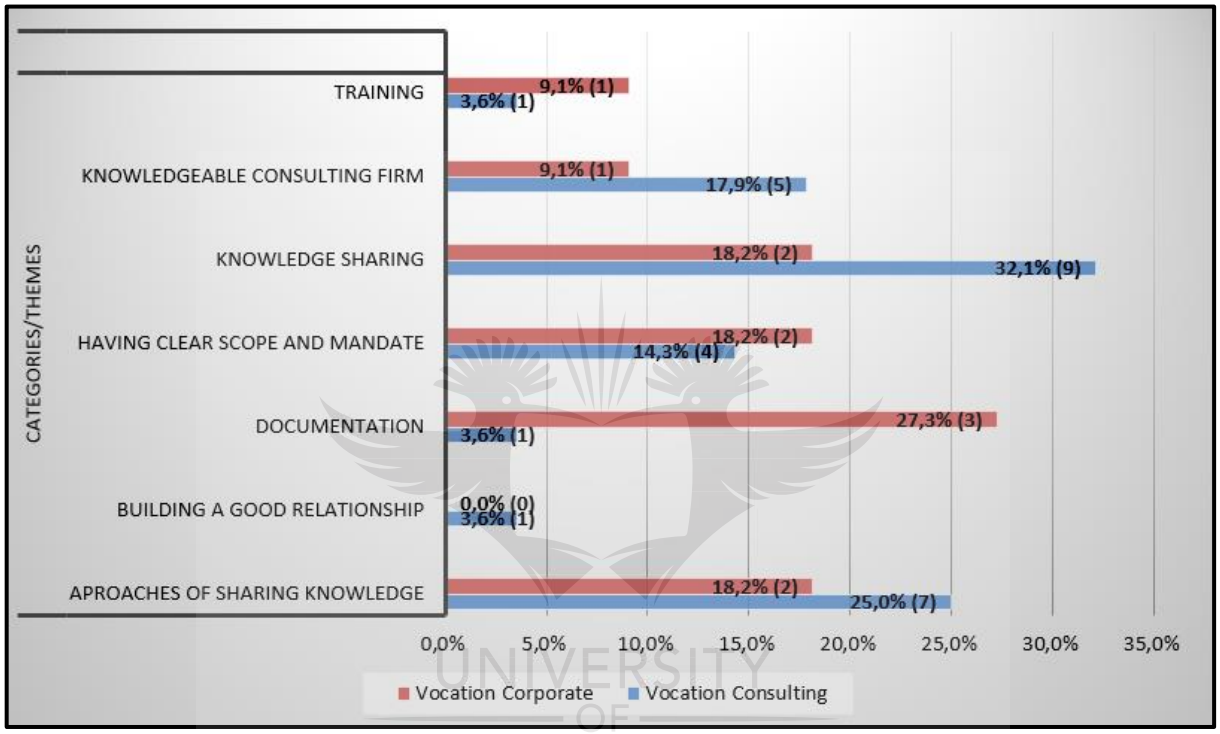

Figure 4.5: Approaches of leveraging knowledge by vocation

Figure 4.5 presents quantitative analysis of 25 responses, which observed 39 comments, grouped by vocation, 28 from Consultants, and 11 from Corporate. Results indicate that for Corporate, having *documentation* is an efficient way of leveraging outsourced firm's knowledge by 27.3%. *Having clear scope and mandate*, *knowledge sharing*, and *approaches of sharing knowledge*, came second with 18.2%.

Results indicate that what is important for the consulting firm is not necessarily important for the organisation. Since the organisation is the one that is going to reap the benefits of the SSBI solution, the outsourced firm needs to always keep the following at the back of their mind, firstly, their role as the service providers, and secondly, the reason why the client decided to outsource them.

There are different reasons why organisations outsource, but according to Burke *et al* (2015:33), it is because they lack required skills and knowledge, time and patience to perform the tasks themselves, tasks such as data governance and management.

4.5.1.4 Data governance and management

Section C of the questionnaire received between 71.4% (N=10) and 78.6% (N=22) response rate. The objective of the section was to understand how data governance and management (DGM) affect implementation and management of SSBI. The assumption that this theme explored, as indicated in Section 2.7.1.3, was that effective SSBI governance and management improve efficiency of SSBI solution [A3]. Respondents gave their perspective on the following:

- Level of importance of having DGM standards in SSBI environment
- Level of importance to include business, not only IT, in formulating governance standards
- Ways in which a consulting firm can assist when it comes to governing SSBI environments
- Data governance initiatives which should be implemented to ensure integrity of SSBI

Quantitative data analysis follows, firstly focused on understanding level of importance of DGM procedures and standards on SSBI, as well as the importance of involving business when formulating those procedures respectively in Table 4.8.

Table 4.8: Importance of DGM standards and of including business in formulating standards

Level of importance	Not at all N (%)	Low N (%)	Slightly N (%)	Neutral N (%)	Moderately important N (%)	Very important N (%)	Extremely important N (%)	Mean
DGM procedures and standards in SSBI environment	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(4.5)	6(27.3)	15(68.2)	5.6
Including business in formulating DGM procedures and standards	0(0.0)	0(0.0)	0(0.0)	0(0.0)	3(13.6)	6(27.3)	13(59.1)	5.5

In Table 4.8, both Question 15 and Question 16 aimed at understanding the level of importance of having DGM procedures in SSBI environment, also how important it was to include the business

in formulating these governance stands and procedures respectively. The mean of 5.6 and 5.5 indicate that majority of respondents tends to believe that it is almost extremely important for both questions. The results also show that governance should be at the centre of SSBI solution. Having these procedures, and not forgetting to include the business, will boost SSBI confidence in trusting data produced by this solution.

Table 4.8 show that none of the respondents chose to rate DGM and inclusion of business in formulating standards in any of the categories of low importance or neutral. The majority, 68.2% of respondents indicated that it was extremely important to have DGM procedures and standards in SSBI, and 27.3% of respondents said it was very important. Chapter 2 noted that organisations define policies and standards that are necessary to ensure consistency and quality of data and information. This is exactly what SSBI users need, they need to trust information they get from the solution.

Table 4.8 show that SSBI is viewed as a collaboration between the business and IT; the results indicate that most, 59.1% of respondents, believed that it was extremely important to include business when formulating DGM procedures and standards, while 27.3% of respondents said it was very important. Few of them, 13.6% of respondents, viewed it as moderately important. Results make it very clear that SSBI is about users, it is about satisfying data and information consumers' need, and therefore, involving them will ensure that their needs are always met.

The next questions aimed at understanding how the outsourced firm can assist its clients. These questions received 21 responses (14 consultants, 7 corporate), and these 21 responses produced 30 comments. From these comments, 6 categories were identified. The results give insight on how can the consulting firm add value to its clients. Question 17 focused on identifying ways in which a consulting firm can assist its clients when it comes to governing the SSBI environment. Also, the results can be seen as the advantages of outsourcing the implementation and management of SSBI. Table 4.9 gives the results of this question; first thing to note from Table 4.9 is that, respondents indicated that because consulting firm has vast amount of knowledge in many industries, they are able to assist clients with implementation of the industry standards. This category received majority of the comments (11 comments). Respondents believed that because a consulting firm has implemented variety of solutions, it implies that they have better understanding of what works, and what does not.

Table 4.9: How a consulting firm can assist when it comes to governing SSBI environments

Category/Theme (N)	CODE - Description	Number of comments Total=30	Quotes
Implement industry standards (11 comments)	IIS - Implement industry standards	11	"implement industry best practices" "provide frameworks and templates, which can then be taken to the internal staff and customised"
Bringing diverse skills and knowledge (6 comments)	SKK - Skills and Knowledge	6	"Provide advice and expertise"
Knowledge of best practices (5 comments)	BEP - Best practices	5	"more knowledge of Best practices and practical governing strategies"
Enforcement (3 comments)	ENF - Enforcement	3	"making sure that they do not expose your data to vulnerabilities" "provide advice and guidance on all the aspects to consider"
Get directive from the client (3 comments)	DIR - Get directives	3	"can only go so far the organization needs to properly govern their SSBI environment" "business needs the assist in guiding the company policy and expectations"
Define procedures and standards (2 comments)	FOD - Formulate DGM	2	"help to define and document data governance and management procedures and standards"

Table 4.9 shows the category that received the second most comments, was *bringing diverse skills and knowledge* (6 comments), and followed by knowledge of *best practices* (5 comments). This is true for the same reasoning as above but also because of different skill set the consulting firm has, and the knowledge it built over the years, which can assist clients by formulating procedures and standards that work according to the best practices. When a consulting firm has all these, it puts it in an advantage position because, as respondents indicated, “it can help a client to define procedures and standards that are customised for their environment”.

As indicated by Peters *et al* (2016), and Harmann (2013) in Chapter 1 and Chapter 2, a consulting firm is perceived by its clients as experts in this field, it is trusted by most organisations to help them achieve required business value from SSBI investments. The results of this study confirm literature, illustrated in Figure 4.6.

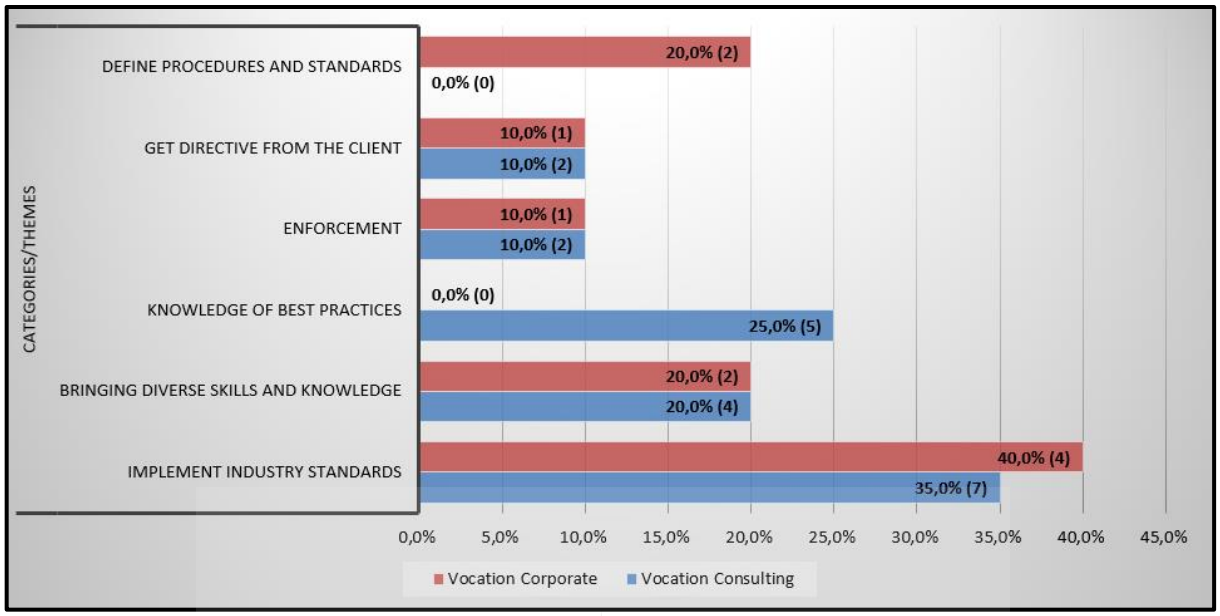

Figure 4.6: How consulting firm can assist clients when it comes to governing SSBI environments

Figure 4.6 shows the results from Table 4.9 by vocation. When looking at the results by category within the industry, the analysis shows that both Consultants and Corporate respondents were of the view that a consulting firm can assist clients in managing SSBI because they have knowledge of industry standards. This is the category with highest comments in the Corporate vocation, 40% of respondents. However, comments from corporate respondents only indicated that consulting firm can assist by defining procedures and standards but not one of them mentioned that consulting firm has knowledge of best practices. This could be an indication that clients want different things, and therefore, it is important for a consulting firm to first assist the client's environment before suggesting any governance procedures and standards.

Question 18 dealt with data governance initiatives, which should be implemented to ensure integrity of SSBI. It received 71.4% response rate, which means only 20 of 28 respondents gave their view to this question. Of these 20 respondents, 13 were Consultants and seven were Corporate. There were 64 comments derived from these responses: Consultants contributed 64.6 % of observations (42 comments), and Corporate 34.4% of observations (22 comments). Table 4.10 shows the results.

Table 4.10: Data governance initiatives

Category/Theme (N of comments)	CODE - Description	Number of comments Total=64	Quotes
Data management standards and procedures (26 comments)	SEC - Security	7	"Define and create Metadata to assist in the consumption of data." "Controlled access to source and bi systems"
	MET - Metadata	6	
	DIC - Data dictionary	4	
	DAO - Data ownership	3	
	BST - Business standards	2	
	DAL - Data lineage	2	
	GFC - Governance forums and communities	1	
	MDM - Master data management	1	
Adhere to data integrity (20 comments)	QUA - Quality	7	"data exposed through SSBI be trusted" Data Quality - to ensure accuracy of information"
	DAA - Data accuracy	5	
	ACC - Accessibility	2	
	CON - Consistency	2	
	INT - Data integrity	4	
Awareness (5 comments)	AWA - Awareness	5	"make sure all business users understand their roles in the processes" "should be defined clearly and communicated with all employees"
Business process management (4 comments)	BPM - Business process management	4	"Business Process Management - to ensure smooth approval processes." "Change Control - to ensure a stable environment."
Regulatory requirements (4 comments)	ILS - Independent legislative standards	4	"POPI, King 4, and Data DW best practices" "compliance with relevant legislature"
Dependent on type of data (3 comments)	DOI - Depends on the industry	2	"Depends on the data you are governing" "It depends on the industry in which the organisation operates and what standards they need to conform to"
	DOD - Dependent on data type	1	
Governance strategies (1 comment)	GOS - Governance strategies	1	"be conducted either along with the SSBI implementation, or as a separate initiative"
Use of technology (1 comment)	TEC - Technology	1	"the technology being used is vital"

Analyis in Table 4.10 shows the top three initiatives were firstly, *data management standards and procedures* by 41% (26 comments), secondly, *adhere to data integrity* by 31% (20 comments), and thirdly, *awareness* by 7.8% (5 comments). Respondents indicated these ways or initiatives which organisations must consider implementing to ensure that data/information in SSBI is relevant, of good quality and has context. Under *data management standards and procedures*, the code SEC (security) and MET (Metadata) rated higher as compared to other codes within the same category. This shows that security and having properly designed system metadata is very critical. When it comes to adhering to data integrity, QUA (Quality) came up number one, which shows that SSBI users need to have the data that they can rely on, and this can be achieved through quality information. Figure 4.7 illustrates these results per vocation.

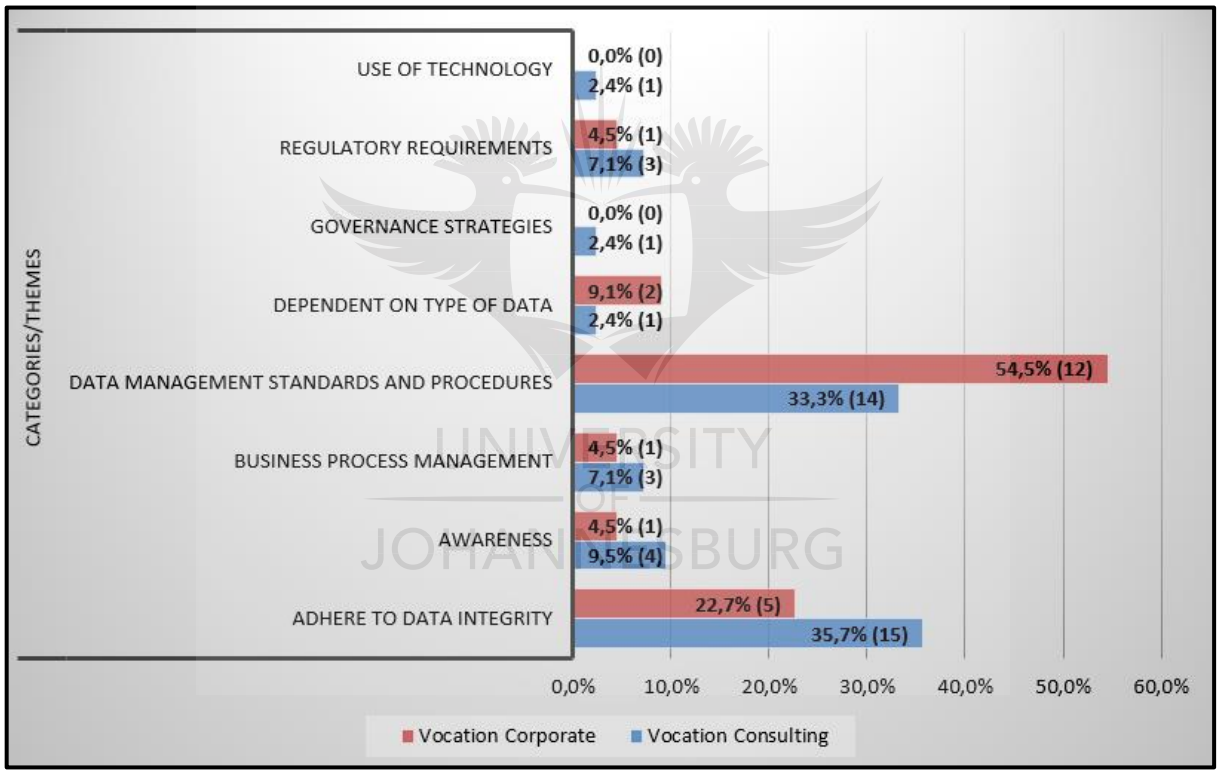

Figure 4.7: The data governance initiatives by vocation

Figure 4.7 shows the results of the above table by category within each vocation. Results indicate that even though in general, data management standards and procedures came at top of the list (*cf* Table 4.10), the Consultant vocation tends to regard adhering to data integrity as a top priority by 35.7%. For the Corporate vocation, the top priority was data management standards and procedures by 54.5%. Taking into consideration the results in Table 4.9, how a consulting firm assists in governance of SSBI, it appears that a consulting firm has an advantage of assisting its

clients to implement data management and standards procedures due to the fact that results showed that *implementing industry standards* was the greatest advantage of having consulting firm assisting governance of SSBI. This category rated high by both Corporate and Consulting vocations (*cf* Figure 4.6).

4.5.1.5 Supporting infrastructure

This section aimed at exploring the assumption made in Chapter 2, namely, SSBI supporting infrastructure is the backbone of SSBI solution [A4]. This section of the questionnaire received the response rate of between 64.3% and 67.9%. Missing values were not included in the analysis. As with previous sections, there were closed questions (quantitative) and open-ended questions (qualitative) questions.

The focus of quantitative questions was to explore the level of importance on the following:

- Collaboration with other stakeholders
- SSBI to business users and decision makers
- Search feature in SSBI tool
- Having a solid IT infrastructure to support SSBI

Qualitative questions on the other hand aimed at exploring the supporting infrastructure further by focusing on the following:

- Strategies which might be applied to ensure that IT and business work together
- Understanding how can business assist when it comes to managing the SSBI solution
- Understanding how can IT assist when it comes to managing the SSBI solution
- Exploring which tasks would business normally perform on SSBI environment

The results and the analysis of both closed and open-ended questions follow below. Table 4.11 shows the results of Question 19 to Question 21 (response rate 67.9%, 19 of 28 respondents), and of Question 26 (response rate 64.3%, 18 of 28 respondents) of Section C of the questionnaire (*cf* Appendix F).

Table 4.11: Supporting infrastructure's level of importance

Level of importance	Not at all N (%)	Low N (%)	Slightly N (%)	Neutral N (%)	Moderately important N (%)	Very important N (%)	Extremely important N (%)	Mean
Collaboration with stakeholders	0(0.0)	0(0.0)	1(5.3)	0(0.0)	1(5.3)	2(10.5)	15(78.9)	5.6
SSBI to business and decision makers	0(0.0)	0(0.0)	0(0.0)	1(5.3)	6(31.6)	5(26.3)	7(36.8)	4.9
Search functionality to business users	0(0.0)	0(0.0)	1(5.3)	3(15.8)	6(31.6)	5(26.3)	4(21.1)	4.4
IT Infrastructure in successful implementation of SSBI	0(0.0)	0(0.0)	0(0.0)	0(0.0)	2(11.1)	3(16.7)	13(82.1)	5.6

Results in Table 5.11 show that the majority, 78.9% of respondents, regarded collaboration as extremely important. With the mean/average of 5.6 just over scale of 5 (very important), this is a clear indication that building a SSBI is a team work. Different stakeholders can contribute positively to the entire project, and this approach will ensure that the needs of everyone are met, especially keeping in mind that the solution is important to decision makers.

In terms of the importance of SSBI, the majority, 31.6% of respondents, indicated that business and decision makers regard SSBI as moderately important. This confirms analysis of Question 19, which indicated that it is very important to involve other stakeholders because they play a vital role.

Even though SSBI is important to business users, it must also be noted that their level of technical skills differ, which means they might be looking for different features in SSBI solution. This means that users will use the solution according to their level of expertise. Which is why it was relevant to investigate whether SSBI's search feature will be useful to users. Results in Table 4.11 indicate that it is important; the mean of 4.4 shows that more respondents see this feature as useful. This will allow users to search the organisation data freely, also promote collaboration with other users.

In terms of the importance of IT infrastructure in support SSBI solution, results in Table 4.11 indicate that even though respondents defined SSBI as an approach where users develop their reports with minimal, or less IT involvement (*cf* Section 4.5.1.2), here in this section the results of

Question 26 show that IT infrastructure is critically important in SSBI solution. An IT department still needs to look after the SSBI infrastructure and they still need to enforce governance and management standards as the results in Table 4.11 indicate. Therefore it is important to develop strategies to ensure that IT and business work together.

Question 22 aimed at exploring different strategies which could be applied to ensure that IT and business work together. Only 15 out of 28 respondents (53.6% response rate) gave their opinion to this question. Nine of the respondents were Consultants (60%), and six were Corporate (40%). There were 30 comments derived from their responses, Consultants and Corporate contributed 63.3% and 36.7% respectively. Table 4.12 below shows the results of this question.

Table 4.12: Strategies to ensure that IT and business work together

Categories/ Themes (N of comments)	**CODE – Description**	**Number of comments Total=30**	**Quotes**
Business rules definition (9 comments)	SCO – Scope	4	"The business rules are defined" "identify the goal and what the desired expected outcome should be"
	BUR- Business rules	3	
	ANA - Data analysis	2	
Being transparent (6 comments)	COM – Communication	4	"monthly or bi-monthly review of the BI content" "Clearly define what is expected from every member of the team"
	TRA – Training	2	
Collaboration (6 comments)	ALI – Alignment	6	"Constitute business and IT collaboration forums to ensure alignment" "Frequent collaboration will also lead to TI showcasing own discoveries in data"
IT to provide governance (4 comments)	GOV - Governance	2	"IT should provide the governed data processes" "the most important would be security"
	SEC – Security	1	
	ANM - Auditing and Monitoring	1	
IT to be an enabler (2 comments)	ENA - Enabler	2	"simply be an enabler for business" "Provide a stable environment for business to enable SSBI"
Enterprise wide warehouse (1 comment)	DWH - Data warehouse	1	"The single most important strategy is to provide a single source of the truth to business"
Having consultants (1 comment)	OUT - Outsourcing	1	"consultants are very useful at this stage"
Use technology (1 comment)	TEC- Technological	1	"simply data structures by using business friendly terminology"

The results in Table 4.12, show that the top strategies to ensure that IT and business work together, were firstly, 30% of observations indicated business rules definition (9 comments); secondly, 20% of observations indicated being transparent and 20% of observations indicated collaboration (6 comments each); and thirdly, that IT provide governance, by 13.3% of the observations (4 comments). This indicates that for SSBI to be a success within the organisation, business rules and the scope of the solution need to be clearly defined, which requires IT and business to work together. Working together requires both parties to be transparent with each other. One of the suggestions given was to have monthly reviews of the BI contents. This would ensure that IT and the business always aligned. This is where collaboration category comes in. Through collaboration, either in person, or by means of technology, it will ensure that every stakeholder coordinated.

It is also important to note that the results in Table 4.12 indicate that collaboration and being transparent shares second position, which means they have equal rating. The majority of respondents in Section 4.5.1.5, Table 4.11 above, rated the level of importance of collaboration extremely important. Figure 5.8 further illustrates the mentioned strategies by vocation.

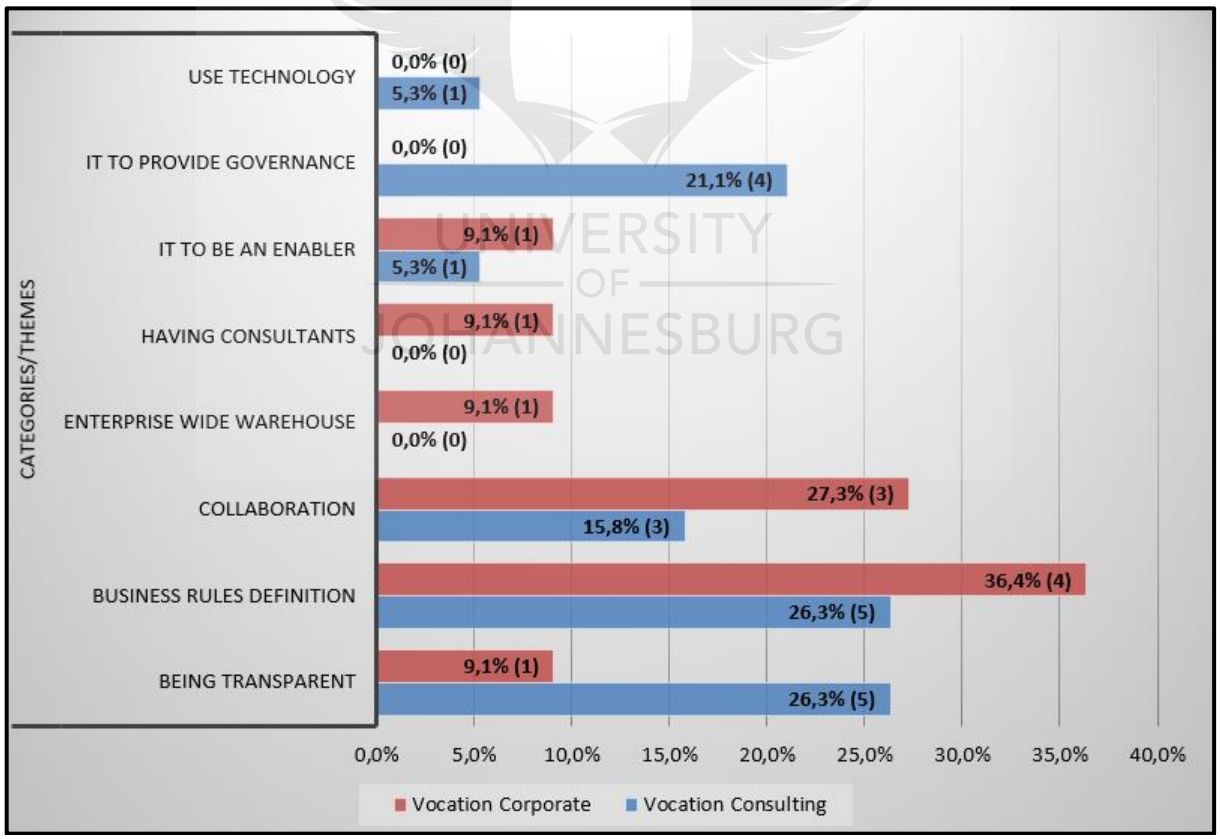

Figure 4.8: Strategies to ensure that IT and business work together by vocation

According to the results illustrated in Figure 4.8, 9.1% of respondents in the Corporate vocation indicated having consultants, also 9.1% of Corporate indicated having enterprise wide warehouse as strategies which could foster healthy relationship between IT and business. Also, 9.1% of Corporate indicated being transparent, and again, 9.1% of Corporate vocation indicated having IT as an enabler as a strategy, which gives an interesting perspective on what Corporate views as strategies to working together.

However, the majority, 36.4% of Corporate, said business rules definition is a strategy to ensure that IT and business work together. The majority, 26.3% of Consultants, support this view. It is interesting, interpreted in combination with results reported in Figure 4.5, that the Corporate vocation values documentation and business rule definition and its incorporation in to corporate data as a strategy to ensure collaboration.

The Consultant vocation indicated business rules definition and being transparent, by 26.3% of Consultants (each). Also, 21% of Consultants indicated IT to provide governance as a strategy, in comparison to 0% of Corporate, of this view. If there is one thing that a consulting firm can take from this analysis is that it is important to understand the scope as set by the organisation, and it must be transparent.

It was alluded to in Chapter 2 and here confirmed; a consulting firm is there to facilitate the implementation of the solution to ensure that clients experience return on their investment. It is important to understand how business can assist when it comes to managing the SSBI solution.

Question 23 aimed at identifying strategies which could be used to ensure that business users or SSBI users contribute positively to the management of SSBI. Only 14 out of 28 respondents (50% response rate) gave their opinion to this question. The respondents included nine Consultants (64.3%), and five Corporates (35.7%). There were 26 observations derived from these responses, Consultants and Corporate contributed 68% and 32% respectively. Table 4.13 shows the results.

Table 4.13: Business strategies on managing the SSBI solution

Category/Theme (N of comments)	CODE - Description	Number of comments Total=25	Quotes
Making recommendations (10 comments)	SUG – Suggestions	6	"make recommendations to IT on what changes they need" "constantly letting the management know of any issues"
	FED - having feedback mechanism	2	
	QUE - Asking questions	1	
	COM – Communication	1	
Clear Scope (7 comments)	SCO – Clear scope	7	"By providing clear business objectives" "clearly articulate their requirements, concerns and challenges"
Intensive use of the system (3 comments)	USA – System Usage	3	"through intensive use of SSBI" "By learning the toolset "
Strick to housekeeping rules (3 comments)	GOV - Governance	3	"Keeping the environment clean" "following the change control and governance processes."
Collaboration (2 comments)	COL - Collaboration	2	"Be part of the journey from the outset" "be 'productionised' and made available to a wide audience within the organisation"

Firstly, the results in Table 4.13 indicate that constant relationship building is very important. In accordance with above analysis (*cf* Figure 4.8), it can also be seen here that for business and IT to work effectively together, they have to be transparent with each other. In Table 4.13, the results show that *making recommendations* is the top category or strategy on how business can assist in managing SSBI solution.

Secondly, analysis indicates that besides making recommendations, it is important for business to ensure that they provide clear scope of what they need from SSBI. Also, they should be very involved in the implementation process from the beginning. This will ensure that the scope is clear from the onset.

Thirdly, intensive use of the system and sticking to housekeeping rules as strategies could also be implemented. This alludes to governance; business has to abide to governance as set out by the organisation. These findings are illustrated per vocation in Figure 4.9.

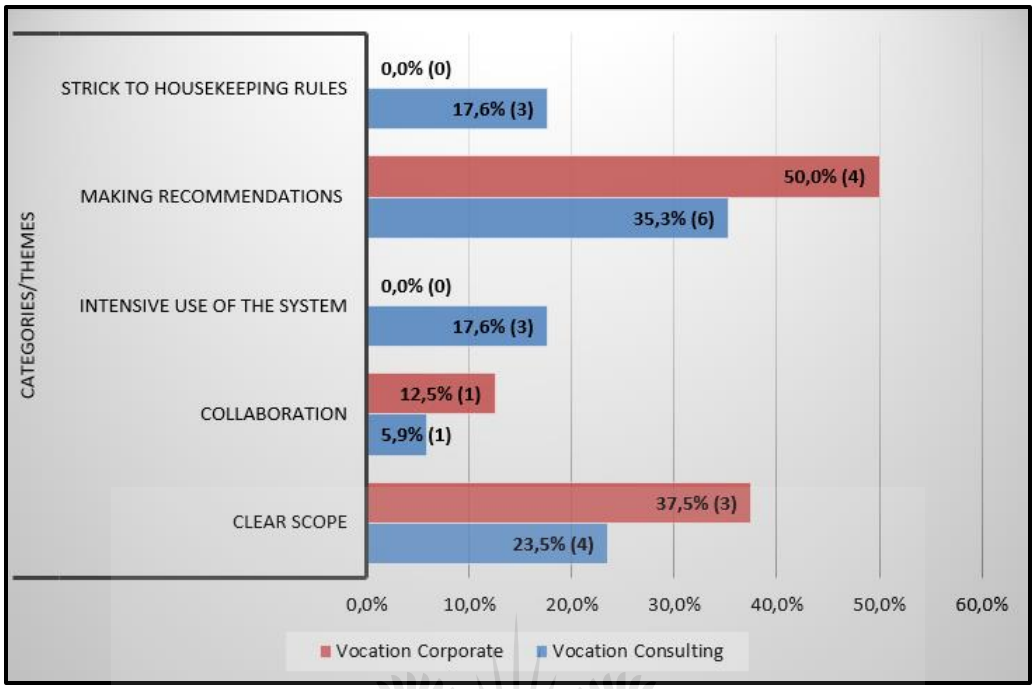

Figure 4.9: Business strategies on managing the SSBI solution

Figure 4.9 presents business strategies on managing the SSBI solution by vocation. It illustrates that the Corporate and Consultant vocations have the same priorities. They both placed making recommendations and clear scope as the two most important categories. This is a significant reflection of IT and business alignment.

Next, the focus is on understanding how IT can assist when it comes to managing SSBI solution, dealt with in Question 24. The aim of this question was to identify potential strategies to ensure that IT contributes positively to the management of SSBI. This question received 53.6% response rate, which means that only 15 out of 28 respondents answered the question. The respondents included per vocation, nine from Consultant (60%), and six from Corporate (40%).

There were 26 observations derived from their responses. Consultant vocation and Corporate vocation contributed 61.6% and 38.5% respectively. Table 4.14 shows the results.

Table 4.14: IT strategies on managing the SSBI solution by vocation

Categories/Themes (N of comments)	CODE - Description	Number of comments Total=26	Quotes
Empower business users (5 comments)	EMP - Empowerment	2	"foster a culture of not doing everything for business, rather teach them" "sharing as much information as possible"
	GUI - providing guidance	1	
	KSH - Knowledge sharing	1	
	TRA – Training	1	
Strick to housekeeping rules (5 comments)	GOV - Enforce governance	5	"keeping the environment clean" "By enforcing data security and governance"
Provide/Maintain the infrastructure (4 comments)	PMI – Provide and maintaining the infrastructure	4	"providing infrastructure" "Maintain software and hardware and keep it up to date"
Clear Scope (3 comments)	SCO – Clear scope	3	"Clear defined spec goals and deliverable management" "By following what business needs"
Making recommendations (3 comments)	COM - Communication	2	"Communication is the key same with SSBI users" "By suggesting appropriate reports"
	SUG - Providing suggestions	1	
Provide SSBI usage insights (3 comments)	INS - Insights	3	"extract useful insights to demonstrate capabilities to business" "identify frequently ran queries/analysis"
Collaboration (2 comments)	COL – Collaboration	2	"Be part of the journey from the outset" "involve business in every step of the process "
Keep it simple (1 comment)	KIS – Keep it simple	1	"By providing user friendly solutions"

Results in Table 4.14 indicate categories, which could serve as strategies that IT can use to ensure effective management of SSBI. These strategies could potentially be handed over to the consulting firm for implementation, while working together with the client.

The results indicate that the two most equally important strategies were *empowering business users* and *sticking to housekeeping rules or governance*, received 19.2% of observations (5 comments each). This shows that the role of IT in SSBI solution should be less development, but more empowering users to do reports and analysis themselves. IT department can instead ensure that environment is conducive enough for users use the solution. The results indicate in second

and third categories, to provide/maintain infrastructure, 15.4% of observations (4 comments), and providing SSBI usage insights by 11.5% of observations (3 comments).

If IT maintains the infrastructure and provides business with insight in terms of system usage, it will boost business trust and increase SSBI footprint within the organisation. It is also important to note that there were four strategies on how business can assist in management of SSBI that also exist as strategies for IT. This is an indication of need for alignment. This will make strategy alignment between these two parties easier. These results confirm the discussions in Section 2.6.1, Section 2.7.1.4, Section 2.7.3(c). This study finds it very important to have IT and business strategies aligned to ensure proper management of the SSBI solution.

Figure 4.10 illustrates the results of Question 24 by vocation.

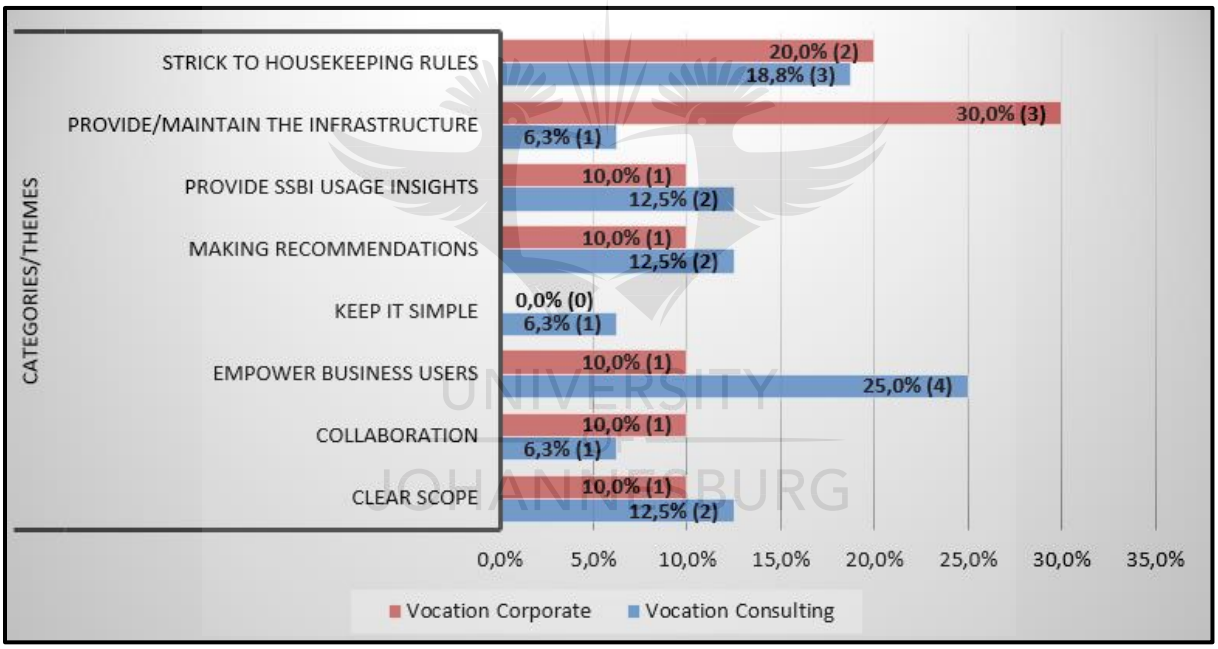

Figure 4.10: IT strategies on managing the SSBI solution by vocation

Figure 4.10 shows the majority, 30% of Corporate vocation, viewed providing or maintaining the infrastructure as more important. This makes sense because business users are not technical people, which means even though they will be exploring company data themselves, they will still depend on IT to provide stable environment. On the other hand, consultants viewed empowering users as more important, indicated by 25% of Consultant vocation.

Next, Question 25 aimed at understanding and exploring users' expectations of SSBI considering their technical level. Respondents were asked what tasks they think users would normally perform.

Out of 28 respondents, only 14 answered this question and that made response rate to be 50%. Responses were received from eight in the Consultant vocation (57.1%), and six in the Corporate vocation (42.9%). There were 28 observations/comments derived from the responses, of which, Consultants contributed 57% (16 comments) and Corporate 43% (12 comments) toward the total number of comments. Table 4.15 shows the results.

Table 4:15: SSBI users' tasks on SSBI environment

Categories/Themes (N of comments)	**CODES - Description**	**Number of comments Total=28**	**Quotes**
Create reports (10 Comments)	CRN – Create reports	7	"designing and deploying business reports" "be able to pull the reports themselves"
	ADH – Ad hoc Queries	2	
	REP – Execute reports	1	
Data analysis (9 comments)	ADD – Ad hoc queries	4	"pull the reports themselves based on what they want" "mostly analysis and running 'what-if' scenarios"
	MOD – Data modelling	4	
	ANA – Data analysis	1	
SSBI maintenance and updates (4 comments	MAU – Maintenance and updates	4	"Maintenance and updates based on additional/changing business requirements" "Implementing any changes needed"
Search (3 comments)	SEA – Searching	3	"searching for data" "Searching reports"
Execute prebuilt reports (1 comment)	PRE – Executing prebuilt reports	1	"run prebuilt dashboards and reports"
Automation (1 comment)	AUT – Automation	1	"users just want to consume reports via email"

The analysis of the results in Table 4.15 indicate that the top three categories or tasks which SSBI users are most likely to perform are to create reports (36%, 10 comments), data analysis (32%, 9 comments), and SSBI maintenance and updates (14%, 4 comments). It is interesting to see maintenance and updates as one of the categories because this shows the relationship with strategies indicated in Table 4.13 and Figure 4.9 above. According to the mentioned business users' strategies, business users must stick to housekeeping rules, and this includes following set governance procedures and standards.

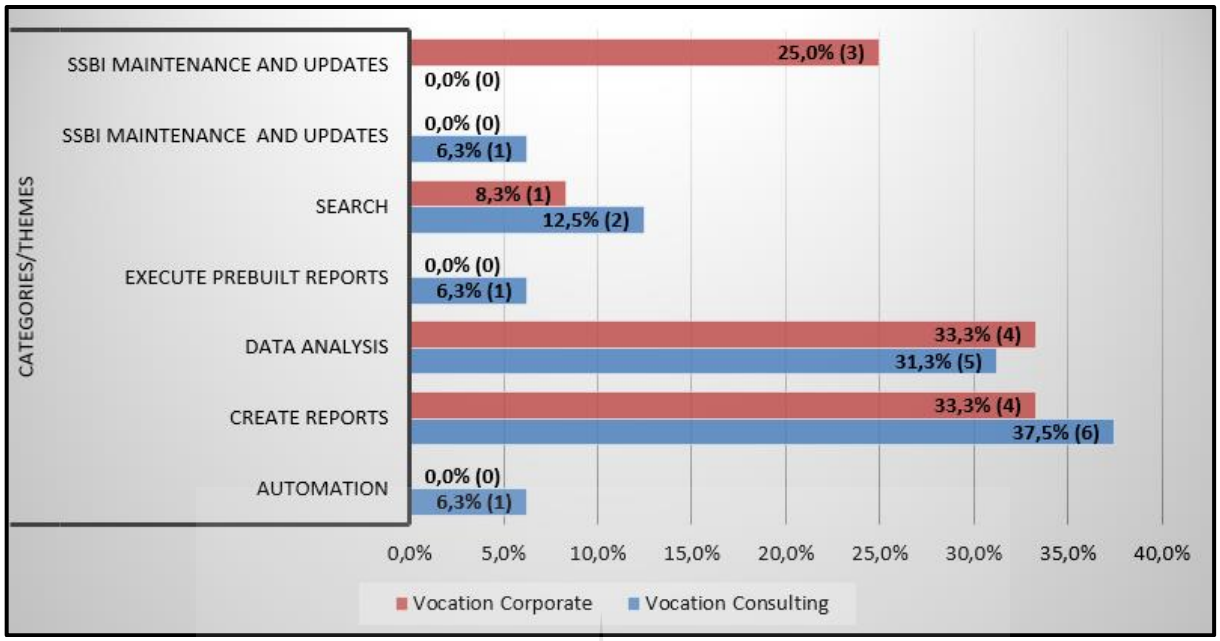

Figure 4.11: SSBI users' tasks on SSBI environment by vocation

Indication from the majority Consultants (37.5%), illustrated in Figure 4.11, show that users will be creating reports themselves on SSBI solution; whereas majority Corporate, put both data analysis (33.3%), and creation of reports (33.3%), the most important task categories. Even though both vocations indicated creation of reports as most important, this category will be influenced by level of technical skills of users, and on how strict the business and IT is in implementing strategies, as indicated above.

4.5.1.6 Context

In Section E of the questionnaire, the main objective was to understand the importance of attaining and delivering good quality information that has context or common understanding to the SSBI users as well as to explore strategies, which could ensure effective SSBI solution. This section explored the assumption that, for SSBI solution to be effective to business users, it must provide contextual information in addition to SSBI contents [A2].

This section was composed of both quantitative and qualitative questions. Closed-ended questions assessed the level of importance (quantitative), of the following:

- Quality and relevancy of SSBI solution information
- Understanding decision makers' (SSBI users) information requirements

Qualitative or open-ended questions focused more on developing strategies, which could assist in managing context as management constraint of SSBI. Therefore, the questions asked were aimed at identifying the following:

- Steps to be taken by an organisation to ensure SSBI information is understood by all
- Approaches which can be used to ensure that BI users get a common understanding of information provided by SSBI solution
- Approaches which can be used to ensure that SSBI information is useful and reliable to its users

This theme received between 64.3% and 67.9% response rate. Missing values were not used for the analysis. Question 27 received response rate of 64.3%, while question 28 received 67.9%. This means both questions received 18 and 19 of 28 responses respectively. Table 4.16 and Figure 4.12, following, show the results of both questions.

Table 4:16: Quality and relevancy of SSBI solution information and SSBI users' understanding of SSBI information requirements

Level of importance	Not at all N (%)	Low N (%)	Slightly N (%)	Neutral N (%)	Moderately important N (%)	Very important N (%)	Extremely important N (%)	Mean
Quality and relevancy of SSBI solution information	0(0.0)	0(0.0	0(0.0)	0(0.0)	1(5.6)	4(22.2)	13(72.2)	5.7
understanding SSBI users' Information requirements	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(5.3)	6(31.6)	12(62.2)	5.6

The results in Table 4.16 indicate that majority of respondents tend to believe that it is extremely important to have quality and relevant information in SSBI solution, as well as to understand users' information requirements. Both questions have an average of over 5.5. Not one respondent indicated neutral, slight, low importance or not at all important. This result confirms the outline in conceptual framework (cf Section 2.7.1.2), that SSBI context is significant in order to produce outcomes that are reliable and sustainable for decision makers. Specifically, chapter 2 discussed quality and relevancy of SSBI solution information; quality information can make or break the organisation. If decision makers base their decisions on incorrect information, it will have major impact on the organisation. The results of this study confirm the importance of quality information, indicated by 72.2% of respondents, as extremely important, while 22.2% of respondents said it is very important. Thus, quality and relevant information is non-negotiable.

Not only quality and relevancy of information is important, but the majority, 62.2% of respondents also indicated that it is extremely important to ensure that all in business understands this information, while 31% of respondents indicated that it is very important.

Next, Question 28 was aimed at identifying steps that could be taken by an organisation to ensure SSBI information is understood by all. Out of 28 respondents, only 15 answered this question, the response rate was 53.6%. Respondents were, nine Consultants (60%), and six Corporates (40%). There were 27 observations/comments derived from all responses. Consultants contributed 55.6% (15 comments) towards total comments, whereas Corporate contributed 44.4% (12 comments). Table 4.17 presents the results connected to possible contextualising strategies an organisation could consider to ensure users in the organisation understand SSBI information.

Table 4.17: Strategies to ensure SSBI information has context

Categories/Theme (N comments)	**CODE - Description**	**Number of comments Total=27**	**Quotes**
Knowledge Management initiatives (13 comments)	TRA-TECH – Technical training	4	"principles of using data for decisions" "Organisations should always provide documentation"
	TRA-BUS - Business data training	4	
	TRA-GEN – General training	2	
	KNS - Knowledge sharing	1	
	KNM – Knowledge management	1	
	KNC – Knowledge creation	1	
Involve all stakeholders (5 comments)	COL – Collaboration	5	"involve all stakeholders from start to finish" "Availability of all participants in the project and commitment to its success"
Show value (4 comments)	VAL – Value	4	"show the importance of SSBI and how it can make things easier" "what SSBI is and what they can leverage it for"
Build data dictionary (3 comments)	DIC – Business dictionary	3	"Create a data dictionary" "use common terminology/ business language" "Understanding business data"
Keeping it simple (1 comment)	KIS – Keep it simple	1	"Use business friendly field names"
Being consistent (1 comment)	CON – Consistency	1	"Step by step strategies that will be followed"

Analysis of results in Table 4.17 shows that the knowledge management initiative came up as the top strategy of how an organisation can ensure that business users understand SSBI information. This category received 48% (13 comments). Included in the knowledge management initiatives highlighted by respondents, were knowledge creation through documentation, knowledge sharing through information sessions, and training. Respondents also indicated clearly that training must not only be technical training, but also about business rules as well as data. The other categories that received high comments were to involve all stakeholders by 19% (5 comments), and show value by 15% (4 comments). It is important to note here that all comments involved stakeholder collaboration, which agrees with analysis of results in Section 4.5.1.5, Table 4.11, and Figure 4.8. Collaboration is a strategy to be used to ensure that both IT and business assist in management of SSBI. Figure 4.12 shows the results by vocation.

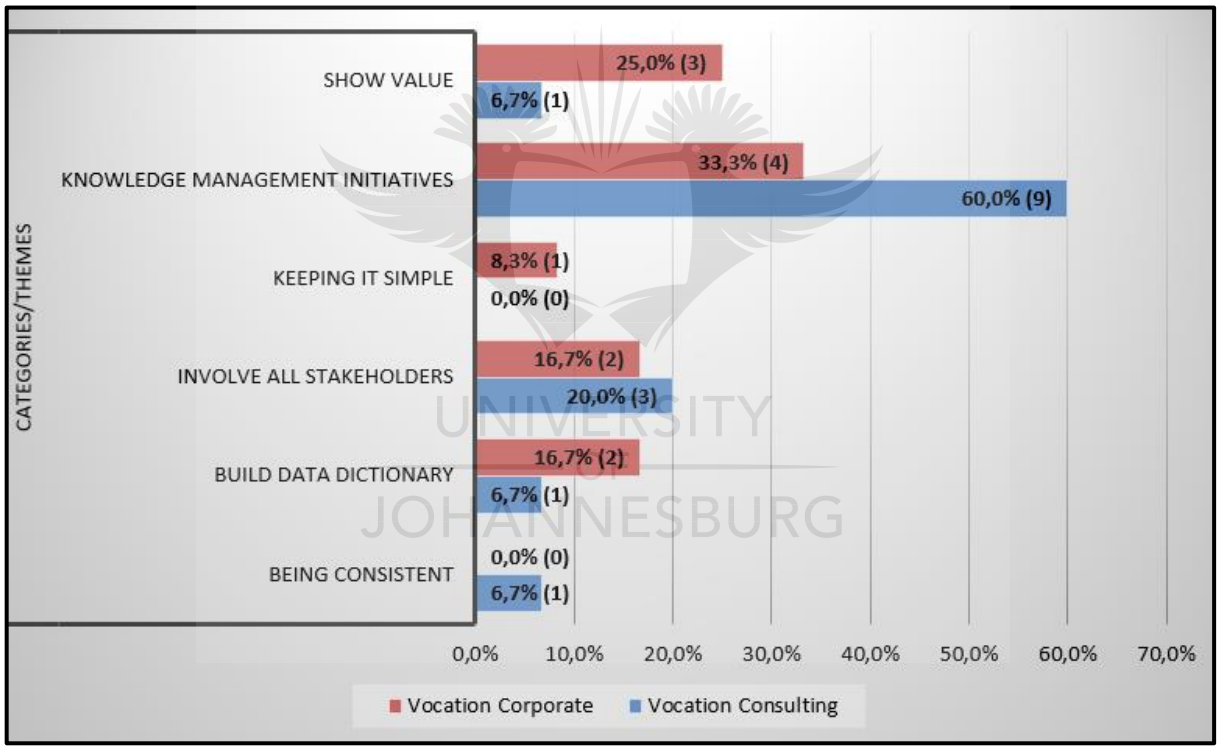

Figure 4.12: Strategies to ensure SSBI information is has context by vocation

The results in Figure 4.12 indicate that both Corporate and Consultant vocations (33.3% and 60% respectively), rated knowledge management initiatives very high, though compared to Corporate, the Consultant vocation regarded knowledge management initiative almost twice as important. This is important to note because in Table 14 and Figure 4.10, Corporate vocation indicated that one strategy of leveraging consulting firm's knowledge is though knowledge sharing. Now here the results show that a consulting firm that has capability to share and transfer knowledge to business

staff would be beneficial to both the consulting firm and organisation. This strategy of knowledge management combined with a BI consulting firm's inherent capability (technical) will most likely play an important role to ensure quality and relevancy of information. Corporate vocation, 25% of observations, placed *showing values* as the second strategy to ensure common understanding from SSBI. Thirdly, Corporate placed *involving all stakeholders* and *building of data dictionary* as their third strategy, each with 16.7% of observations. Consultation vocation, 20% of observations, emphasised *involving all stakeholders*, thus placing slightly more emphasis than did Corporate vocation.

In order to identify strategies to ensure that BI users get a common understanding of information provided by SSBI solution, the respondents had an option to give input. From 28 respondents, only 15 gave their view, and the response rate was 53.6%. There were 26 comments derived from these 15 responses, 18 comments from Consultant vocation, and from Corporate, 8 comments. Table 4.18 shows the categories/themes extracted from data.

Table 4.18: Approaches to ensure that BI users get a common understanding from SSBI solution

Categories/Theme	**CODES**	**Number of comments Total=26**	**Quotes**
Provide training and workshops (7 comments)	TRA – Training	6	"Through training and application" "it's easier when they ask questions"
	QNA – Questions and answers	1	
Transparent design process (5 comments)	DEP – Design process	5	"By explain the dataflow and where the information comes from" "consistency in naming processes, procedures, activities across the organisation"
Having semantic layer (5 comments)	SVT –Aim for single version of the truth	5	"providing a single version of the truth" "providing a conformed view of the underlying data"
Building data dictionary (4 comments)	DIC – Business data dictionary	3	"Ensure that there is a glossary for definitions of data"
	AWA - Awareness	1	"Business diagrams and hierarchies needs to be provided"
Through governance (3 comments)	GOV – Governance	3	"Data is accurate and governed" "data is of high quality."
Collaboration (2 comments)	COL – Collaboration	2	"encouraging collaboration and sharing in the BI environment" "knowledge of all areas to be integrated"

The categories or themes in Table 4.18 are very close to each other in terms of number of comments. *Providing training and workshops* category received the highest number, 27% of observations (7 comments). Since SSBI is a new concept, it makes sense to orientate people first and regularly, not only about the tool (*cf* Table 4.13), but also about the business, and use of its data. The second categories or approaches, both marked by 19% of observations (5 comments each), were *transparent design process* and *having semantic layer*. As results above have shown, it is crucial to have all stakeholders on board, therefore, the process of SSBI solution should be made transparent for everyone to contribute effectively. This will not only ensure that any issues are known beforehand, but most importantly, it will ensure that information provided by the system will have common understanding.

The issue of *semantic layer* is receiving lot of interest in the space of data and information management (Mel'čuk, 2012; Spivack, 2016). It is an approach of intelligent platform, which presents business or corporate data from a single interface to decision makers. Information from a semantic layer should be uniform across the organisation, as expressed by one respondents, it "provides a single version of the truth" across the business. The other categories that have been identified from the analyses are *building data dictionary* (4 comments), *governance* (3 comments), and *collaboration* (2 comments). From 26 comments received, 18 were from Consulting vocation, and eight from Corporate vocation. Figure 4.13 shows the categories by vocation.

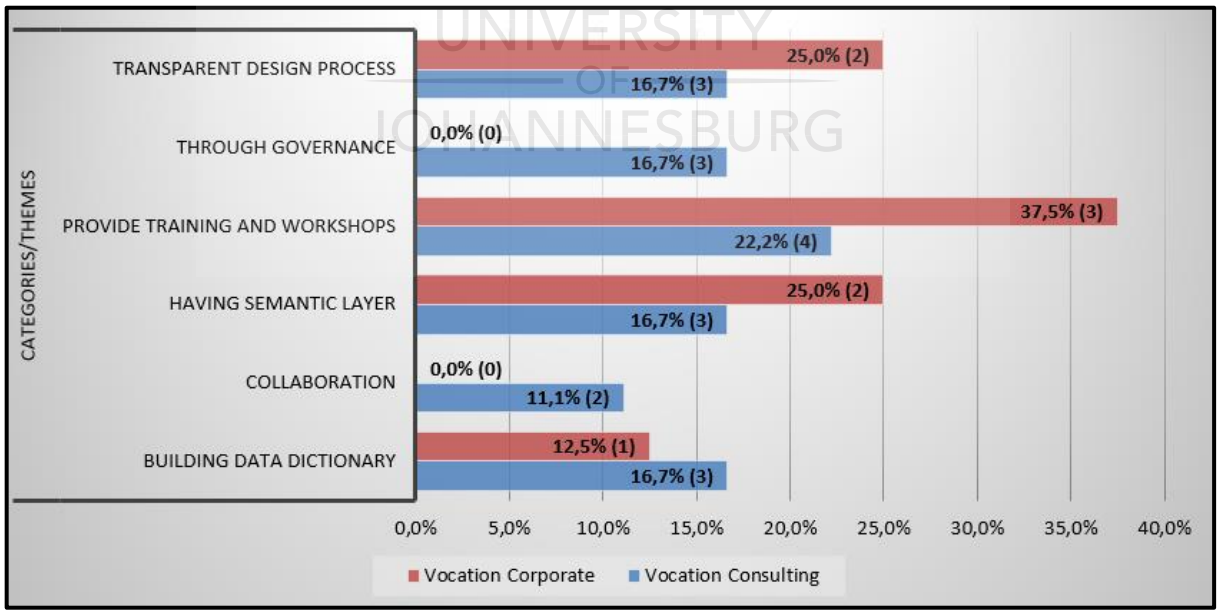

Figure 4.13: Ensuring that BI users get a common understanding from SSBI solution

Results in Figure 4.13 show that Corporate, 37.5% of observations, regard *training and workshops* as the most important category, followed by both *transparent design process* and *having semantic layer* (both 25%) as the second most important categories. This view is what similar to the observation made in the combined results above. Thus, consultants, as experts in this industry, will have to work hard to equip corporate employees with knowledge.

One of the approaches to having contextual information, or attaining common understanding in BI is by gaining users' trust. SSBI users will gain trust on the system when they regard its information useful and reliable. Therefore, respondents were asked in Question 30 to give their view on approaches that would ensure that information from SSBI solution is useful and reliable. From 28 respondents, 15 shared their views, nine Consultants and six Corporate, the response rate was 53.6%. Table 4.19 present categories or themes extracted from the comments.

The results in Table 4.19 indicate that the category, *adhere to data integrity*, received majority of comments from respondents, 38.5% (10 comments). Of most importance in this category, was *quality and accuracy (*QAA), which received most of the comments (6 out of 10). Respondents viewed quality as the building block of an information system. The results also show that there is a huge gap between highest category, and the second categories. The second categories were, *implementing checks and balances* and *monitoring system usage* (3 comments each). The categories mentioned above complement each other. Example, for system to adhere to data integrity, there must be checks and balances in place, and respondents clearly indicated that this should be done both on sources and target systems. With these in place, it is also important to monitor the usage of the system, giving a clear picture of the value of the SSBI solution (3 comments).

In general, the results in Table 4.19 show the importance of having reliable SSBI solution across the board. This alludes to the results reported in Section 4.5.1.6 above. The results there show that majority of respondents regarded quality and relevancy of information as extremely important (72.2%). The results emphasises the importance of contextual information, as explained by Imhoff and White (2011a) and Schmarzo (2016), especially in the context of big data.

Table 4.19: Approaches to ensure that SSBI information is useful and reliable to its users

Categories/Theme (N of comments)	CODES - Descriptions	Number of comments Total=26	Quotes
Adhere to data integrity (10 comments)	QAA – Quality and accuracy	6	"Checks and balances in place to ensure integrity and accuracy of the data" "It must be available on time and in the right format"
	TIM – Timely	2	
	SVT – Single version of the truth	1	
	INT – Integrity	1	
Implementing checks and balances (3 comments)	CAB – Checks and balances	3	"put checks and balances in place" "daily sanity checks can be developed based on the expected outcomes"
Monitoring system usage (3 comments)	MON – Monitoring	3	"Through monitoring use and outcome" "Tracking operational performance - volumes, availability, timeliness"
Testing (2 comments)	TES – Testing	2	"Through user testing of SSBI information" "testing done by different business users in different areas to get input"
Training (2 comments)	TRA – Training	2	"Training the BI Users on the system." "Training"
Context/Common understanding (1 comment)	CTX – Context	1	"By providing content that is relevant to the particular user"
Have reliable infrastructure (1 comment)	INF – Infrastructure	1	"have proper infrastructure in place including fast network"
Having clear objectives (1 comment)	COB – Clear objectives	1	"The outcomes need to be clearly defined from the start"
Involve users (1 comment)	COL – Collaboration	1	"By involving users in development from the start especially in initial design stages"
Refresh data regularly (1 comment)	RUP – Refresh data	1	"have regular updates to the data"
User feedback (1 comment)	UFE – User feedback	1	"If good decisions are made based on good data, the business performance will improve"

The results in Table 4.19 represent the perspectives of 26 respondents; there were 26 comments in total derived from 15 responses, 18 comments from Consultant vocation, and 8 comments from Corporate vocation. Figure 4.14 shows the results by respondents' vocation.

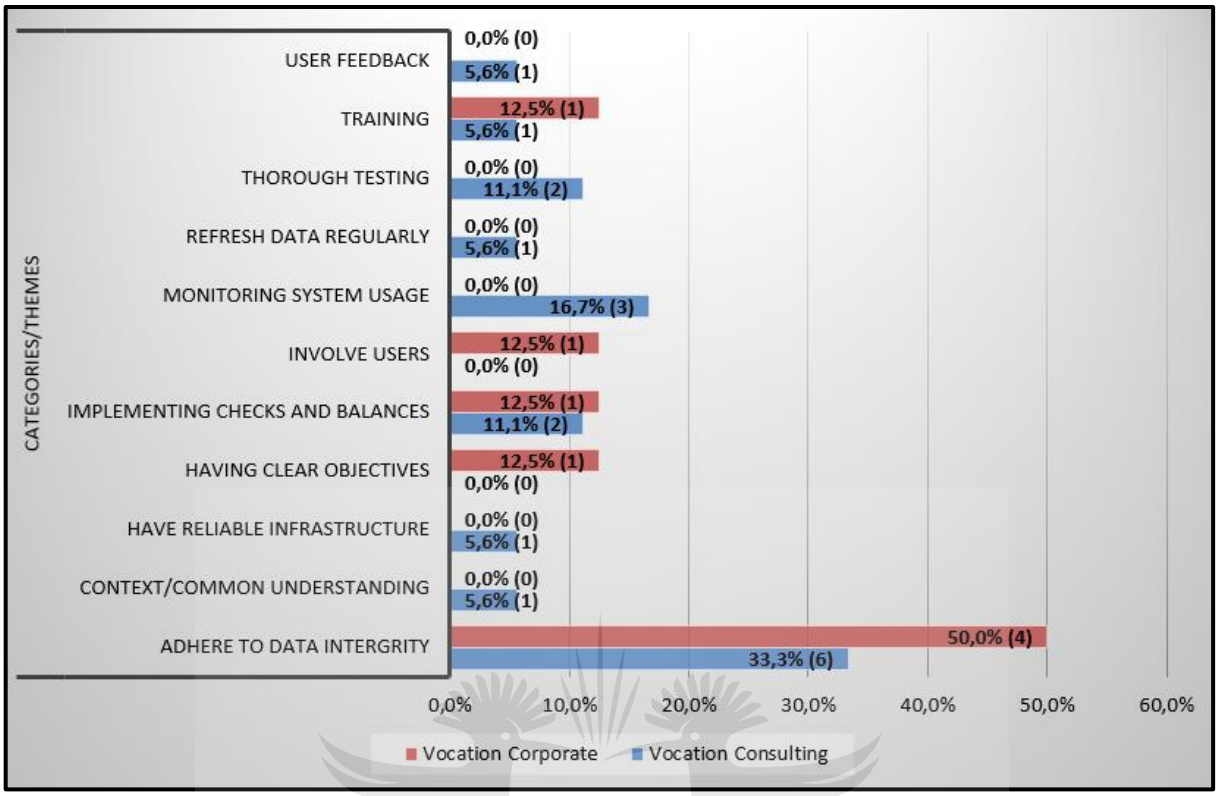

Figure 4.14: Ensuring that SSBI information is useful and reliable to its users by vocation

Figure 4.14 shows that the two vocations, Corporate and Consultant, have their own categories as to what they regard as important. Example, the two categories, *having clear objectives* and *involve users* were only mentioned by Corporate (12.5%, both categories), and not by a single Consultant; whereas the categories, *user feedback*, *thorough testing*, *refresh data regularly*, *monitoring system usage*, *have a reliable infrastructure*, and *context/common understanding*, were not mentioned by a single respondent in Corporate vocation. This shows different needs, and is clear indication to a consulting firm that when it implements and/or manages a client's SSBI solution, it needs to cater for that specific client's need.

However, results in Figure 4.14 show that the one instance where Corporate and Consultant vocations significantly shared same category, was *adhere to data integrity*, mentioned by 50% of Corporate vocation and 33.3% of Consultant vocation. Other shared categories were *implementing checks and balances*, as well as *training*. This indicates the three common approaches of ensuring SSBI information is useful and reliable to its users, were *adhere to data integrity*, *implementing checks and balances*, and *training*.

4.5.1.7 System integration

The questionnaire's last section, Section F, focused on understanding importance of integration of SSBI with other systems and the extent to which respondents agreed with assumptions made in the conceptual framework in Chapter 2. The aim was to identify systems to connect the SSBI system to as well as establishing strategies, which could ensure that IT and business align in order to improve management of SSBI. The response rate was between 53.6% and 67.9% (15 to 19 responses), and the missing values were not used for the analysis. The section comprised of closed-ended and open-ended questions.

Firstly, data collected in a quantitative approach:

- The importance of system integration or connectivity in the organisation
- Systems integration necessary to ensure SSBI efficiency and effectiveness
- Strategy of having a centralised SSBI system

Secondly, data collected in a qualitative approach:

- Systems to integrate with SSBI solution
- Approaches to ensure that IT and business strategies are aligned

The analyses of responses to both types of questions in this section will conclude the questionnaire method, and Section 4.5.2 will then analyse data obtained from the interview method. Question 32 dealt with the level of importance of system integration in the organisation while Question 33 and Question 34 assessed respondent's level of agreement. Table 4.20 and Table 4.21 show the results in terms of level of importance and level of agreement. These three questions received a 67.9% response rate, meaning 19 respondents gave their view.

Table 4.20: Level of importance of system integration in the organisation

Level of importance	Not at all N (%)	Low N (%)	Slightly N (%)	Neutral N (%)	Moderately important N (%)	Very important N (%)	Extremely important N (%)	Mean
System integration in the organisation	0(0.0%)	1(5.3%)	0(0.0%)	0(0.0%)	1(5.3%)	10(52.6%)	7(36.9%)	5.1

Table 4.21: Role of system integration

Level of importance	Strongly disagree N (%)	Disagree N (%)	Somewhat disagree N (%)	Neutral N (%)	Somewhat agree N (%)	Agree N (%)	Strongly agree N (%)	Mean
Systems integration is necessary to ensure SSBI efficiency and effectiveness	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(5.3%)	11(57.8%)	7(36.9%)	5.3
Having a centralised SSBI system is a GOOD strategy	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	2(10.5)	7(36.9%)	10(52.6%)	5.4

Results in Table 4.20 and Table 2.21 indicate the importance of system integration or connectivity within the organisation. Results show that the majority, 52.6% of respondents, indicated that system integration was very important in the organisation, while 36.9% of respondents, said that it was extremely important. In Chapter 2, Isik *et al* (2013), indicated that system integration can happen at data level, user level, business process level or application level; all components of SSBI, including external systems if possible, should integrate to bring quality and relevant information to business users. Specifically, Table 5.21 shows that 57.8% of respondents indicated that they agree, and 36.9% of respondents strongly agreed that integrated systems will result in efficient and effective SSBI. This is an indication that components of SSBI depend on each other. To provide reliable SSBI, there should be proper governance in place, data should be sources from reliable source systems and all these should be well managed to have a well trusted SSBI system.

One aspect, which came up often in the above analysis, was collaboration. Some literature links collaboration and centralisation. Centralised SSBI as a strategy could enhance collaboration; however, there are many approaches to the design of SSBI (Burke *et al*, 2015:37; Schmarzo, 2016:136). Some believe that having a centralised system is a good strategy, others not. Therefore, this study requested respondents' opinion regarding systems integration, whether a centralised approach was as a good strategy. Results in Table 4.21 indicate, 52.6% of respondents strongly agree that centralised SSBI is a good strategy, 36.9% of respondents agreed, and 10.5% of respondents somewhat agreed. Not one respondent chose to be neutral or disagreed with the notion that centralised SSBI was a good strategy.

Question 34 focused on identifying systems that should integrate with SSBI solution. Sixteen responses were received; and 23 comments derived from these 16 responses, which consisted of

16 comments from Consultant vocation, and 7 comments from Corporate vocation. Table 4.22 show the results of this question.

Table 4.22: Systems to connect with SSBI solution

Systems	Number of comments	Quotes
Source systems	5	"Source systems such as ERPs" "All systems - Financial, Customer, Product, Sales, etc"
Most relevant environments	5	"Whatever system the users are comfortable with" "Business requirements will determine what sources will be needed"
Data warehouse	4	"The Enterprise Data Warehouse" "Data warehouse"
Depend on scope of the project	3	"This would need to be determined by end users and IT working together" "In a broad sense, as many as possible"
Reporting tools	2	"For access - web front end" "Reporting tools"
Master data management	2	"Master Data systems" "Master data management"
Analytics tools	2	"Analytics tool"

Results in Table 4.22 show that SSBI should connect with traditional BI systems including different source systems (5 comments), and data warehouse (4 comments). References to source systems included systems where information will be extracted, for example, enterprise resources systems (ERP), customer relationship management (CRM), financials systems, product systems, sales, and other traditional information systems. Data warehouse on the other hand refer to central database where corporate data are stored. These systems will have data from different departments. Respondents in Table 4.21 indicated the importance of having centralised SSBI therefore, data warehouse should be the starting point of getting there. According to Burke *et al* (2015:37), information in SSBI solution must extract from different warehouses storing the organisation's information in order to have a desired context.

Also, results in Table 4.22 show that some respondents believed that SSBI should connect to every relevant system where possible, saying that it depends what business needs to achieve or needs to report on (5 comments). Respondents indicated that scope of project would determine which systems be integrated (3 comments), reporting tools (2 comments), and analytics tools (2 comments). Also master data management systems came up as a possible system to connect with (2 comments). This is a clear indication that each client has its own need and requirements.

In Chapter 2 the discussion was that SSBI should integrate with most available systems, and IT architecture should support free flow of information (*cf* Section 2.7.1.1). Chapter 4 now adds detail; for instance, Figure 4.15 shows the results of Table 4.22 by vocation, of systems to connect with SSBI solution.

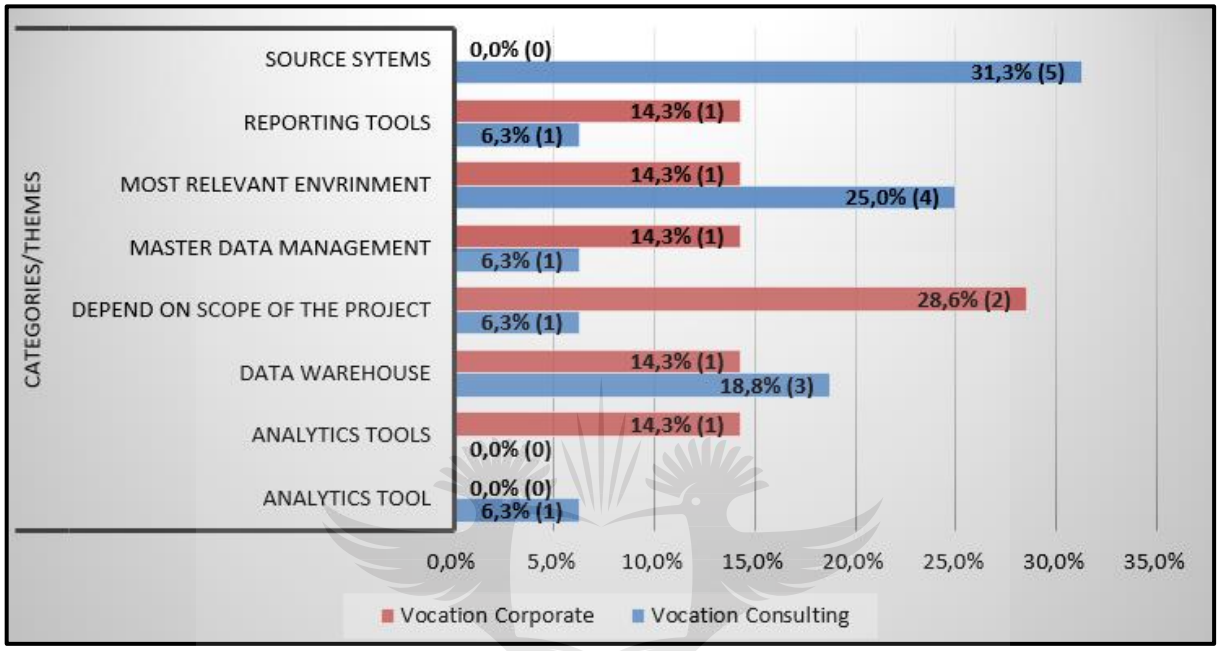

Figure 4.15: Systems to connect with SSBI solution

Figure 4.15 compares the responses by vocation of respondents; the majority, 28.6% of Corporate, said that the systems to connect with depend on scope of project in contrast to the minority, 6.3% of Consultants, indicating it. Results in Figure 4.15 show the importance of strategy alignment based on a shared understanding of what clients need.

Question 35 focused on exploring strategies to ensure that IT and business strategies are aligned. From 28 respondents, only 14 gave their view to this question (response rate, 50%). There were 17 comments derived from these 14 responses, of which 10 comments were from the Consultant vocation, and 7 comments from Corporate vocation. Table 4.23 shows the results from responses to Question 35.

Table 4.23: Strategies to align IT and business

Categories/Themes (N of comments)	CODE - Description	Number of comments Total = 7	Quotes
Sustained collaboration (7 comments)	COL – Collaboration	7	"Through consultative engagements between Business and IT" "By making sure that you sustain the collaboration between IT user and Business users"
Having clear requirements (5 comments)	CRE – Clear requirements	5	"Touch base on what information in the BI Reporting is useful to business" "Making sure all parties have a clear understanding of what is expected of them"
Business to guide IT (3 comments)	BGI – Business guide IT	3	"IT strategy should be informed by business strategy" "By aligning their policies and procedures"
Defining business rules (2 comments)	DBR – Define business rules	2	"By defining the business rules" "Create the appropriate Governance forums"

Results in Table 4.23 show that *sustained collaboration* as a strategy received most comments as compared to other strategies (7 comments). This indicates that majority of respondents in general, regard collaboration as the best strategy to ensure that business and IT aim towards achieving the same goal. SSBI should be a collaboration effort, which is why respondents indicated that involving all stakeholders from the beginning is critical.

The strategy of *having clear requirements* was the second-most cited strategy (5 comments). This is very important; business needs to ensure that IT understand their information requirements, and IT needs to make sure that business abide to the business rules. As the results show, business should guide IT (3 comments), and together, they must define the business rules (2 comments).

The results in Figure 5.17 present the abovementioned strategies to align IT and business strategy, by comparing the responses per vocation of the respondents. These strategies include:

- Sustained collaboration
- Having clear requirements
- Business to guide IT
- Defining business rules

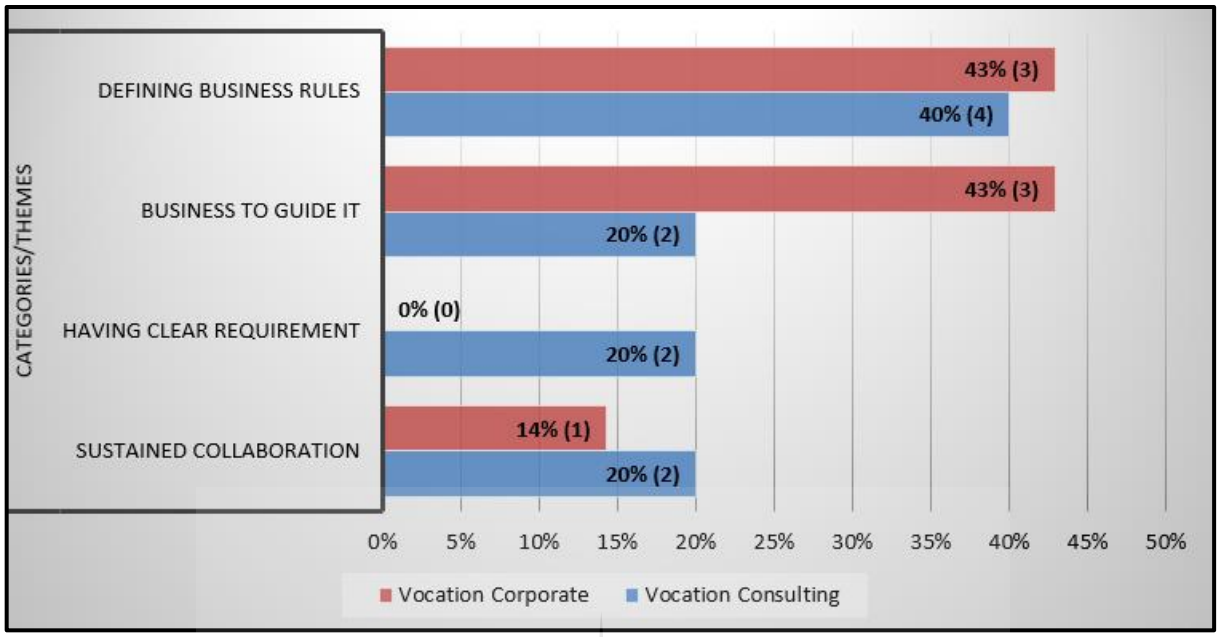

Figure 4.16: Strategies to align IT and business

Results in Figure 4.16 show that both these strategies, *defining business rules* and *business to guide IT strategies*, received most mention, 43% of observations, from Corporate vocation. Both these strategies are suggested as the best strategy for aligning the strategies of business and IT. Also, 40% of observations, indicate that Consultant vocation agrees with Corporate vocation that the strategy *defining business rules*, was the most important strategy. Thus, even though *sustained collaboration*, was mentioned most, the comparison of results per vocation indicates that *defining business rules* was considered as the most important strategy to align business and IT strategies. The other strategies mentioned by Consultant vocation, were *business to guide IT*, *having clear requirement*, and *sustained collaboration*. The strategy, *having clear requirements*, was not mentioned by the Corporate vocation.

This concludes the findings from data collected from the online questionnaire. The next section reports the interview results and analysis.

4.5.2 Interview results and analysis

The second data collection instrument used was semi-structured interview. Five BI managers, one from each of the clients of C-Firm, were chosen for interview. As indicated in Chapter 3, they were selected based on the assumption that they had more knowledge about BI and SSBI, and because in most cases, they were involved in deciding if BI services should be outsourced or not.

The interview schedule was structured to have the same categories/themes as the questionnaire (*cf* Appendix E), namely:

1. Demographics
2. Outsourcing
3. Data governance and management
4. Supporting infrastructure
5. Context
6. System integration

Each theme (numbers 2 to 6 above), had one central question, and a number of sub questions. However, only the central questions were mandatory, and sub or follow-up questions were asked depending on whether the answer given to the central question was rich (satisfactory), or not. Details about the sampling techniques used to select interviewees, the structure of interview questions, and notes on analysis and interpretation of qualitative in a quantitative manner, can be found in Chapter 3 and Section 4.4.1. Analysis begins with demographics.

4.5.2.1 Demographics

The response rate was 100%, but only 80% of cases responded to all themes but outsourcing. From all BI managers interviewed, one manager was outsourced from another consulting firm to be BI manager for the client; as for the others, their respective companies employed them as permanent BI managers. One manager indicated that their BI was fully outsourced, and the other three indicated that theirs was partly outsourced, and one indicated that BI was not outsourced. The three that indicated that their SSBI was partly outsourced, indicated that they had internal BI developers responsible for creating reports for users, though they also depended on outsourced firm for BI system maintenance and upgrades.

4.5.2.2 BI managers' understanding of SSBI

Out of four responses, 14 comments were derived, and four categories were formulated. These are the same categories identified during questionnaire data analysis. Table 4.24 shows categories or themes extracted from respondents' answers.

Table 5.24: BI managers' understanding of SSBI

Categories/Themes	Code – Description	Number of comments Total=14	Quote
SSBI Description (4 comments)	APR - Approach	3	"Is a tool" "Self-service BI is the ability"
	TOO - Tool	1	
Type of SSBI users (4 comments)	GEN - General users	3	"You don't need to know analytics." "That is where the user can help themselves"
	NTU - Non technical users	1	
User's action (5 comments)	ATD - Access to data	2	"let users loose on a data set" "you can do analytics and select your own datasets that you need"
	ATC - Ability to create reports	2	
	ASK - Ask question	1	
IT Involvement (1 comment)	ITI - IT independent	1	"without a huge reliance on IT"

Three of four managers described the SSBI as an approach where users were given access to dataset and create their own reports with less IT intervention. Only one manager described SSBI as a tool. One manager did not answer this question. This description is in line with how BI developers described SSBI in Section 4.1.2 above. The results also indicate that SSBI solution was for general users' application in business.

4.5.2.3 Outsourcing

Managers were asked why it was important for their organisations to outsource the implementation and management of SSBI to external companies. All five managers answered this question, and from five responses, 14 comments derived. The comments were grouped into different categories. Table 4.25 lists these categories/reasons as well as quotes from managers' responses.

The results in Table 4.25 indicate the two most important reasons why it was important for organisations to outsource their SSBI was that *consulting firm has the* expertise *and knowledge* and *to ensure continuity*. These two reason received 5 and 3 comments each out of 14 comments made by BI managers. One manager indicated that because "technology move very fast pace and people need to adapt and learn", it was difficult for organisation to adapt quicker, whereas a consulting firm was "exposed to broader set of issues, [thus] they are able to help clients adapt quicker".

Table 4.25: Reason why organisation outsource implementation and management of SSBI

Reasons why companies outsource SSBI	Number of comments	Quotes
Consulting firm has the expertise and knowledge	5	"strengths of using a consulting firm is that they are generally exposed to a broader set of problems and challenges" "Outsource service provider will have knowledge and skill"
To ensure continuity	3	"there must also be someone onsite once the system is live for ongoing maintenance" "consulting firms can generally react quicker when you need a specialised skill set"
To equip internal stuff	2	"Consulting firm must not work alone, they must involve internal stuff as well" "But the company needs to have clear objective of where it wants to go"
Need for quick implementation	2	"When you start a new system there will be lot of work to do" "they should be able to do quicker and much more effectively"
Cost	1	"it will also be cheaper"
Consultants gain knowledge faster	1	"gain faster and broader experience"

Results in Table 4.25 also indicate the importance to ensure continuity of services. In this age of business, companies cannot afford not to provide business users with data simply because someone in the company resigned. Seemingly, a consulting firm can afford to replace resources easier as compared to corporate. For this reason, organisations opt to outsource their BI services in order to ensure business continuity.

What is interesting to note is, in the analysis of data from the questionnaire, none of the respondents saw continuity as one of the reasons why organisations outsource. Instead, according to results in Section 4.5.1.3, the second reason why organisation outsourced was that it makes financial sense with 8 comments out of 49. This is in contrast to what managers indicated. According to results in Table 4.25, cost received only 1 comment of 14 comments by managers, indicating *ca* 50% difference in terms of understanding the cost dynamics of SSBI management and implementation.

Other reasons why it was important for organisations to outsource, as indicated by managers, were to equip internal staff (2 comments), and need for quick implementation (2 comments).

4.5.2.4 Data governance and management

Managers were asked to explain the importance of data governance and management procedure in SSBI. All four managers who responded to this question indicated that data governance is very important. Table 4:26 shows different reasons and quotes from responses.

Table 4.26: Importance of data governance and management procedures

Importance of data governance and management procedures	Number of comments	Quotes
Level of importance	4	"governance and security is vital" "DGM is key"
To maintain data integrity	2	"manipulated and corrupted without it being picked up quickly" "risk of people seeing two different figures, when they actually intend to pull one same figure"
Managed by internal staff	2	"Organisations need to take data governance and management of data very seriously"
Regulatory requirements	2	"Think of privacy law and leaks, governance and security is vital" "There will be chaos if there is not governance procedure"

Each response was analysed to check how manager regarded the importance of data governance and management. It was noted from the comments/responses that they all regard DGM as vital for effective function of SSBI, especially considering the regulatory requirements in South Africa.

Results indicate that each of the categories in Table 4.26, besides level of importance, received 2 comments. Managers indicated that data governance was important because it maintains data integrity, and internal staff must manage it. One manager mentioned that a consulting firm can assist by providing guidance, but said that internal staff should take accountability. Therefore, the results above corroborate the discussion in Chapter 2, for example, good governance is vital for the success of big data initiatives in any business (EY, 2015; Schmarzo, 2016).

Section 4.5.1.4 highlighted regulatory requirements and maintenance of data integrity as data governance initiatives, which should be applied to ensure integrity of SSBI information. In Section 4.5.1.4, data integrity received 27% of observations made by Corporate vocation, which placed it as the second initiative after data management standards and procedures.

4.5.2.5 Supporting infrastructure

Three managers were was asked follow-up questions to explain why was it important or not important to collaborate with all stakeholders during implementation and management of SSBI considering the fact that BI/SSBI solution is often a collection of various technologies, processes, and people from different departments (IT and Business), and sometimes a service provider. Table 4.27 shows the results of this question.

The other manager was asked more technical follow-up questions. Manager was asked which features of SSBI would be most useful to users, and this manager mentioned that pre-defined filters were important. These filters could assist users focus their analysis. This question of features of SSBI was asked to another one of the managers as a follow-up question, and this manager indicated it depended on technical level of the user. The example made was that company executives preferred to receive standard emails in their tablets every morning, and they would not want to go to the system and run reports themselves.

Table 4.27: BI managers' perspective on importance of collaboration

Importance of collaboration	Number of comments	Quotes
Level of importance	3	"It is extremely important to make sure that all these stakeholders are involved" "so it's vital for everybody work together"
To be aligned	2	"IT should be responsible for providing accurate data, while business need to guide IT in business rules"
IT to support business	2	"IT should be responsible for providing accurate data" "IT's responsibility is to develop more complex reports for users"
To have buy in	1	"There must be buy in from all parties"

Results in Table 4.27 show the importance of collaboration with other stakeholders to have strategies aligned (2 comments), and also to ensure that IT supports the business (2 comments). One respondent indicated that IT needs to get closer to the business, and business needs to be close to IT. Put differently, another manager said IT ensures that business gets accurate data, and business needs to guide IT in business rules. This indicates that there should be teamwork; no one party should try work on its own. The other reason for collaboration is to have buy-in from all parties. This is very critical because SSBI without support is likely to fail.

4.5.2.6 Context

Managers were asked to give their perspective on what steps should be taken to ensure SSBI information is relevant and has common understanding. Table 4:28 below shows those steps or strategies as identified by BI managers

Table 4.28: BI managers' strategies to ensure common understanding of SSBI information

Strategies to ensure common understanding	Number of comments	Quotes
Transparent and effective design process	3	"Development and structure must be very correct" "Even in SSBI, Data must still be sourced, modelled, prepared for consumption"
Strict data governance and management	3	"The whole data management should be very tight" "Your rules and procedures must be built from BI in such a way that users shouldn't be allowed to make mistakes"
Clear scope	2	"business is involved in providing the specifications for what data is made available" "They need to understand what core data that is required, what data you want to ask more question from"
Collaboration	2	"It is imperative that business is involved" " business glossary is maintained and used by all stakeholders"
Identify primary decision makers	1	"satisfy primary decision first and most, because those are the guys who are going to determine is system is success or not"
Building business dictionary	1	"very important that a complete and accurate business glossary"

Results in Table 4.28 show the strategies that received most comments were, transparent and effective design process as well as strict data governance and management (3 comments each). Data governance and management seemed to be central to the efficiency of SSBI solution. The results in Section 4.5.1.4 indicated that DGM is extremely important to ensure effective SSBI solution. Managers were also of the view that procedure and standards should be enforced, and it should not allow users to make mistakes of misinterpreting the data. This can be achieved through collaboration (2 comments), and by clearly defining the scope of SSBI (2 comments).

What is interesting to note from the results above is that these categories, identified by managers, coincide with categories identified by BI developers. They also regarded them as possible approaches to ensure common understanding, which verifies the findings above.

4.5.2.7 System integration

Only three of four managers answered the central question related to system integration. The fourth manager was asked technical follow-up questions instead. For example, BI manager was asked which systems should SSBI integrate with and the manager indicated that as much as it was important to connect to internal systems, it would also be useful to integrate with public databases like weather data and currency data as examples. It is interesting to note that none of the BI developers in Section 4.5.1.7 indicated something like this. Instead, BI developers indicated systems that are internal to the organisation only.

4.5.2.8 Scope of SSBI and practical working framework

The last section of interview schedule was designed to assess the scope of SSBI and practical working framework. In order to do so, the interview schedule conclusion followed a simple "do you agree", and giving the interviewee opportunity to elaborate on the following:

- Management of SSBI is influenced by the level of sophistication of SSBI tools and its capabilities [A5]
- Decisions to outsource SSBI implementation and management are directly related to organisation's perception of SSBI's level of sophistication and its capabilities [A6]
- The cost of SSBI is depended on adopted SSBI tools as well as the decisions to outsource (or not) SSBI implementation and management functions [A7]
- Outsourced service providers act as bridge between business and IT drivers while ensuring effective implementation and management of SSBI solution [A8]
- Effective management of SSBI is dependent of alignment of business drivers and IT drivers [A9]

Table 4.29 shows the results from interviewees' responses to the last question set of the interview.

Table 4.29: Scope of SSBI and practical working framework

Assumption	BI Manager 1	BI Manager 2	BI Manager 3	BI Manager 4	BI Manager 5
A5	No Answer	Agree	Agree	Agree	Agree
A6	No Answer	Disagree	Agree	**Depends**	Agree
A7	No Answer	Agree	Agree	Agree	Agree
A8	No Answer	Agree	**Depends**	Disagree	**Depends**
A9	No Answer	Agree	Agree	Agree	Disagree

Results in Table 4.29 show that managers agreed with Assumption 5 and Assumption 7, whereas Assumptions 6, 8 and 9 received mixed reaction. These assumptions need to be explored further. The focus of this study was only on Phase 1, i.e. Assumption 1 to Assumption 4, which suited the scope of a minor dissertation.

4.6 Summary

This chapter presented the research findings. The mixed method, mixed-model approach permitted the research to benefit from quantitative and qualitative data analyses. Results show that SSBI as a whole should be designed to satisfy business users' information for decision-making needs. Decision makers require relevant information, based on quality data, to make good decisions. In order to serve business decision-making in the most efficient manner, consulting firms have to understand the management constraints of SSBI. It is important to ensure that users trust the system in order to use the information produced by it. The next chapter synthesises the research findings in order to develop a practical working framework for C-Firm. In addition, it proposes some areas for further research.

Chapter 5
Conclusion and recommendation

5.1 Introduction

Transitioning from traditional business intelligence (BI) to modern BI presents organisations with many different challenges. Modern BI introduces the era of self-service business intelligence (SSBI). SSBI should be a joint effort between business and IT departments, which is why Imhoff and White (2011a) assert that these two parties should aim to reach common ground. In order to overcome the challenges presented by SSBI, the strategy of business and IT must align.

Therefore, the aim of this study was to explore how a BI consulting firm, named C-Firm, should deal effectively with the management constraints of SSBI. Chapter 3 explained the research methodology of how this study went about investigating BI governance, system integration, context, and supporting infrastructure factors. Chapter 4 reported on the research findings. Subsequently, in this chapter, the interpretation of findings are synthesised and used to develop a strategy for C-Firm, which could assist them with effective implementation and management of their clients' SSBI solution.

The chapter begins with a review of the study, followed by conclusions based on the key findings in terms of data governance and management, supporting infrastructure, context, and systems integration. Conclusion and recommendation follow on findings, which culminates in a proposed practical working framework. A consulting strategy, developing from this study, concludes the study and makes recommendations for further study.

5.2 Study review

The stages of the interactive approach model gave structure to this study, consisting of conceptual framework development (Chapter 2), research methodology of case study (Chapter 3), data analysis and interpretation of findings (Chapter 4), and lastly, the conclusion of study.

5.2.1 Conceptual framework development

Variance and process theories influenced the conceptual framework of management constraints of SSBI. The conceptual framework helped the researcher to focus on those factors that could assist in gaining understanding of the management issues associated with SSBI and how a BI

consulting firm can assist its clients in dealing with those issues. Developing the conceptual framework was a four-step process:

- **Step 1 –** Choose a topic and state the research problem
- **Step 2 –** Find sources of information and factors which could assist in understanding the research problem
- **Step 3 –** Identify relationships between factors and variables from Step 2
- **Step 4 –** Construct a conceptual framework

These four steps are typical of a study that applied Maxwell's (2012) interactive approach model to give structure to its research process (*cf* Figure 1.1).

5.2.2 Case study

A single case was studied, namely, a BI consulting firm, which was referred to in this study as C-Firm. Data were collected from C-Firm's employees and clients. Chapter 3 explained the interactive research model adopted for this study. The research participants were nineteen (19) BI developers from C-Firm, and from C-Firm's clients' nine (9) BI developers and five (5) BI managers. The research choice for this study was mixed method, mixed-model research, which means quantitative data and qualitative data were collected, using two data collection instruments, and then giving preference to either quantitative or qualitative reporting. Data collection instruments consisted of an online questionnaire with open-ended and close-ended questions, and semi-structured interview (*cf* Appendix E and Appendix F). Data were collected from BI developers by questionnaire, and semi-structured interview was used to collect data from BI managers. Both instruments consisted of same questions, though a different process was followed; this was done in order to ascertain validity by testing findings by comparing BI developers' and BI managers' responses. The interview technique of using central questions and follow-up questions, helped with ensuring the reliability of findings.

5.2.3 Analysis of the data

Chapter 4 dealt with data analysis and presentation of results. All data collected were analysed using Statistical Package for the Social Sciences version 24 and Microsoft excel. Qualitative data were first categorised into different themes before being analysed by using the mentioned software.

5.2.4 Conclusion of the study

The study concludes by submitting answers to the one main question and one sub question of this study:

- **One main question:** How does a BI consulting firm support its clients to implement and manage their self-service business intelligence solution and how important is SSBI, and to what extent do SSBI governance, system integration, context, and supporting infrastructure factors affect management of the SSBI solution?
- **One sub question**: In relation to self-service business intelligence, what are the governance, system integration, context, and supporting infrastructure management constraints experienced by clients and how can a consulting firm assist in dealing with those constraints?

These questions scaffolded into a research question and four sub questions (*cf* Section 1.4 and Section 3.6.3), which made it possible for the researcher to delineate three sets of goals, namely, a personal goal, practical goals, and intellectual goals (*cf* Section 3.6.1). Now, the study conclusion revisits the one main question and one sub question and answers these by taking into account the insights drawn from the analysis done in Chapter 4. This is done in the next section, which aims to address the three goal categories set out in the interactive approach model (*cf* Figure 1.1 and Section 3.6.1).

5.3 Management constraints of self-service business intelligence

This section presents conclusions based on the key findings in terms of data governance and management, supporting infrastructure, context, and systems integration.

5.3.1 Data governance and management

The research explored the assumption: *Effective SSBI governance and management improve efficiency of self-service business intelligence solution* [A3].

Information has become a critical asset to every organisation, therefore, strategic management and utilisation of information should be at the forefront of any strategy in the organisation. This is the reason why data governance and management procedures and standards are particularly important in SSBI.

Chapter 2 established from literature that when SSBI is governed, decision makers consume the information at ease knowing that the information they consume is governed. Which explains why

the analysis in Chapter 4 indicated that it is extremely important to include business in formulating governance and management procedures and standard for SSBI. This will ensure that users are using SSBI information accordingly.

IT and business should work together in this regard. Business should guide IT on what data need to be exposed and to which business users. Therefore, data management initiatives like security, data stewardship, metadata management and other measures have to be implemented in order to ensure data integrity. Organisations should increase SSBI governance awareness across all departments as an initiative to ensure effectiveness of SSBI. Organisations have the responsibility to make sure the organisation adheres to all defined governance and management procedures and standard. This includes adhering to regulatory requirements like the Protection of Personal Information (POPI) act. Therefore, IT departments should enforce strict governance procedures and standard according to the business needs (*cf* Section 4.5.1.5, Section 4.5.2.6 and Section 5.3.1).

- **Conclusion** is to formulate data governance and management procedures and standard in order to minimise the risk of feeding poor quality information to business users. Standard must be enforced throughout different stages of the information value chain, not only in terms of SSBI. If governance is implemented in this way, then the assumption stated above will be true.
- **Recommendation** is that both C-Firm and its clients must set their aim on avoiding any loopholes in the system that could compromise the integrity of SSBI information. In order to do this, C-Firm and its clients must abide by their SSBI governance principles.

5.3.2 Supporting infrastructure

The research explored the assumption: *SSBI supporting infrastructure is the backbone of SSBI solution* [A4].

SSBI solution is as good as the infrastructure that it builds on. There are different components and systems that support SSBI solution. In this study, supporting infrastructure referred to technical skills required, business processes, IT infrastructure (hardware and software), and all parties involved in supporting the objective of SSBI.

The results indicated that by involving relevant stakeholders from the start of the implementation of SSBI is extremely important to improve the implementation of SSBI solution. In order to involve

relevant stakeholders, one of the first things is to identify the different parties who might benefit from the solution. It is critical to ensure that all these parties collaborate and their strategies align towards achieving the same goal. Collaboration is one of the possible approaches to ensure strategy alignment between IT and the business.

The second thing after collaboration and getting stakeholders on board is to define requirements. In this regard, collaboration initiatives and business rules need to be clearly defined. SSBI is extremely important to business users and decision makers and therefore it is critical in these collaboration initiatives to ensure that all parties are transparent about every process.

The analysis showed that business users of SSBI are most likely going to create their own reports in SSBI, which is after all the objective of self-service. This includes doing ad hoc queries and complex analytic and modelling. They will need to maintain and update their created reports based on new requirements. Therefore, the SSBI infrastructure must allow them the flexibility to do all these activities.

For IT department to provide sustainable infrastructure to host/service the SSBI solution, it will depend on the requirements they receive from business users and other parties. IT infrastructure is extremely important in SSBI, but it can only be that strong if it improves effectiveness and efficiency of the SSBI solution (*cf* Section 4.5.1.5 and Section 5.4.2.5). IT should enforce strict governance procedures and standard according to the business needs (*cf* Section 4.5.1.5, Section 4.5.2.6 and Section 5.3.1). While IT *is* the enabler, business and SSBI information consumers on the other hand, can improve the implementation and management of the SSBI if they provide feedback and make suggestions to the relevant parties. They need to make their requirements clear and ensure that their plans are in alignment with all stakeholders.

- **Conclusion** is that SSBI's success depends on its supporting infrastructure, supported by the findings in Section 4.5.1.5 and Section 4.5.2.5.
- **Recommendation** is that business must guide the IT in order to ensure that it needs are catered for. Implementation of the SSBI solution should not only be driven by IT, but it should be influenced by business needs.

5.3.3 Context

The research explored the assumption: *For SSBI solution to be effective to business users it has to provide contextual information in addition to SSBI contents* [A2].

Effective SSBI solution should be able to provide common understanding to its users. According to Burke *et al* (2015:35), information that has context and common understanding is able to produce outcomes that are reliable and sustainable for decision-making. The findings in Chapter 4 indicate that quality and relevancy of information is extremely important to business users and decision makers. They, the research participants, perceived SSBI as an approach that allows users with different technical skills to access corporate data and do analysis on it with less IT intervention (*cf* Section 4.5.1.2 and Section 4.5.2.2). In order to provide quality and relevant information, the results indicated that it is extremely important to understand SSBI users' information requirements.

Research findings suggest some approaches to providing quality and relevant information. Knowledge management strategy could be used to ensure that SSBI information has context and is understood by all. KM initiatives include sharing information and knowledge through training. Business users should receive training not only on technology, but also on the use of company data to make effective decisions. The other strategy is collaboration. As indicted under supporting infrastructure (*cf* Section 5.3.2), involving all relevant stakeholders will ensure that everyone has common understanding of what the objective of SSBI is and how can it be used to increase the company's competitiveness.

Beside collaboration and KM initiatives, organisations could aim to have a semantic layer to provide a single version of truth. Development of semantic layer will require different stakeholders to take part. This will ensure that SSBI provides useful and reliable information to its users.

In addition to the three main strategies, *viz* KM, collaboration, and semantic layer, research findings suggest these strategies or approaches:

- Adhering to data integrity
- Implementing checks and balances
- Monitoring system usage
- Testing
- Training
- Having reliable infrastructure

Approaches will differ from customer to customer, and they are all equally important.

- **Conclusion** is that the most important thing is to ensure that business users and decision makers do not have reason to lose trust in SSBI solution. Without trust, the whole solution

will be useless. Which is why it is important to aim for high quality information as well as providing contextual information through SSBI.

- **Recommendation** for organisations is to implement different approaches rather than only focusing on one. Mixing approaches will ensure that all areas are covered.

5.3.4 System integration

The research explored the assumption: *Effective management of SSBI is dependent on SSBI's capability to integrate with other systems* [A1].

SSBI solution is a collection of different systems; therefore, system integration is at the heart of the whole solution. Data in SSBI need to be sourced from systems that are within as well as external to the organisation. This is to ensure that SSBI information has context, and to give users a broader view of data. The above assumption can only be true if the emphasis is firstly on the proper regulation and governance of systems. However, analysis in Chapter 4 indicated that the majority of BI developers firstly regard system integration in the organisation as very important. This is probably because of the respondents' assumption that the organisation will have standardised governance procedure across the entire systems. The issue of governance predetermines SSBI's capability to integrate with other systems.

Respondents identified systems that SSBI system should definitely integrate with, *viz* source systems and enterprise data warehouses, such as, enterprise resource planning (ERP), customer relationship management (CRM,) and master data management (MDM).

- **Conclusion** is that governance predetermines SSBI's capability to integrate with other systems through, and through sustained collaboration between all stakeholders, system integration in SSBI can lead to improved management of the entire solution.
- **Recommendation** is that IT and business, including other relevant stakeholders, aim at improving their collaboration effort, and have clear requirements stating which systems need to be connected to SSBI solution.

Based on the above it is now possible to develop a consulting strategy.

5.4 Development of consulting strategy

Organisations choose different approaches when implementing new systems, some prefer to implement it themselves, some use external companies to assist with the implementation. In this era of big data and the fourth industrial revolution, technology is moving at a very fast pace and it

becomes difficult for companies to catch up (Schmarzo, 2016). For this reason, some companies decide to outsource; because a consulting firm can act as strategic partner in implementation and management of SSBI.

There are different advantages that organisations can benefit from by using a consulting firm as a strategic partner. Firstly, in this case study, results indicated that participants did not regard having the outsourced firm taking care of implementation and management of SSBI as that important. However, over 60% of respondents indicated that they agreed with the assumption that the outsourced service providers play a vital role in implementing effective and efficient SSBI solution for their clients.

Therefore, taking into account the management constraints of SSBI outlined in Section 5.3 above, a consulting firm can assist its clients to effectively implement and manage the solution. There are different reasons why organisations outsource, and some of those reasons are:

- Lack of resources
- To ensure continuity
- Financial sense
- Need for dedicated resources
- Leverage consulting firm' experience and knowledge

It is important to acknowledge that organisations' need for outsourcing the implementation and management of SSBI differ; thus, C-Firm should approach the opportunity to assist its clients in a tailored manner. For example, besides organisations' lacking the required resources to implement SSBI solution, some clients may prefer to use the outsource firm because they want their internal staff to focus on critical day-to-day business issues. Which is why C-Firm needs to make sure it understands its place or role.

There are different roles that C-Firm can play during implementation of the SSBI, including being the advisors. As an advisor, C-Firm can draw from different expertise it has in-house to best assist the client to reap desired value from SSBI solution. Therefore, for C-Firm to be effective in addressing management constraints of SSBI outlined in Section 5.3 above, it needs to have a practical working framework to successfully deploy and manage SSBI for their clients.

This leads to the last phase of the interactive approach model; the ideal outcome of the study is, subsequent to investigation of management constraints of SSBI, to develop a practical working framework that will inform C-Firm's strategy for dealing effectively with the implementation and

management of SSBI. Figure 5.1 illustrates the practical working framework for dealing with implementation and management of SSBI.

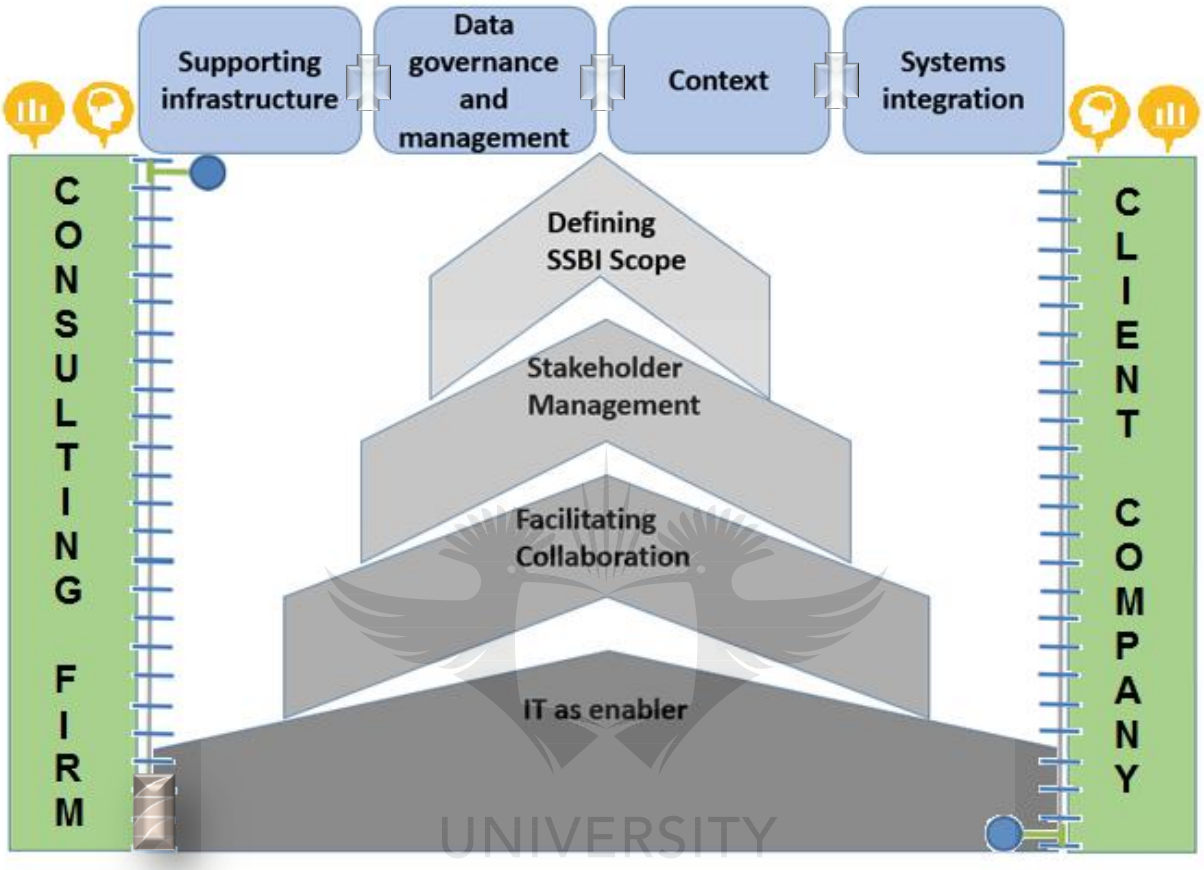

Figure 5.1: SSBI implementation and management framework (own source)

Though the framework in Figure 5.1 applies to C-Firm, it has potential value to inform any consulting firm's SSBI strategy because it builds on the analogy of a fabric fastener (zipper). C-Firm and its client are separate pieces of fabric and SSBI governance is the zipper. To achieve successful implementation and management of SSBI, C-Firm and client's strategy must align. Strategy alignment rests on parties' common understanding of IT as enabler in the framework that integrates people, process, and technology, facilitating collaboration as a strategy, stakeholder management, and the scope of SSBI. A neatly fastened fabric has a zipper that goes up and down effortlessly, which means:

- **Defining SSBI scope:** Before a consulting firm starts with any implementation of the solution, it needs to ensure that scope of the solution is clearly defined. A consulting firm needs to understand its role in the project. That is, is it there to facilitate the implementation

process and equip the client to manage the solution itself after the implementation, or not. All this information must be clearly outlined at this level.

- **Stakeholder management:** All relevant stakeholders need to be identified. A consulting firm can guide the client on the process, but the client needs to take ownership of stakeholder management. This is important to ensure that solution caters for the entire organisation.
- **Collaboration facilitation**: The strategy of collaboration involves setting up different forums, which will assist in disseminating information to relevant people. This can be done through using technology, or daily, weekly catch up meetings. A consulting firm oversees this initiative and manages knowledge generated here.
- **IT as the enabler:** IT department needs to provide sustainable infrastructure. Business requirement needs to be clearly defined for IT to provide the infrastructure. Generally, fabric fastens from bottom to top; IT in this strategy is the foundation of SSBI solution, the reason being that all components of the strategy can be facilitated by the use of technology, namely:
  - → Supporting infrastructure
  - → Data governance and management
  - → Context
  - → Systems integration

  IT is responsible for leading the formulation and enforcement of data governance and management standard and procedures. Data integrity initiative will be enforced by IT and business will be the guide.

In Figure 5.1, the consulting firm is the facilitator – it has the one side of the fabric fastener that has a holder at the bottom. In order to be the holder, C-Firm has to ensure that it has all the required skills to facilitate strategy alignment, which will lead to the execution of SSBI implementation and management strategy. C-Firm does not only need technical skills, it needs analysts, strategists, project managers, and other relevant resources required for the execution of the strategy.

5.5 Limitations of the study

Research relied on a single case conducted within one consulting firm and five of its clients. Due to limited number of BI and SSBI resources, only few BI developers from client's side participated in this research. The conclusion and recommendation made in this chapter are only relevant for this case and it may not be generalised. The research findings influenced the development of the

SSBI implementation and management framework above, but the framework has not been tested for its effectiveness, therefore, it can only be used as a conceptual framework.

5.6 Value of the study

The BI managers and BI developers of the organisations participating in this research could use the research findings as a guide. It would significantly help them with assessing the value of SSBI in their respective organisations. At the time of the study, similar studies aimed at developing a consulting strategy that deals with management constraints of SSBI were not in existence. Therefore, this study will add value to the body of knowledge in this field, and could possibly serve as a starting point for future researchers studying SSBI.

The study adds a practical working framework that deals with SSBI management. The framework builds on an empirical understanding of the management constraints of SSBI. Even though the study cannot be generalised as indicated above, its findings has value as a reference point for other consulting firms or clients functioning in a similar environment.

5.7 Further research areas

Firstly, management constraints studied in this research need to be explored further using more than one case organisation. The framework illustrated in Figure 5.1 will also need to be tested for its effectiveness. Secondly, the study does not address all issues associated with management of SSBI. As indicated in Chapter 2, Phase 1 of the conceptual framework provided sufficient scope suitable for a minor dissertation. Therefore, even though the interview briefly touched on the assumptions of Phase 2 and Phase 3, further research has to address all phases of the conceptual framework. Assumptions for future study could derive from this study's conceptual framework, Phase 2 and Phase 3:

- Management of SSBI is influenced by the level of sophistication of SSBI tools and its capabilities
- Decisions to outsource SSBI implementation and management are directly related to an organisation's perception of SSBI's level of sophistication and its capabilities
- The cost of SSBI is depended on adopted SSBI tools as well as the decisions to outsource (or not) SSBI implementation and management functions
- Outsourced service providers act as bridge between business and IT drivers while ensuring effective implementation and management of SSBI solution
- Effective management of SSBI is dependent of alignment of business drivers and IT drivers

Finally, as with any other information management system, SSBI must be effectively managed in order for the organisation to benefit from technology. The SSBI implementation and management framework developed by this study is generic and has potential value to inform any consulting firm's SSBI strategy. This study combined inductive and deductive approaches by firstly developing a conceptual framework and secondly developing a practical working framework based on SSBI governance theory developed for the study.

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Appendix A: Access and ethical clearance obtained

FACULTY OF MANAGEMENT

FACULTY ETHICS COMMITTEE (FEC)
RESEARCH ETHICS CLEARANCE FORM

PF* CHAIR NAME: Prof M Mearns (MCom RM Lecturer) **PF DATE:** 28 October 2016
*Proposal Forum

RESEARCH COMPLIES WITH:	COMPLIANCE	NON-COMPLIANCE (flagged issues that need closer scrutiny)
Participants' right to privacy, confidentiality and anonymity	Yes 01	
Participants' right to equality, justice, human dignity/life and protection against harm	Yes 01	
Participants' right to freedom of choice, expression and access to information	Yes 01	
Participants' right to be informed, consent/letters of request	Yes 01	
Rights of the community and the scientific community	Yes 01	
The responsibility of presenting data that is accurate, truthful and not falsified	Yes 01	
The responsibility of acknowledging ownership of ideas, theories, contributions or concepts	Yes 01	

OVERALL RATING	(01)	02	03	04

CODE 01 - Approved
CODE 02 - Approved with suggestions without re-submission
CODE 03 - Suggestions with re-submission
CODE 04 - Not approved, re-application required

FACULTY ETHICS CODE: FOM2016-IKM02

STUDENT NAME: Vincent Gaorekwe **SIGNATURE:** *
SUPERVISOR NAME: Prof T du Plessis **SIGNATURE:** *
PF CHAIR SIGNATURE: * **DATE:** 28 October 2016
HOD SIGNATURE: * **DATE:** 28 October 2016
FHDC CHAIR: * **DATE:** 7 November 2016

*Original SIGNED form on file with supervisor

Appendix B: Email to BI developers

From: vincentg@***.co.za
Sent: Monday, 26 June, 2017 17:50
To: <Respondent's email address>
Subject: I need your opinion: Management of SSBI

Greetings <Respondent's name>,

I am emailing you to ask if you would like to take few minutes to complete a survey for a study that I am conducting for my MCom (Business Management).

The topic of my dissertation is: **A strategy for dealing with management constraints of self-service business intelligence**.

Participation is completely voluntary and your answers will be anonymous. Please click on the link below to start the survey.

Link: https://www.surveymonkey.com/r/vincentg

If you have any questions, please do not hesitate to contact me on vincentg@***.co.za or 078 *** 18**.

Thank you for your participation!

Regards
Vincent

**Amended according to UJ Research Ethics Policy*

Appendix C: Email to BI managers

From: vincentg@***.co.za [mailto:vincentg@***.co.za]
Sent: 26 July 2017 9:13 AM
To: <respondent's email>
Subject: I need your views on management of SSBI

Good Day <Respondent's name>

I hope all is good.

As per our discussion, I would like to invite you to participate in a semi-structured interview for the study I am conducting for my Masters at University of Johannesburg.

Can you please respond with your convenient date and time for this? Anytime between tomorrow (27 July and 04 Aug 2017).

With the interview, I aim to gain your views on various aspects of management of self-service business intelligence (SSBI), including the follow:

- Your view of self-service business intelligence
- Your view on factors hindering or promoting success of SSBI
- Your view on having a consulting firm/service providing implementing and managing your self-service BI

The purpose of my study is to explore how BI governance, system integration, context, and supporting infrastructure factors contribute to effective management of SSBI, and to develop a strategy to be used by a consulting firm in ensuring effective implementation and management of its clients' SSBI solution.

Following themes will be discussed during the interview:

- Governance - How data/BI governance is affecting effective management of SSBI
- Context - What actions one needs to take to ensure that SSBI solution is providing quality information, and within context
- System integration - How is or should SSBI solution integrate with other systems within the organisation
- Supporting infrastructure - How widely is SSBI supporting, and what should be done for it to be recognised.

I have attached letter of informed consent for your information.

Regards
Vincent

**Amended according to UJ Research Ethics Policy*

Appendix D: Letter of informed consent

CONSENT FORM

Study	A consulting strategy dealing with management constraints of self-service business intelligence
Degree	MCom (Business Management)
Faculty	Faculty of Management
Objective	Obtain consent from research participants in writing and set out the conditions of participation

I, the undersigned, _____ hereby indicate that I have read and understand the conditions set out below for participation in this study. I hereby give permission to SV Gaorekwe (200941379), that he may conduct interviews for data collection, given the following conditions of participation:

- Participants will at all times be fully informed about the research purpose and process; interview questions will be provided to participants in advance.
- Interviewees have the option to either participate by providing answers to questions in MS Word format, emailing their response to the researcher; or, by appointment, participate in a **30 minutes** face-to-face interview.
- Face-to-face interviews will be recorded on an audio recording device and the researcher undertakes to store the data (recordings and emailed responses) in a secured environment.
- Participation is voluntary and opportunity to comment on the findings from the interview will be afforded to participants as well as the right to withdraw from the study at any time, without any pressure to provide reasons.
- All possible means will be undertaken to ensure that participants are not caused any harm by partaking in this study; a pseudonym will be allocated to participants to protect identities and to guarantee that any information revealed, either personal or professional, will be regarded as confidential.
- Participants will not be exposed to any acts of deception or betrayal in the research process or its published outcomes; faithfulness, keeping of agreements and loyalty in interpersonal relationships are central to the reputation of the researcher, the research supervisor, and individual participants.

_____ _____

Signature: Interviewee **Date**

_____ _____

Signature: Researcher **Date**

Appendix E: Interview schedule

Introduction

a) What is your Role/Position/Industry? (Financial institution, Health, IT, Consulting, other (specify))

b) Do you work for corporate or a consulting firm? Corporate, consulting form, other (specify)

c) If working for corporate, do you or did you use an outsourced firm to implement and manage your BI?

General

What do you understand by self-service BI?

Outsourcing

Central question:

1. Why is it important/or not important to you and/or your organisation to have outsourced company/consulting firm taking care of you implementation and day-to-day management of you self-service BI environment?

Sub or follow up questions:

1.1. What are the reasons why organisations outsource their BI/SSBI implementation and management to external parties?

1.2. What is the role of a service provider during implementation of self-service BI?

1.3. What should be day-to-day activities of a service provider in a BI environment?

1.4. How do you leverage a consulting firm's experience and knowledge to ensure that you get good value, value to your users and to your BI team?

1.5. To what extent do you agree with this statement: Outsourced service providers play a vital role in implementing effective SSBI solution for their clients?

Data governance and management

Central question:

2. Please explain the importance of having data governance and management procedures and standards in self-service BI environments?

Sub or follow up questions:

2.1. What BI governance standards, policies and procedures would you enforce to ensure successful self-service BI implementation and management?

2.2. How important it is to include business, not only IT, in formulating these governance standards?

2.3. How does a consulting firm help when it comes to governing SSBI environment?

2.4. What capabilities do you want to instill in your BI users?

2.5. BI is made up of many systems, and it includes raw data residing in source systems (data stage), and also informational data residing in data warehouses, BI systems (information stage), how important is governance in all these systems to SSBI?

2.6. What data governance initiatives one needs to consider (Both for source systems and DW/BI systems) to ensure that data/information in SSBI is relevant, of good quality and has context?

2.7. How can IT policies assist in effective management of SSBI?

Supporting infrastructure

Central question:

3. BI/SSBI Solution is a collection different technologies and processes, and it involves people from different departments (IT and Business), sometimes a service provider (consulting firm); in your opinion, Why is it important/necessary or not important/necessary to collaboration with all these stakeholders during implementation and management of SSBI?

Sub or follow up questions:

3.1. What are business needs or expectations from SSBI solution?

3.2. How important is SSBI to Business and decision makers?

3.3. What features or capabilities of SSBI are important to BI users?

3.4. How important is "search" functionalities to business users?

3.5. Which tasks will BI users perform mostly on SSBI considering their differing technical level?

3.6. What impact will sophistication of SSBI tool have on implementation, management and usage of SSBI tool?

3.7. What does business expect from IT in SSBI environment?

3.8. What does IT expect from business in SSBI environment?

3.9. SSBI has to do with business users developing their own reports or interacting with corporate data without or with less IT involvement, what strategies would you implement to ensure IT and Business work together in order to provide good SSBI value to business users?

3.10. How important is IT infrastructure in having successful implementation of SSBI?

3.11. How does a consulting firm help when it comes to governing SSBI supporting infrastructure?

3.12. What is your biggest management information challenge?

Context (common understanding)

Central question:

4. What steps should be taken to ensure SSBI information is relevant and has common understanding?

Sub or follow up questions:

4.1. What is SSBI context according to you?

4.2. How would you deal with or govern how BI users use external data, which data not provided via SSBI? (example - Do you write that data back to be used by other users or its only available to that specific user)

4.3. How important is contextual information to decision makers?

4.4. How do you ensure that SSBI have a common understanding of information you provide? (having data dictionaries, workshops on new data sources and how frequently do you update them)

4.5. How can a consulting firm be used to ensure data has appropriate context?

4.6. How important us understanding decision makers' information requires to you organisation?

Systems integration

Central question:

5. SSBI involves different system and it connects many sources of information. What needs to be done to ensure SSBI integrates with required systems to ensure quality information is delivered thereby ensuring SSBI efficiency and effectiveness?

Sub or follow up questions:

5.1. What systems should SSBI definitely integrates with?

5.2. How important is system integration (connectivity) to your organisation?

5.3. Is having a centralised SSBI system a good/bad strategy according to you?

5.4. How would you ensure there is a system and strategy alignment between IT and business?

Concluding the interview

Central question:

6. Do you agree or disagree with these statements? You are welcome to motivate your opinion.

Sub or follow up questions:

6.1. Management of SSBI is influenced by the level of sophistication of SSBI tools and its capabilities.

6.2. Decisions to outsource SSBI implementation and management are directly related to organisation's perception of SSBI's level of sophistication and its capabilities?

6.3. The cost of SSBI is depended on adopted SSBI tools as well as the decisions to outsource (or not) SSBI implementation and management functions.

6.4. Outsourced service providers act as bridge between business and IT drivers while ensuring effective implementation and management of SSBI solution.

6.5. Effective management of SSBI is dependent of alignment of business drivers and IT drivers.

–End of interview schedule–

Appendix F: Questionnaire

Welcome to My Survey

Letter of informed consent

Dear Research Participant,

The topic for this study is: Strategy for dealing with management constraints of self-service business intelligence.

The premise is: In order for a BI consulting firm to be effective in assisting clients to realise long term value and achieving return on their BI investment, it needs to have a strategy to deal with governance and management constraints of self-service BI (SSBI).

SSBI is described as: A new approach to BI which enables and gives business decision makers the ability to access and interact with corporate data and to ask business questions quickly without technical help from or less dependent on IT department.

Your participation on this study is ANONYMOUS.
By clicking on NEXT button below you give permission to the researcher to use the data you provided to inform the topic of the study.

NB. This survey consists of 7 pages(36 questions). Please answer all questions as honestly as possible.

Section A: BIOGRAPHICAL INFORMATION (please tick relevant column for all sub-questions)

1. Gender

Male Female Prefer not to say

2. Age Group

20 Years or younger

21-30 Years

31-40 Years

41 Years and above

3. Highest Qualification

Matric/High School leaving qualification

Diploma

Bachelor's degree

Post graduate qualification

Certificate

4. Job Title (please specify)

5. Industry (please tick the relevant option below)

Financial Institution | Health | Information Technology | Consulting | Insurance

Other (please specify)

6. Do you work for corporate or consulting firm? (please tick the relevant option below)

Corporate | Consulting

Other (please specify)

7. If working for a corporate, is the implementation and management of BI solution outsourced to external party?

Yes | No | Not sure

Other (please specify)

8. What is your definition of self-service business intelligence (SSBI)?

Section B: OUTSOURCING

* 9. How important is it to YOU to have outsourced company/consulting firm taking care of implementation and day to day management of the self-service BI solution?

(0 rating indicates not at all important, 10 indicates critically important)

0 10

* 10. How important is it to YOUR ORGANISATION to have outsourced company/consulting firm taking care of implementation and day to day management of the self-service BI solution?

(0 rating indicates not at all important, 10 indicates critically important)

0 10

Please indicate your views on the following: (open questions)

* 11. Why do organisations outsource their BI/SSBI implementation and/or management to external parties?

* 12. What is the role of a service provider during implementation of SSBI?

* 13. How do you leverage a consulting firm's experience and knowledge to ensure that you get good value to your your BI team?

* 14. To what extent do you agree with this statement: Outsourced service providers play a vital role in implementing effective and efficient SSBI solution for its clients?

0 (0 indicates fully disagree, 10 indicates fully agree) 10

Section C: DATA GOVERNANCE AND MANAGEMENT

15. How important is having data governance and management procedures and standards in SSBI environments?

0 (0 rating indicates not at all important, 10 indicates critically important) 10

16. How important is it to include business, not only IT, in formulating these governance standards?

0 (0 rating indicates not at all important, 10 indicates critically important) 10

Please indicate your views on the following: (open questions)

17. How does a consulting firm help when it comes to governing SSBI environment?

18. What data governance initiatives, standards, policies and procedures does one need to consider (both for so DW/BI systems) to ensure that data/information in SSBI is relevant, of good quality and has context?

Section D: SUPPORTING INFRASTRUCTURE

19. BI/SSBI Solution is a collection of different technologies and processes, and it involves people from different departments (IT and Business), sometimes a service provider (consulting firm); in your opinion, how important is collaboration of all these stakeholders during implementation and management of SSBI?

0 (0 rating indicates fully disagree, 10 indicates fully agree) 10

20. How important is SSBI to Business and decision makers?

0 (0=not at all; 10=critically important) 10

21. How important is "search" functionalities to business users?

0 (0=not at all; 10=critically important) 10

Please indicate your views on the following: (open questions)

22. SSBI has to do with business users developing their own reports or interacting with corporate data without or v involvement, what strategies would you implement to ensure IT and Business work together in order to provide go to business users?

23. How can business (SSBI users) assist in management of SSBI Solution?

24. How can IT (SSBI Developers) assist in management of SSBI Solution?

25. Which tasks will BI users perform mostly on SSBI considering their differing technical level?

26. How important is IT infrastructure in having successful implementation of SSBI?

(0 rating indicates not at all important, 10 indicates critically important)

0 10

Section E: CONTEXT (Common Understanding)

27. How important is quality and relevancy of information to decision makers?

(0 rating indicates not at all important, 10 indicates critically important)

0 10

Please indicate your views on the following: (open questions)

28. What steps should an organisation take to ensure SSBI information is understood by all?

29. How do you ensure that BI users get a common understanding of information provided by SSBI solution?

30. How would you ensure SSBI information is useful and reliable to its users?

31. How important is understanding decision makers' information requirements to your organisation?

(0 rating indicates not at all important, 10 indicates critically important)

0 10

Section F: SYSTEM INTERGRATION

32. How important is systems integration (connectivity) to your organisation?

(0 rating indicates not at all important, 10 indicates critically important)

0 10

33. To what extent do you agree with this statement: Systems integration is necessary to ensure SSBI efficiency and effectiveness?

(0 rating indicates fully disagree, 10 indicates fully agree)

0 10

Please indicate your views on the following: (open questions)

34. What systems should SSBI definitely integrate with?

35. How would you ensure that IT and business (SSBI Users) strategies are aligned?

36. To what extent do you agree with this statement: Having a centralised SSBI system is a GOOD strategy?

(0 rating indicates fully disagree, 10 indicates fully agree)

0 10

–| end of dissertation |–