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**Signification framework of a business intelligence tool
for SME business decision-making**

by
Tshepo Confidence Magoma

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Please note: In order to present a truthful view of the student's own command of scientific language and research methodology this dissertation has not been language edited by an external language editor.

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ABSTRACT

Background

Business Intelligence (BI) tools are being adopted more frequently, especially in large organisations that have the resources to deploy it. BI tools are allowing businesses to optimise their decision-making process and sustain competitive advantage. There is, however, limited published research into how BI tools are being used by small and medium enterprises (SMEs), as well as limited research in terms of the affordable features from IBM Cognos that support SMEs' decision-making needs. Application of the key features of BI tools are helping organisations to take decisions to ensure their sustainable growth and competitive advantage. BI is also vast and complex hence it requires skilled human resources, and it makes the development and maintenance of BI highly expensive for SMEs. The main motivation of the research has been associated with the fact that finding a BI tool that is cost efficient for SMEs can be important for the success of the business and to cater effectively to their decision-making needs.

Objective

The study's purpose was to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. The objective was to analyse the significance of BI tools in the SMEs by identifying affordable and suitable features from IBM Cognos based on SMEs' needs and business functions using a signification framework.

Method

A quantitative research method has been used in which primary method of data collection has been adopted. With respect to this, data collection instrument chosen for the research is in the form of a questionnaire online survey which was sent to the respondents through survey monkey. The sample size for this research was 200 research participants, and amongst these total 200 research participants, 80 participants were BI Consultants from consultancy firms and with the composition of their own consultancy firm's clients, the other participants were 60

SME BI developers and 60 SME managers. For the purpose of data analysis, this research has used SPSS software and Microsoft Excel and analysed the results by using demographic and frequency analysis.

Results

The findings of this research have revealed that BI is a broad field and can be used as a tool for solving various issues faced by the SMEs. BI tool is able to solve issues through their features. All the questions asked from the respondents were associated with the features of BI and how they are effective for decision-making in SMEs. The features of IBM Cognos are cost effective but not necessarily affordable in the context of SME business needs. Affordability was identified as the mediating variable in this study.

Conclusion

The research has concluded that the SMEs established in South Africa should adopt the IBM Cognos tool for supporting their decision-making process and needs. The implementation of low cost and affordable features is important for SMEs but it requires a specialised IT employee for managing and running the tool. This tool would help the SMEs in articulating solutions based on the issues as well as making operational decisions that would improve the growth and profitability of the business. Overall, it has been indicated from the study that IBM is an important tool for the SMEs in that, it aids in gathering relevant data and further interpreting the data for making effective decisions.

Keywords: IBM Cognos; business intelligence; decision-making; SMEs; affordability; signification framework.

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List of abbreviations

ASME	American Society of Mechanical Engineers
BI.....	business intelligence
CBEREC	College of Business and Economics Research Ethics Committee
<i>cf</i>	compare further
CRM	Customer Relationship Management
DoT	diffusion of technology
DSS.....	Decision Support Systems
ERP.....	Enterprise Resources Systems
<i>et al</i>	and others
i.e.	in essence
IT.....	information technology
POPI	Protection of Personal Information
SME	Small and Medium Enterprise
SMEs.....	Small and Medium Enterprises
SPSS	Statistical Package for Social Science
<i>viz</i>	to be exact

CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

1.1 Background to the study

Small and Medium Enterprises (SMEs) in South Africa and world-wide, are often characterised as organisations that have limited capital and resources and lacking skills and infrastructure, yet they play an important role in the prosperity of their countries (Ladzani and van Vuuren, 2002; Hüsing, Dashja, Gareis, Korte, Stabenow and Markus, 2015; Pereshybkina, Conde and Kalyesubula, 2017; BMI Research Technology Report, 2018; Jones and George, 2018).

In the South African context, SMEs face many issues such as access to the right information, access to providers of the right systems and tools, the right packaging of information, and scope of business information (Ladzani, 2001). Many researchers agree with Ladzani (2001), saying that SMEs in South Africa face various obstacles including, but not limited to, budget constraints, lower access to credit, and a technology landscape that has become more complex than ever before (Mabinane and Edoun, 2017; Mayeng and van Vuuren, 2017; Ndjike and Rambe, 2017; Nguza-Mduba, 2017; Rankhumise, 2017; Siwadi, 2017).

Furthermore, using business intelligence (BI) could help the organisations to become flexible and efficient while responding to persistently changing business conditions (BMI Research Technology Report, 2018). With the continuous rise of the digital age technologies characterised by the Fourth Industrial Revolution, SMEs are now finding themselves sufficiently challenged in many ways unimagined (Reddy, 2014; Pereshybkina *et al*, 2017).

The Fourth Industrial Revolution is considered as a fourth key industrial era since the 18th century industrial revolution (Schwab, 2017). It has been associated with the fusion of technologies which has blurred the dimensions between digital,

biological and physical spheres and are collectively known as cyber-physical systems (Stearns, 2018). The advent of big data has shown a tremendous change in the world of information technology (IT), says Hilbert (2016). Big data is regarded as a term that is used for referring to big sets of data that are complex (Wu, Chen and Olson, 2014). Big data technologies have brought with it various cost benefits and other advantages to businesses when dealing with large volume of data (Wu, Zhu, Wu and Ding, 2014; Assunção, Calheiros, Bianchi, Netto & Buyya, 2015; De Mauro, Greco and Grimaldi, 2016).

There are many different types of data available in the organisation including customer information, product-related data, employee's database, and so on. A BI tool such as IBM Cognos convert these data into meaningful information which helps the firm to take appropriate decisions (Ghazanfari, Jafari and Rouhani, 2011; Khan and Quadri, 2012). Due to the adoption of data-driven decision-making processes supported by processes and tools such as BI tools, SMEs are now faced with several complexities. These complexities have been encountered during the making of efficient and timely business decisions in the highly competitive market (Pereshybkina *et al*, 2017). Roitzsch, Hacker, Pietrzyk and Debitz (2012) indicate that there is insufficient research which primarily focuses on how to improve the operations of SMEs even after knowing that SMEs are the primary drivers for national economic development.

Although a trend towards development of BI tools as decision support tools for large corporations is repeatedly increasing, SMEs are very reluctant to invest and adopt BI tools (Roitzsch *et al*, 2012; Wagner and Paton, 2014). Other researchers such as Sin Tan, Choy Chong, Lin and Cyril Eze (2009), Olszak and Ziemba (2012), and Wagner, Fillis and Johansson (2003) in similar field have indicated that cost is another significant barrier to the adoption of BI tools in several SMEs. One of the most essential and advanced BI software is IBM Cognos that is designed in order to assist businesses to make and determine decisions effectively and quickly (Turban, Sharda and Delen, 2011). IBM Cognos also has a core feature of enabling its users

to configure and create dashboards and report from one platform or system. The solution provided by IBM Cognos is considered as highly scalable and it can also develop together with the organisation (Adkison, 2013).

The BI system can be incorporated either from the cloud or on-premise and as the system comes with the interactive and formatted dashboards, it also has excellent functionalities regarding scheduling and distribution (Gurjar and Rathore, 2013; Assunção *et al*, 2015). Moreover, the BI system has a wide range of products and features that can be operated through mobile devices or any other portable device. It is due to the fact that the adoption of the BI tools involves cost of obtaining license, cost for supporting and training the users of the system, and other additional costs associated with managing the projects. All these costs can make it difficult for SMEs to overcome cost overruns and further in making important decisions for the enterprise, which leads to the motivation of this study.

1.2 The motivation of this study

BI is vast and complex, says Vercellis (2011) hence it requires skilled human resources, which makes the development and maintenance of BI highly expensive especially for SMEs. The main motivation of the research was the fact that finding a BI tool that is cost efficient for SMEs in South Africa can be important for the success of the business as well as important for the country (Mohlameane and Ruxwana, 2014; Basole, 2014). Therefore, it is essential to identify the affordable key features of a widely used BI tool called IBM Cognos BI, to assess the fundamental features that can apply to the SME environment for addressing the SME needs that can foster efficient decision-making, sustainability and competitiveness. Moreover, the enhancement of the knowledge of this analytical tool in businesses will aid in filling the knowledge gap in BI, and it will give managers and employees of SMEs a better understanding which assists them in making better business decisions in a cost effective manner (Vercellis, 2011).

Along with the advancement of technology, the introduction of the latest and advanced BI tools has been increasing on a large scale, and each tool differs in features which are customised for suiting contemporary needs (Al-Fuqaha, Guizani, Mohammadi, Aledhari and Ayyash, 2015). However, many researchers such as Wu *et al* (2014), Gangadharan and Swami (2004) and Azvine, Cui, Nauck and Majeed (2006), have carried out extensive research on BI, but that research only focuses on large organisations. Therefore this study has focused only on IBM Cognos as a BI tool for utilisation in SMEs. The main motivation behind choosing IBM Cognos was because it is regarded as a BI tool that may have the effect of fostering innovation in SMEs (Olszak and Ziembra, 2012). Therefore, this research has been conducted in order to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs.

1.3 Research problem statement

In this fast changing technological world, it has become essential for any organisation to examine more efficient systems for storing and analysing the increasing volume of data along as well as attempt possible cost reduction avenues (Porter and Heppelmann, 2014). The problem is that the features of a BI tool such as IBM Cognos may not be accessible or affordable features to SMEs in South Africa. In order to gain competitive advantage and remain sustainable in this competitive market, an organisation has to develop more innovative smart ways and techniques that will increase its significance (Liamputtong, 2013). There are certain benefits of adopting BI tools for businesses for instance, these tools can help to make timely and accurate decisions based on immediate facts and figures (Chang, 2014).

BI tools are essential for allowing various types of users to access dashboards and data and apply self-service solutions to obtain and create various reports and metrics (Nofal and Yusof, 2013). Over the years, BI tools have been embedded in many applications due to which vendors and software developers have been able to

integrate actionable analytics and reporting into businesses processes and applications (Sangar and Iahad, 2013). Hence, BI tools present ideal ways of offering a competitive edge to the products and services offered by the organisation.

One of the major benefits of IBM Cognos has been associated with the usual BI techniques it has incorporated such as planning, real time monitoring, and data visualisation along with predictive analytics incorporated on a single platform (Rusaneanu, 2013). This platform can also function through a notebook, tablet, smart phone and desktop computer (Chung and Chung, 2013). IBM Cognos allows the organisation to obtain any kind of information or report that can further provide a comprehensive reporting capabilities as well as convenient access to the set of information that is required in an easier and fast manner.

However, the use of this tool is dependent upon the IT team and its support (Thamir and Poulis, 2015) which means that SMEs would require expanding their workforce in the IT domain in order to deal with the functions of IBM Cognos (Eden and Ackermann, 2013). Once the report has been established, it can be accessed by the various channels and systems in many languages. The IBM Cognos can allow the SMEs to create reports just by dropping and dragging the templates and speed up the standard process and interactivity by performing all the functions such as calculating and analysing the data as well (Rusaneanu, 2013).

IBM Cognos entails the information management field aspect, of data management and BI; through the scope of managing, integrating, and reporting on financial data that shows the overall performance of the company. IBM Cognos has sets of common applications embedded in it such as Microsoft applications that are commonly used to prepare annual financial statements, which SMEs are quite familiar with, but it also has other features which can play a pivotal role in SMEs. Due to the complexities of the production of efficient and timely business decisions in highly competitive markets, data-driven decision-making by utilising BI applications has lured many organisations worldwide (Kousalya, Balakrishnan and Raj, 2017). Many BI tools and applications have been suited for use in any type of

organisation; however, it is only the more prominent enterprises that have achieved a stage of maturity in BI (Kousalya *et al*, 2017). The problem is that SMEs are still lagging behind in terms of utilising BI tools.

1.4 Research aim and objective

The research aim was to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. The objective was to analyse the significance of BI tools in the SMEs by identifying affordable and suitable features from IBM Cognos based on SMEs' needs and business functions using a signification framework.

1.5 Research questions

The main research question of this study was:

What are the fundamental features of IBM Cognos that can address the data needs of SMEs?

The study had two sub questions, namely:

- What are the data needs for SMEs looking to remain sustainable and competitive?
- Which affordable features found in IBM Cognos can address the business needs of SMEs?

The study utilised a significance framework in order to operationalise the research questions. A significance framework is the underlying structure used for the representation of meaning; it is the basic structure underlying a system, concept, or text. According to Snowden and Boone (2007) the representation of meaning allows decision makers to assimilate complex concepts. The signification framework utilised by this study had five components:

- **Presume:** To suppose that (a specified thing) is the case on the basis of probability or likelihood
- **Predict:** To say or estimate that (a specified thing) will happen in the future or will be a consequence of (a specified thing)
- **Prize:** To value (a specified thing) as extremely highly valuable
- **Perceive:** To interpret or regard (a specified thing) in a particular way
- **Produce:** To lead to or cause (a specified thing) to happen or exist

The above signification framework was used as a guide to develop the data collection instrument for this study in order to:

- **Presume:** What is the presumed relevance of a business intelligence tool such as IBM Cognos?
- **Predict:** How would a SMEs business decision-making ability change as a consequence of IBM Cognos features?
- **Prize:** What are the key features of IBM Cognos?
- **Perceive:** How do SME users of business intelligence tools perceive IBM Cognos features?
- **Produce:** What do IBM Cognos features produce of value to SMEs?

1.6 Scope and limitations

The scope of the study is mostly determined by considering its academic and managerial implications. Academically, this research has included the review of previously conducted studies and added in the knowledge of BI tools and the concepts associated with SMEs. Moreover, as the research has covered SMEs, it has a broader scope in terms of how SME managers would be able to create policies and take measures to use BI tools for their decision-making needs.

The main limitation of the study has been associated with the time constraint where the time allotted for the study has not been enough for dealing with the comprehensive area of the study. Another limitation has been associated with the

selection of BI tool for this study. The BI tool can be performed through various platforms i.e. online analytical processing, BI metadata management, platform integration, and so on; however, this study has been limited to IBM Cognos as a BI tool required by SMEs.

1.7 Chapter layout

The outline of the study is given below:

Chapter 1 has assimilated an introduction that has encompassed the contextual background of the study. It has also included the rationale and significance of a selected theme. The chapter has outlined the research aim and objective as well as the research questions and signification framework of the study.

Chapter 2 outlined a review of relevant literature associated with the adoption of BI tools, SMEs and the concept of decision-making. This has included the review and assessment of the primary literature amalgamated to the range of the study.

Chapter 3 has combined and integrated research methodology which has been followed by this study. This chapter has also taken account of research philosophy, research design, research approach, and data collection resources and methods and techniques for analysing data.

Chapter 4 has included the analysis of data collected from questionnaire. It has used statistical methods for data analysis and interpretation that led towards the achievement of the research aim, that is, to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. The results have also led towards accomplishing the objective of the research viz determining the significance of BI tools such as IBM Cognos, perceptions of SME users of IBM Cognos features and identifying which affordable features found in IBM Cognos can address the business needs of SMEs and produce value for SMEs.

Chapter 5, the last section of the study, has taken account the complete summary of outcomes which have led in the direction of recommendations and likelihood for future research. The conclusion of the study has also been given in this section.

1.8 Summary

The chapter has provided the introduction of the research topic and structured in a manner that led towards the understanding of research paradigm. The first section has provided the background of the context of the study whereas the second section has incorporated the motivation behind conducting the research. The third section has encapsulated the problem statement, and the fourth has included the aim and objective. The chapter has also provided the holistic view of research design and presented the scope and limitation of the research. The next chapter is the literature review.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The IBM Cognos is a BI tool that has the potential to help SMEs tackle the decision-making processes. The tool uses the data that is derived from the organisational data and legacy systems; the data is then prepared, processed and analysed to enable the organisations to have real time instant data (Ghazanfari *et al*, 2011; Khan and Quadri, 2012). In recent years, the American Society of Mechanical Engineers (ASME) has been engaged in promoting science, practice, and art of allied sciences and multidisciplinary engineering around the globe (ASME, 2018), which has had a profound impact on the development of BI tools such as IBM Cognos.

In this study, research has focused on IBM Cognos BI tool which could assist in addressing decision-making needs of SMEs. The literature review helps in discussing this topic. This chapter also helps in analysing the different theories and models of BI and decision-making. IBM Cognos plays the crucial role in decision-making needs of the SMEs (Ramrathan and Sibanda, 2014). The concept of decision-making and BI tools helps to understand the facts of decision-making needs. The following literature review has been presented in order to explain the theoretical framework of the study including various decision-making models and diffusion of innovation theory.

2.2 Business intelligence definition

Ghazanfari *et al* (2011), and Khan and Quadri (2012) describe BI as a system for gathering and storage of data as well as a knowledge management practice that provides users with analytical tools to convey competitive information and internal information to decision-makers of an organisation. Sauter (2014) defines BI as an umbrella term which covers all kind of tools, databases, architectures, data warehouses, methodologies, and performance management systems. Olszak and

Ziemba (2012), and Offredy and Vickers (2013) propose that BI is a process which works towards the transformation of data into information and then transforms it into a body of knowledge. It has been further argued that BI also contain other entities like organisational function and human interaction as well.

The study conducted by Wu *et al* (2014), refers to BI in terms of the technologies, practices, and applications for the integration, analysis, presentation, and collection of the information related to business. On the other hand, Turban, King, Sharda and Delen (2013) define BI as a term that combines applications, tools and infrastructure as well as best practices that can enable the organisation to access information in order to optimise and improve performance. Along with how literature has defined BI tools, it is essential to identify its relevance for SMEs by considering its main characteristics. Therefore, the next section explains the characteristics of BI tools as identified in the previously conducted research.

2.3 Characteristics of business intelligence tools

Simply put, IBM Cognos is business performance management software, state Debortoli, Müller and vomBrocke (2014). The majority of BI tools similar to IBM Cognos helps the SMEs and large companies that have novice users who are having no technical knowledge to analyse, assembling the report, and extracting it from corporate data, explain Yeoh and Popovič (2016). Kimball, Ross, Becker, Mundy and Thornthwaite (2015) identify one of the main characteristics of BI tool as its ability to represent systems that can play a significant role in the process of strategic planning. These systems also have a tendency to allow the company to store gather and analyse data in order to aid decision-making (Fan, Lau and Zhao, 2015).

The research of Gurjar and Rathore (2013) has stated that BI tools provide personalised dashboards that are relevant and easily understood and also provide real-time data to the leaders and managers. The study further explained that this characteristic of BI tool can help to reduce response rate to external and internal events while offering better and faster decision-making approaches (Gurjar and

Rathore, 2013). Sauter (2014) states that the primary purpose of BI is to support the decision-making process of the organisation because the systems have been data-driven. One of the main features of BI systems is that it provides historical, predictive and current information and views of operations of the business for which the data have been gathered into a data mart or data warehouse (Işık, Jones and Sidorova, 2013).

According to Lim, Chen and Chen (2013), BI tools can create more accurate planning, reporting and analysis. Other studies conducted by Mardani, Jusoh and Zavadskas (2015), and Moro, Cortez and Rita (2015), determined that BI tools improve the quality of data and improve operational efficiency. Other researchers such as Brooks, El-Gayar and Sarnikar (2015), Debortoli *et al* (2014) and Sallam, Tapadinhas, Parenteau, Yuen and Hostmann (2014), have considered BI tools as pioneers of better decisions because these tools provide easier methods and ways of dealing with the day-to-day business issues. The relevancy of BI tools is also identified by the fact that Muhammad, Ibrahim, Bhatti and Waqas (2014) who stated that BI helps in the process of data capturing, which means that all the major information can be acquired from any system.

On the other hand, Alhyasat and Al-Dalahmeh (2013), and Ates, Garengo, Cocca and Bititci (2013), state that the use of BI tool by SMEs can assist them in making better decision because timely information could be available on a number of platforms. For the purpose of this study, the characteristics of BI tools have been identified in the literature along with its relevancy to SMEs in decision-making process.

It is important to understand what the literature says about the concept of decision-making and its relevance to SMEs. Hence the next section identifies the concept of decision-making as stated in previously conducted studies.

2.4 The concept of decision-making

Decision-making assists in enhancing the different aspects of the organisation and is the essential function of management (Wheelen, Hunger, Hoffman and Bamford, 2017). Decision-making processes are managerial functions that deal with the organising, directing, functioning, controlling, coordinating and a variety of more complex processes associated with making tacit knowledge explicit (Snowden and Boone, 2007). Decision-making is done on the ground of problem identification, problem analysis, alternative action courses and other elements described by Popovič, Hackney, Coelho and Jaklič (2014).

As per the research of Chng, Shih, Rodgers and Song (2015), various management issues can be analysed by considering the aspects of decision-making process. Decision-making positively affects the productivity of the organisation, state Chng *et al* (2015), which is why the current study has focused on the decision-making of SMEs in South Africa to increase productivity. The notion of increased productivity has been associated with one of the variables of the research: decision-making needs. The study conducted by Eden and Ackermann (2013) identified that decision-making is considered as the art of making those choices that are available amongst the alternatives. Their study has further revealed that decision-making in terms of business undertakings are being taken at distinct steps and hence regarded as one of the essential functions of an organisation's management (Eden and Ackermann, 2013). This notion is in line with the decision-making model which forms part of the current study's theoretical framework (*cf* Section 2.11)

According to the study conducted by Provost and Fawcett (2013), various managerial functions including staffing, directing, planning, coordinating, controlling and organising, are carried out by the management in which practical decision-making skills play a crucial role. However, Chai, Liu and Ngai (2013) state that in SMEs, the process of decision-making often relies upon the only one proprietor or the manager and hence, requires a practical approach to make decisions that can be resulted in the sustainable growth of the organisation. Therefore, as the literature

has identified, decision-making is a critical aspect of problem-solving in the organisation, which means that a tool such as IBM Cognos has to be studied in terms of its decision-making support features.

2.5 IBM Cognos and its features

IBM Cognos is defined as IBM's business intelligence and it could also be referred to as the performance management software suit (Martin *et al*, 2013). Muntean and Surcel (2013), and Larson and Chang (2016), explain that IBM Cognos is a software that is designed to making the business users able to extract data, assemble reports and analyse it without having a technical knowledge. In addition to this, Al-Aqrabi, Liu, Hill and Antonopoulos (2015) define IBM Cognos as a BI tool that has been built on open standards and has a number of software built into it as well.

These software products can be incorporated with multidimensional or rational data sources for numerous vendors such as SAP, Oracle, Teradata and Microsoft, as explained by Zulkernine, Martin, Zou, Bauer, Gwady-Sridhar and Aboulhaga (2013). IBM Cognos is the BI tool that offers a unified workforce for analytics and BI that the whole organisation can incorporate in order to outperform the competition and answering the major business questions (Reddy, 2014). As per the study of Lunsford and Phillips (2018), business users often do not understand the kind of information needed and what available tools can offer to explore and combine the information into what the business wants to achieve.

IBM Cognos BI tools allow users to express and explore the information and personalise and assemble the data in order to follow and generate new and unique perspective (Davis and Woratschek, 2015). The research carried out by Chii, Xue, Low, Yoon and Gold (2016) profess that if an organisation is required to adopt a separate tool, it would often be difficult to encapsulate statistical results for core business reporting. The study suggested that IBM Cognos can offer the fact-based and statistical evidence to the users in order to support key decisions (Chi *et al*,

2016). With respect to this, it is essential to analyse various key features that are needed in BI tools in order to make sure that the decision-making needs of an organisation are met. For this purpose, the next section has presented various key features of BI tools that have been essential for creating a theoretical framework for this study.

2.6 Key affordable features of IBM Cognos

IBM Cognos has many useful features, state Kim, Ostrowski, Yamaguchi and Sheu (2013), mentioning features of advanced calculations for dashboards and data modules. Rusaneanu (2013) recognise features such as better filtering in reports and visualisation as some of the most important features of IBM Cognos. However, not all of the features of IBM Cognos can be considered as affordable (Hofstee, Chen, Gebara, Hall, Herring, Jamsek, Li, Shi, and Wong, 2013). For instance, according to Ristovska (2014), data modules is an expensive new advanced feature of IBM Cognos that can enable the users to perform easier data modeling. Bodislav (2015) finds that some IBM Cognos features cannot be considered as affordable. As per the study of Horakova and Skalska (2013), IBM Cognos can allow the ease of drilling down into the data; however, this feature is costly especially for small companies. Consequently, the literature review below presents the key features of BI tools and gives an indication of few studies that have been described in terms of affordability of fundamental BI tool features.

2.6.1 Intuitive interface for authoring content

According to the study conducted by Demirkan and Delen (2013) one of the significant features of BI tools is the capability of authoring the reports available for the management. The study further explained that this feature could be regarded as necessary as, in terms of intuitive interface, the reports can be viewed and modified as per the requirements and it can also meet the queries of the users. Another research carried out by Sano (2014) shows that BI tools can assist the professional report author in terms of building, designing and securely distributing the reports to

the enterprise. Therefore, the interface for authoring content might also help the administration to streamline its tasks in an effective and efficient manner.

2.6.2 Contextualised smart search

As per the research conducted by Hermida, Meliá, Montoya and Gómez (2013), contextualising smart search is one of the major components of BI tools under which the organisations can search for all the data sources along with dashboards and widgets. The study further opined that the smart search could also allow to report quickly and easily and find what the management is looking for. The BI tools can allow the organisations to access all sort of information conveniently and make decisions by facts achieved through smart search (Rainer, Cegielski, Splettstoesser-Hogeterp and Sanchez-Rodriguez, 2013). Hence, contextualised smart search has been added to the conceptual framework as one of the significant features of a BI tool (*cf* Figure 5.1).

2.6.3 Data protection

The research of Katal, Wazid and Goudar (2013) determine that data privacy and data protection are the two increasingly essential dimensions that can ensure the quality of data. In the context of BI, Kaisler, Armour, Espinosa and Money (2013) state that data protection plays a very crucial role as every enterprise has a large volume of confidential information that needs to be protected in order to use the information for important decisions. Their study further explains that it is necessary for the organisations to keep the data safe where BI tools can provide such features which can ensure that the data has been encrypted by the help of codes or passwords (Kaisler *et al*, 2013).

2.6.4 Scheduling and alert

The research of Ebbers, Abdel-Gayed, Budhi, Dolot, Kamat, Picone and Trevelin (2013) profess that BI tools have been becoming more comprehensive and

have not only been providing a large variety of information but also providing key measures for scheduling and alerts. The study explained that this feature is often associated with the financial decisions of the company for which BI tools alert the businesses of any cost overruns or overbearing expenses. Hence, scheduling and alerts have been incorporated as one of the significant features of BI tool for possible inclusion in the current study's conceptual framework, showing that it could possibly fulfill the decision-making needs of SMEs.

2.6.5 Best automatic visualisations

The research carried out by Chen and Zhang (2014) profess that BI tools could automatically build on the models that are data-based to search for a keyword and then intelligently provide recommendations to the organisation for best data visualisation on the selected data. The study further explained that through the automatic visualisation, the management could find the data accessible to interpret (Chen and Zhang, 2014). Another study conducted by Kimball *et al* (2015) profess that the BI tools could represent the data in a manner that is user-friendly and can be easily comprehended by the management. Hence, best automatic visualisation has been added as one of the major features of BI tool for creating a conceptual framework showing that it can fulfill the decision-making needs of SMEs.

2.7 Decision-making needs of SMEs

The decision-making needs of the companies have been described in various studies whereas few have been described below in order to form a conceptual framework of this research.

2.7.1 Consistency

As per the study conducted by Steinerowska-Streb and Steiner (2014), consistency in the decision-making process is essential in terms of facts, figures, and information available for making appropriate decisions. The study further

explains that the consistency in information could allow the management to analyse the pertaining situation logically and provide plausible solutions (Steinerowska-Streb and Steiner, 2014). Therefore, consistency could be considered as one of the significant decision-making needs of the SMEs and hence has been considered for possible inclusion in the conceptual framework of this research; however, its actual inclusion was dependent on the empirical research findings (*cf* Figure 4.9, e).

2.7.2 Comfort and convenience

The study conducted by Ates *et al* (2013) stated that comfort and convenience, for the management, can play a crucial role in making sound decisions. Graham, Harvey and Puri (2015), and Trianni, Cagno and Farné (2016), profess that for organisations operating in a highly competitive environment, it is critical to access all the essential information in the most convenient manner. Therefore, comfort and convenience could be considered as one of the significant decision-making needs of the SMEs and hence has been considered for inclusion in the conceptual framework of this research.

2.7.3 Avoiding impulsivity

According to the study conducted by Antons and Piller (2015) impulsivity in the decision-making process can be resulted in the decisions that might have negative consequences for the sustainable growth of the organisation. On the other hand, the study of Bayrak (2013) profess that the management of the organisation must have an ability to take decisions on the basis of authentic and reliable information so that sustainable competitive advantage could be achieved. Therefore, avoiding impulsivity could be considered as one of the significant decision-making needs of the SMEs and hence has been considered for inclusion in the conceptual framework of this research.

2.7.4 Increase legitimacy

The study conducted by Pettigrew (2014) states that it is highly essential for the companies to maintain legitimacy in the decision-making process. The study further opined that legitimacy is one of the significant needs of decision-making that can be achieved by keeping the vital information of the organisation safe and protected and taking decisions accordingly. It might also mean that the organisations have required considering all the information before reaching towards any decision. Therefore, legitimacy could be considered as one of the significant decision-making needs of the SMEs and hence has been considered for inclusion in the conceptual framework of this research.

2.8 IBM Cognos, an affordable BI tool for SMEs

In the light of the study conducted by IBM (2013), affordable systems along with easy implementation has the potential to provide powerful business analytics to the organisations whereas these best solutions can also offer reporting, dashboard, scorecard, analysis, planning, forecasting, and budgeting capabilities. IBM (2013) further reveals, albeit biased, that all these features of IBM Cognos can enhance the capabilities of SMEs that require affordable BI tools and provide preconfigured solutions such as easy to integrate, install, use and apply within the organisation. In addition to this, the research of Ebbers *et al* (2013) states that IBM Cognos does not possess an official statement regarding the support's break out as the percentage of actual purchase price. This means that the allocation of maintenance and support costs incurred from the purchase of IBM Cognos will be included only in the first year of its purchase.

As per the IT related research of Morabito (2014) IBM Cognos 10.1 has been helping organisations to deliver a tremendous experience and expand the traditional horizons of BI by providing scenario modelling, planning, predictive analytics, and real-time monitoring. It has been further identified that it is possible to upgrade the system in a cost-effective manner (Morabito, 2014). However, lack of research has

been found on how the affordability in the key features of IBM Cognos can help the SMEs in the decision-making process. This signifies the gap that was identified by the present study.

The study of Loshin (2012) professes that with the BI tool, IBM Cognos, the organisations can be able to increase its benefits by the minimised cost of deploying these analytics. It is because, as IBM (2010) states, that IBM has been partnering with its customers in order to provide solutions that can resolve real-world problems of the businesses in a manner that can increase the success while keeping the cost of ownership to minimum. Furthermore, IBM (2012) reveals that the BI tool IBM Cognos has been providing is the consolidating management system as well as the features including proactive management and task-based system so that the IT department could be able to manage the information cost effectively.

2.9 Relationship between IBM Cognos and decision-making needs of SMEs

BI tools help with competitiveness in the global market (Sewdass and Du Toit, 2014). BI tools can measure the competitive advantage. It can be stated that BI is the mixture of gathering, cleaning, and integration of data that enhances business decision-making processes. The implementations of new technology systems can be regarded as one of the essential ways to assist and foster good decision making processes within the SMEs in South Africa.

The BI tool helps in the decision-making processes of the organisation as well as in increasing the consistency, comfort, avoiding impulsivity and increasing legitimacy in the decision-making process. BI tools help in focusing on the areas that are necessary to evaluate it more appropriately. The proper implementation of the changes in BI tools helps the decision-making of the organisation. The BI tool gathers the information and it is displayed, which helps the management system of the organisation to make the proper decision and make the proper analysis (Cascetta, Carteni, Pagliara and Montanino, 2015). The SMEs can gather the detail information in the BI tool to maintain the records,

and this will help to make the outgained by the organisation more appropriately (Cascetta *et al*, 2015).

In another study, Gangadharan and Swami (2004) disclose that there are some SMEs which use the BI applications to access both long and short-term data as well as production figures. In two different studies, Roitzsch *et al* (2012), and Wagner and Paton (2014), identified that BI has also benefited SMEs with an improvement in data, providing support in decision-making, and save the cost of production. Most of the SMEs realise that, with the usage of a BI tool, they will excel in their businesses; however, many SMEs, fail to utilise the advantages of BI because of the lack of resources (Roitzsch *et al*, 2012).

The research by Anandarajan, Anandarajan and Srinivasan (2012) found that specific human resources are important for most of the SMEs; however, most of the employees perform multiple tasks and they might not specialise in any particular area. Due to lack of skilled workforce and lack of technical specialisation and over that the non-affordability of a BI tool ultimately results in no adoption of this IT innovation in SME (Anandarajan *et al*, 2012). Nevertheless, most of the SMEs have been inclined towards investing in improved technologies, state Kapurubandara and Lawson (2006), assessing any investment strategies which even involves IT, according to Dickson, Weaver and Hoy (2006).

The need for BI in most of the SMEs has been increasing at a higher pace (Canes, 2009; Roitzsch *et al*, 2012). Thus, affordable features of IBM Cognos are important for SMEs to gain relevance in their decision-making process. Furthermore, by using BI tools, SMEs can manage the information sources using primary features such as dashboards used for getting customer's data (Roitzsch *et al*, 2012; Thamir and Poulis, 2015). For example, using survey for getting buyer's behaviour, product reviews data, and financial spectrum; thus, this tool helps organisations in managing this information as well as making insightful decisions using a BI dashboard.

BI dashboards are defined as data visualisation tools that can display the status of business analytics metrics on single screen along with key performance indicators (Adkison, 2013). These dashboards are also essential for making appropriate decisions as all the information will easily be available for the enterprises. Therefore, data visualisation was considered as one of the significant decision-making needs of a SME and hence has been considered for inclusion in the conceptual framework of this research.

2.10 The mediating role of affordability between IBM Cognos and decision-making need of SMEs

According to the research of Modimogale and Jan (2011) affordability and cost effectiveness can play a significant role in decision-making process of SMEs where it is highly essential for the SMEs to keep the cost minimum in order to ensure higher profit. However, the issue raised by Chang (2014) implies that the biggest challenge faced by SMEs in the wake of implementing BI tools and analytics is the lack of trained and skilled workforce. According to Williams and Williams (2010) SMEs are inclined towards making decisions that could lead to lower cost and can be achieved in a timely manner by using a BI tool, but the effective utilisation of a BI tool often requires training.

Employees are the major human capital for SMEs, however the decision-making of SMEs is often centralised to a single sole proprietor, state Yeoh and Popovič (2016). The adoption of affordable BI tools can allow the employees to be empowered and turn them into a decision-maker whereas the employees can also be able to save time that they have been spending on data entry and manipulation (Rainer *et al*, 2013). In corroboration, the research of Roitzsch *et al* (2012), and Seuter (2014), identifies that SMEs have been facing numerous issues related to excessively large amount of data, lack of knowledge and lack of information. The study further opines that this is highly important for the managers at SMEs to incorporate affordable BI tools in order to avoid the risk of failure (Roitzsch *et al*,

2012; Seuter, 2014). As per the study of Howson (2007), BI tools are helpful and useful for the purpose of bringing benefits to SMEs by facilitating the process of decision-making in the organisation.

However, BI tools can be pertaining high cost on the organisation which can make it complex and difficult for the SMEs to proceed with acquiring the system while developing and maintaining the considerable funding for BI systems (Olszak and Ziemba, 2012). Another major issue has been associated with the required specialised IT professionals in SMEs because the administration of most SMEs does not have a significant knowledge about the functions of BI tools (Popovič *et al*, 2014). Park, El Sawy and Fiss (2017) state that this can increase the cost for SMEs, as the organisations would have to hire more staff for which the cost of BI tools should be kept to minimum. Therefore, this study has undertaken affordability as the mediating variable for identifying if the affordability of key features of IBM Cognos has been able to fulfil the decision-making needs of SMEs.

So far, the literature review has identified two of the three variables relevant to the present study. These three variables were used in the signification framework, namely:

- IBM Cognos BI tool features
- BI tool affordability
- SME's decision-making

The next section presents the theoretical framework which underpins the third variable, that is, decision-making.

2.11 Theoretical framework for decision-making

The theoretical framework for this study is associated with the key theories that have been underpinned in the study. The framework is consisted of two parts; first, the decision-making model, and second, the theory of diffusion of technology.

2.11.1 Decision-making model

The decision-making model has been chosen in order to correlate with the aim of the research. The aim of the research was to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. The objective was to analyse the significance of BI tools in the SMEs by identifying affordable and suitable features from IBM Cognos based on SMEs' needs and business functions using a signification framework. Therefore, it was essential to correlate the research instrument and the main aim with the chosen theoretical framework. Decision-making model is defined as the way of making choices on the basis of identifying the needs, gathering information, and assessing the alternatives, says Smith (2014).

The model provides the step by step inclusion description of how the decision can be made more deliberate and thoughtful on the basis of relevant information and through identifying the alternatives (Velasquez and Hester, 2013). This part of theoretical framework would assist the SMEs in order to decide on the basis of provided information regarding affordability of key features of IBM Cognos that can further help them in catering to business decision-making needs. The model, as described by Smith (2014), is explained below.

Step 1: Identify the decision

The first step of the model is associated with the need to make a decision, says Smith (2014). For this purpose, an individual or the organisation tries to find clearly what needs to be done or what change needs to be brought. In this way, the SMEs would need to find the nature of decision linked with the IBM Cognos and decide if it is suitable regarding the cost of the system and how will it bring improvements.

Step 2: Gather relevant information

The second step is associated with gathering relevant information (Smith, 2014). In this step, the organisation collects some related information prior to making

decision; it will also decide the nature of information needed, if the information is internal or external. This means that SMEs would be gathering internal information from the employees regarding the need of IBM Cognos and external information regarding the cost of the system.

Step 3: Identify the alternatives

The third step is to identify the alternatives from the collected information (Smith, 2014). In this way, the organisation can consider different paths of alternatives or action. The SMEs can also list the possible desirable alternatives for the adoption of key features of IBM Cognos.

Step 4: Weigh the evidence

This is the fourth step of the model in which the evidence would be considered in order to find the best fit decision for the organisation, says Smith (2014). In this step, the organisation can also evaluate if the need that was identified in the step one would be able to meet the requirements of the issues. This can be the difficult process for SMEs as there might be certain alternatives available; however, by placing it at the priority the enterprise will be able to make appropriate decision regarding the adoption of affordable IBM Cognos features.

Step 5: Choose among alternatives

Once the organisation has weighed all the information and evidences, it will be ready to decide on which alternative is the best fit for the organisation. The choice of the alternative would be similar to what SMEs have put at the top of the priority list in the step four.

Step 6: Take action

At this step, the organisation would be able to take a positive decision in order to implement the alternative that was chosen in the previous step.

Step 7: Review your decision and its consequences

This is the final and important step of the decision-model. In this step, the organisation will consider the results of its decision and also assess if it has been able to meet the requirement identified in the first step (Smith, 2014). If the affordability of key features of IBM Cognos have not been able to cater to the decision-making needs of SMEs, the enterprises would have to consider repeating the whole process.

2.11.2 Diffusion of technology

The theory of diffusion of technology (DoT) is part of this study's theoretical framework because it identifies the why, what and how of the technology diffusion in SMEs where IBM Cognos is the answer of what, decision-making needs of SMEs is the answer of why and by considering affordability of IBM Cognos features is the answer of how (Elliott and Higgins, 2012; Cronje, 2014). The research of Wamuyu (2015) supports this notion that DoT is the theory that is associated with seeking the why, how and what of the spread of the technology.

Rogers (1962) was behind popularising DoT in 1962 and argued that the technology diffusion is the process through which innovation is being communicated among the respondents of one single system over a period of time. These are the main components that can affect the spread of new innovation or idea: the innovation itself, the social system, and communication channels (Dunning, 2013). Therefore, this process is highly dependent on a human capital and the innovation should be widely incorporated in the organisation for the purpose of sustaining to the point where it approaches the critical mass (Puklavec, Oliveira and Popovic, 2014).

Under the DoT theory, there are a number of adopters, namely early adopters, late majority, early majority, innovators and laggards. The diffusion of technology is often manifested in such ways where it is highly subjected to the kind of innovation decision process and adopters, explain Olszak and Ziemba (2012). With regard to SMEs, DoT is done through the transfer of technology and mechanisms by various

channels whereas the informal and formal networks enable the learning process as well as absorptive capacity of the SME.

This then concludes the theoretical framework of the present study.

2.13 Summary

The research focus was on SMEs' decision-making processes, concentrating on the concept of BI tools and its adoption based on the affordable fundamental features of the BI tool. In this chapter, the review of existing literature has not mentioned any specific BI tool's affordability that can help in the decision-making of SMEs in South Africa. Previous studies mentioned in this chapter were conducted on the ground of different perspectives that would help in focusing on the areas which are necessary to evaluate it more appropriately. The present study was developed with the help of previous research findings and the incorporation of the decision-making model and DoT theory. Chapter 3 presents the research methodology.



CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The aim of the research was to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. The research methodology for analysing the significance of BI tools in the SMEs was designed in order to collect data that would identify those affordable and suitable features from IBM Cognos based on SMEs' needs and business functions using a signification framework (*cf* Section 1.4). It was important that the participants be representative of the population being studied and that these participants were “not systematically different in any meaningful way from the overall group” (Baruch and Holtom, 2008:1153). This study's population was the SMEs in the Gauteng province of South Africa listed in the Braby's database, which was narrowed down to only those SMEs listed in the retail and services industry (Brabys.com, 2017). In this study, the research onion was adopted for the purpose of outlining the research methodology. The research onion, illustrated in Figure 3.1, was developed by Saunders, Lewis and Thornhill (2009).

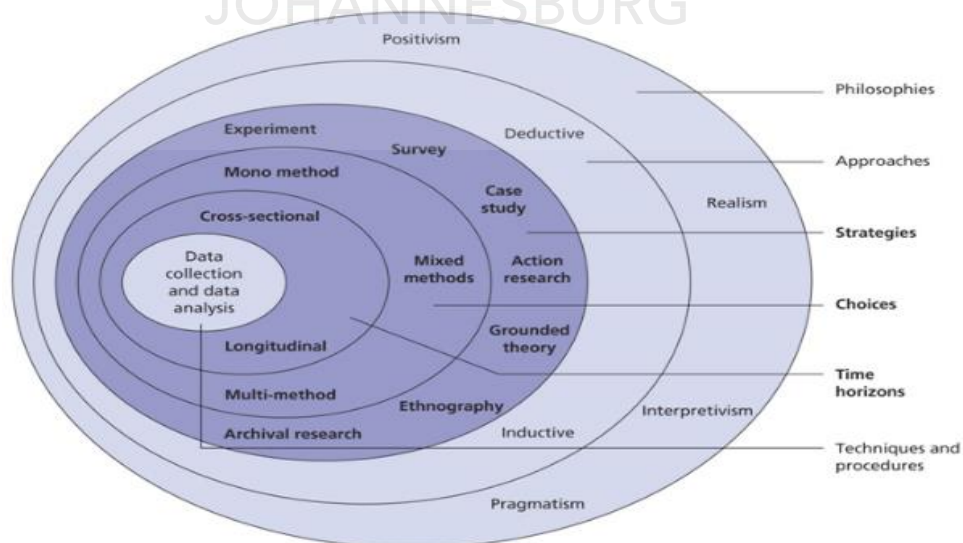


Figure 3.1: Research Onion (Saunders et al, 2009)

In this chapter, the detail of techniques has been provided, which helps to make the research reliable, for example, the sampling technique is further discussed in the methodology section, which deals with the different types of methods for making the research useful. This chapter presents the ethical background of the collected data, which is important to make the research results reliable (Cascetta *et al*, 2015). The discussion begins with the research philosophy.

3.2 Research philosophy

The outmost and first layer of research onion in Figure 3.1, indicates the research philosophy. The current research has incorporated positivism philosophy because it focuses on the practical application of features related to IBM Cognos and by testing them in human experiences associated with decision-making needs of SMEs. The positivism philosophy has been associated with the logical explanation of the research paradigm under which the study is conducted by keeping scientific testing and logical reasoning intact in its findings (Blanco, García-Peñalvo and Sein-Echaluce, 2013).

Positivism was incorporated in the research as the study has taken an approach which evaluates theories or beliefs regarding the success of a practical application of affordable features of IBM Cognos by SMEs. Moreover, the research is regarding the identification and evaluation of the fundamental features of IBM Cognos which could be affordable for the SMEs segment in addressing their decision-making needs. Therefore, positivism has been the most suitable research philosophy as it has enabled the researcher to conclude on the basis of scientific findings. Moreover, as this philosophy has been associated with the logical manner of extracting knowledge which has been essential for incorporating logical reasoning into the matter if the key affordable features of IBM Cognos have been able to address the decision-making needs of SMEs. Hence, positivism philosophy has helped to achieve the research main aim and objective in an effective, scientific and logical manner.

3.3 Research approach

The second layer of the research onion, illustrated in Figure 3.1, indicates the research approach. In this research the deductive approach has been undertaken because the study used a signification framework based on pre-existing theory of business decision-making and diffusion of technology for investigating IBM Cognos as a BI tool relevant to SMEs in South Africa, Gauteng province. According to Saunders *et al* (2009), deductive approach is defined as a way of developing the study's premises that are based on the existing theory and it leads towards formulating a research strategy that can test these premises. The study has formulated the approach by considering the information in general and reaching to specific conclusions for evaluating the fundamental features of a BI tool that can apply to SMEs.

Further, this study utilised the deductive approach in dealing with the aims of this study. The deductive approach supports the data that had to be collected through the chosen methodological choice, which was supported by the signification framework. The deductive research has been incorporated to gather detailed information about the area of the research in such a manner which has helped to achieve the research objectives more appropriately (Wood and Kerr, 2010). Moreover, the deductive approach has been suitable because it has helped to align with the chosen philosophy and the nature of the research. The approach has provided the logical ways of generalising the data in order to achieve the main aim and objectives of the research. The information under this strategy has been quantified and presented in numeric form inclining towards appropriately answering the research questions and addressing research problem.

3.4 Research strategy

In Figure 3.1, the third layer of the research onion, is research strategy and survey strategy has been adopted because it has been perceived as an efficient way of gathering large amounts of data and allowed to address the 5 Ws (Creswell and Creswell, 2017), that is, who, what, where, when and how of the research topic related

to affordable features of IBM Cognos and decision-making needs of SMEs. A survey strategy is related to a deductive approach.

Survey strategy was the chosen method for gathering data regarding the topic because it is an extensively used method in research, which can provide accurate data related to the research topic (Turban, Sharda and Delen, 2011; Vithal and Jansen, 2012). Furthermore, the quantitative nature of the research was taken towards the incorporation of a survey strategy, which resulted in the quantitative data that could be assessed empirically. This strategy was suitable for gathering information regarding BI tools and its features of relevance to SMEs. The perceptions of research participants regarding the IBM Cognos has been gathered to determine where the priorities of SMEs lie when it comes to the investment of resources. Therefore, the survey has been adopted as a research strategy allowing the researcher to achieve the main aim and objectives of the research.

3.5 Research design

The next layer of research onion, illustrated in Figure 3.1, is for choosing a research method amongst the methodical choices which include mono method, mixed method, and multi methods. For this research, mono method has been adopted in which specifically quantitative research has been incorporated for drawing out results. According to Marczyk, DeMatteo and Festinger (2005), and Mertler and Reinhart (2016), quantitative research design is the one where variables are quantified and measured by using statistical tools and knowledge. It has also been defined as the way of setting up a conceptual structure, which is tested through the incorporation of various forms of empirical instruments and scientific observations (Neuman, 2003; Choy, 2014; Coiro, Knobel, Lankshear and Leu, 2014).

The quantitative research method is the opposite of qualitative in which the ideas, opinions, and beliefs are being represented while identifying various interpretations. However, with the main aim of this research, that is regarding the

significance of the fundamental features of IBM Cognos BI tools, which could be suitable for the SMEs segment in addressing their business decision-making needs, the quantitative research method has been most suitable.

Quantitative research incorporates this study's positivism philosophy and survey strategy. The study used a signification framework to collect data to achieve the research aim and objectives as well as to answer research questions (*cf* Section 1.4 and Section 1.5).

3.6 Time horizon

The fifth layer of research onion in Figure 3.2 indicates time horizon. A cross-sectional study is defined as the observational study that is undertaken to analyse the data from the population or a subset of the representatives at a particular period of time (Creswell and Creswell, 2017). This study has been based on cross-sectional time horizon because it examined the application and different advances at a given period of time in order to remain within the boundaries of a minor dissertation project which had a specific date set for submission.

Further, this research was not a continuous study, which means that the researcher has never undergone such type of research before. This research was designed in such a way that it best suited the time allocation as well as the participants (Chen, Chiang and Storey, 2012).

3.7 Data collection and analysis

In Figure 3.1, the core layer of the research onion indicates data collection and analysis and in this research, primary method of data collection has been adopted in which a questionnaire was conducted from the respondents of the study. The primary method of collecting data has allowed the researcher to collect information by directly approaching the respondents and getting the questionnaire filled while keeping ethical considerations intact (*cf* Section 3.8). Primary method of data collection has allowed

gathering information on the basis of quantified variables identified in the research. As per the views of Neuman (2016), biased sources could be avoided by wisely planning the data collection process and also by pre-testing the tools of data collection. The data collection instrument used for the present study was a questionnaire based on this study's signification framework (*cf* Section 1.5 and Appendix B). The questionnaire itself as well as the features of the online questionnaire were tested in two rounds of testing prior to sending the Survey Monkey link to all research recipients. This was a necessary step; first, to ensure the data collection instrument complied to the University of Johannesburg Code of Academic and Research Ethics (2007), and second, to make sure that every aspect of this study's signification instrument had been included.

It was important to choose a right sample from the right population. Sampling refers to the process that is used for selecting a part of the population for carrying out its research (Saunders and Lewis, 2012). The sample size was 200 and amongst the total 200 research participants within the retail and services industry listed in Brabys.com (2017), 80 participants were BI Consultants from consultancy firms and with the composition of their own consultancy firm's clients, the other participants were 60 SME BI developers and 60 SME managers. A non-probability sampling procedure was selected for the selection of the participants from consultancy firms and SMEs. Creswell and Creswell (2017) have defined non-probability sampling as a technique in which the samples are being gathered by a process that does not require that all the individuals to be selected. This sampling technique was relevant because BI platforms are costly and the purpose of this research was not for generalising the findings of the study; instead it used a signification framework in order to determine which of the fundamental features of IBM Cognos were also affordable features for addressing the business needs of SMEs.

The sampling technique was convenient sampling *viz* the non-probability sampling method in which SMEs were taken from the "acquaintances" of a well known business directory and narrowed down to only those SMEs listed in the retail and services industry in Gauteng (Chaudhuri, Dayal and Narasayya, 2011; Brabys.com,

2017). The reason behind choosing this technique was that the sample for carrying out the study needed to be familiar with the business needs of SMEs in South Africa and it was convenient for the researcher to reach out to SMEs in Gauteng, South Africa. This method was appropriate for identifying the affordable fundamental features of IBM Cognos for SMEs in Gauteng. This made the questionnaire an efficient tool for meeting the research objectives. The questionnaire was structured according to the significance framework in order to gain a deep understanding and the ability to recognise the features of the tool which can address the business needs.

Using a questionnaire as a data collection technique has allowed the researcher to depict the inclusion and exclusion of the features during the extraction of features from IBM Cognos (*cf* Appendix B). The questionnaire was online and distributed to all participants taking in account all ethical considerations of the research. The data that were measured were based on mathematical tools or statistical analysis which will helped in providing the detailed quantitative data (*cf* Appendix C). The data were collected from 200 employees with an IT technical background of different SMEs in Gauteng, South Africa.

Data analysis technique, according to Best and Kahn (2016), refers to the systematic manner of analysing the data by using a variety of tools. Each data analysis technique is associated with the specific data collection tool (Best and Kahn, 2016). The data analysis technique in this research has also been adopted on the basis of data collection method, namely survey strategy. Therefore, the data in this research has been analysed by using graphs and tables generated on Microsoft Excel spreadsheets and the Statistical Package for Social Science (SPSS). The analysis in this research has included frequency analysis in which the tables and graphs generated on SPSS have been analysed and the findings have been analysed by considering the findings of previously conducted studies (*cf* Chapter 2).

3.8 Ethical considerations

In the beginning of the study, research ethics clearance had to be obtained from the UJ College of Business and Economics Research Ethics Committee (CBEREC). Clearance could only be obtained after the researcher had performed the actions in Table 3.1.

Table 3.1: Research ethics clearance

CBEREC's clearance preconditions	Researcher's planned actions
1) Participants' right to privacy, confidentiality and anonymity.	The data submitted by respondents will not be given to any third parties, and the POPI Act will apply.
2) The right to equality, justice, human dignity/life and protection against harm.	The researcher aims to ensure that all participants are treated fairly, and the questionnaire will be sent to all those that will add value irrespective, and their identity will be highly guarded and protected against any harm.
3) The right to freedom of choice, expression and access to information.	Respondents will have the opportunity to voice out any opinions to the researcher and also have access to any information that they deem necessary.
4) The right of the community and science community.	The research is designed in a way that is inclusive.
5) The researcher will not experience any harm in conducting the research.	The questionnaire is made in a way that communication will be done online using the communication platform.
6) Informed consent/letters of request.	An email will be sent inviting the participants to participate. The list of respondents' emails have been collected prior by means of an open source business directory, and communication will be sent along with a brief background of the study to ensure the respondents are aware of what the study is about. To save time and make sure the researcher will copy the

CBEREC's clearance preconditions	Researcher's planned actions
	consent form inside the online survey. The respondent will have the chance first to read the abbreviations and terminologies and then go to the consent form, they will read it and if they agree to insert their name to give consent and then proceed to the question.

According to Williams and Williams (2010) ethics in research ensures that the investigation is being carried out in such a manner which serves the interests of all people involved in the study. Along with that, this should be made sure that this research protects the interest and rights of the participants, ethically examining the specific research activities. The following efforts have been made in order to ensure that the questionnaire was conducted professionally, ensuring that participants were in no way discriminated or offended (*cf* Appendix C): The study has provided the letter detailing the research aim to all the participants along with consent forms, which ensured the ethical research conduct. The letter of consent was delivered to the respondents through Survey Monkey (*cf* <https://www.surveymonkey.com/r/FRDZTW6>).

The introduction section of the questionnaire presented research participants with a list of terminology linked to the signification framework, which also gave participants the option to insert their names and click on the OK button. These features of the online questionnaire suited the requirements mentioned by Saunders *et al* (2009) to provide information regarding the purpose of the study and allow participants the option to confirm their voluntary participation. In this manner, the research has adhered to all ethical and legal considerations that have been stipulated by the University of Johannesburg Code of Academic and Research Ethics (2007). The research has avoided violating participants' right to privacy by restricting to ask sensitive questions and to ensure participants of anonymity.

Information received after the participants have participated in the questionnaire has been analysed based on the given answers without making any additions or subtractions of the content. This has been done using quantitative data analysis method to ensure that the information provided is depicted as by the participants and the research intended to have no biased input in the content researched. All the sources used for the research has been acknowledged.

3.9 Research limitations

The main limitation of the study has been associated with the time constraint where the time allotted for the study has not been enough for dealing with the broader subject area. Moreover, the research has been based on the fundamental features linked to the significance of BI tools in SMEs, which means that the research did not focus on the adoption behaviour and accepting of BI tools, rather focused on affordability of the fundamental features of IBM Cognos effecting the decision-making needs of SMEs in Gauteng, South Africa. The research has also been limited to a signification framework focused on what has been presumed about SMEs' application/non-application of BI tools based on the literature review (*cf* Chapter 2).

The signification framework was limited to: what does the literature predict will happen when SMEs start using BI tools, what does the literature say is the value of BI tools specifically for SMEs, what is prized about BI for SMEs, what does the literature say how/what do SMEs currently perceive of BI tools to be true, and what does the literature say will the result be of applying BI tools in SMEs, in other words, what will BI produce. Another primary limitation has been associated with the research methodology because the research has been based on a quantitative approach and data has been collected through only questionnaire. Therefore, it lacks qualitative approach where the respondents could not provide their own opinion due to structured questionnaire.

3.10 Summary

The chapter has provided the detailed description of methodological underpinnings incorporated for conducting this research. Individual evaluation of the research has been done which has helped to collect data. It has been explained that the study has used a deductive approach, positivism philosophy, and quantitative research design which has helped to collect data. It has been emphasised that the proper use of the research material has been done. The research has used specific sampling techniques to do the survey accurately. It has been emphasised that the research has tried to maintain the privacy of the research participants and that data that were collected were kept in supreme privacy. This chapter mentioned the limitations linked to carrying out the research that the specific issues which have affected the research.



CHAPTER 4

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This study was carried out with the help of quantitative research and primary data collection as explained in the previous chapter. Data were collected from BI consultants, SME BI developers and SME managers. The population was SMEs in the Gauteng province of South Africa listed in the Braby's database, which was narrowed down to only those SMEs listed in the retail and services industry (Brabys.com, 2017). The sample size selected for analysis was 200 respondents and the response rate was 100% (cf Figure 4.1). The researcher had collected data from all respondents by sharing the online link of the questionnaire via Survey Monkey and asking them to fill in their responses.

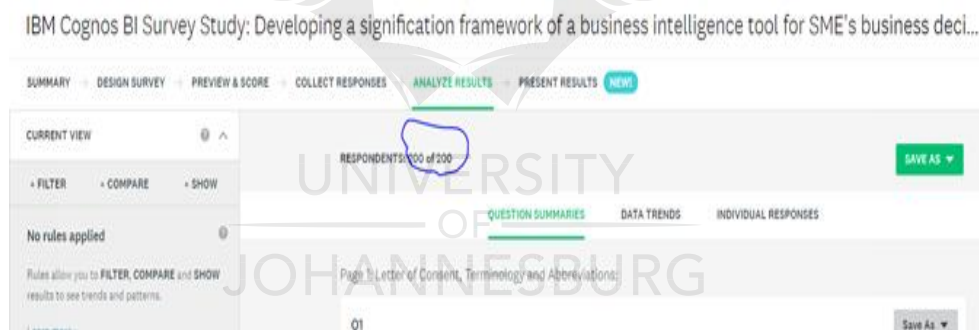


Figure 4.1: Response rate (own source developed for this study, 2018)

The previous chapters of the study have highlighted the objectives of the study, reviewed existing literature, described the research methodology used to collect and analyse the data. Chapter 4 presents the findings of the study and is focused on determining the fundamental features of a BI tool addressing SMEs' needs in decision-making. The researcher has only used Microsoft Excel to design graphs and charts, and only frequency analysis was carried out using SPSS. This chapter also includes a detailed section of discussion where the researcher ensures

whether all objectives of the study have been achieved or not. The chapter does not provide a set of recommendations as they are presented after analysing the findings.

4.2 Research demographic

The demographic analysis is the first section in this study which is analysed on the basis of the number of respondents that participated in the study. Figure 4.2 shows the number of respondents that participated in the study and their occupations.

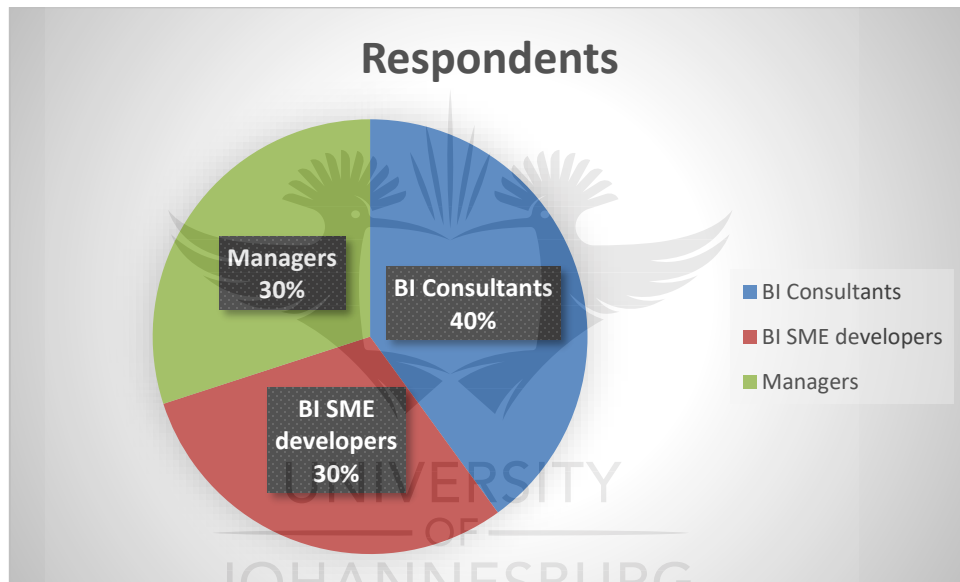


Figure 4.2: Respondent demography (own source developed for this study, 2018)

Figure 4.2 shows the total number of respondents who answered the survey questionnaire on Survey Monkey. The total number of respondents was 200 and out of them, 60 respondents were BI SME developers, 60 respondents were SME managers, and 80 respondents were BI consultants. Since the research aim was to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs therefore BI SME developers along with SME managers and BI consultants were selected for this study.

4.3 Questionnaire results and analysis

This section presents the research frequency analysis of data *viz* the method applied for identifying the number of responses given against each question of the Survey Monkey frequency distributions (*cf* Appendix C; Willemse, 2009; SPSS, 2017). Frequency analysis is regarded as an acceptable standard of data analysis required of studies of limited scope such as this minor dissertation. Total 25 questions were asked from the respondents and three variables were used in the signification framework, namely:

- IBM Cognos BI tool features
- BI tool affordability
- SME's decision-making

The researcher investigated these variables in order to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. The objective was to analyse the significance of BI tools in the SMEs by identifying affordable and suitable features from IBM Cognos based on SMEs' needs and business functions using a signification framework. Ten questions were asked related to IBM Cognos BI tool features, 7 questions were asked related to affordability, and 8 questions were asked related to SME's decision-making needs. The figures shown below are analysed on the basis of the results obtained from the respondents.

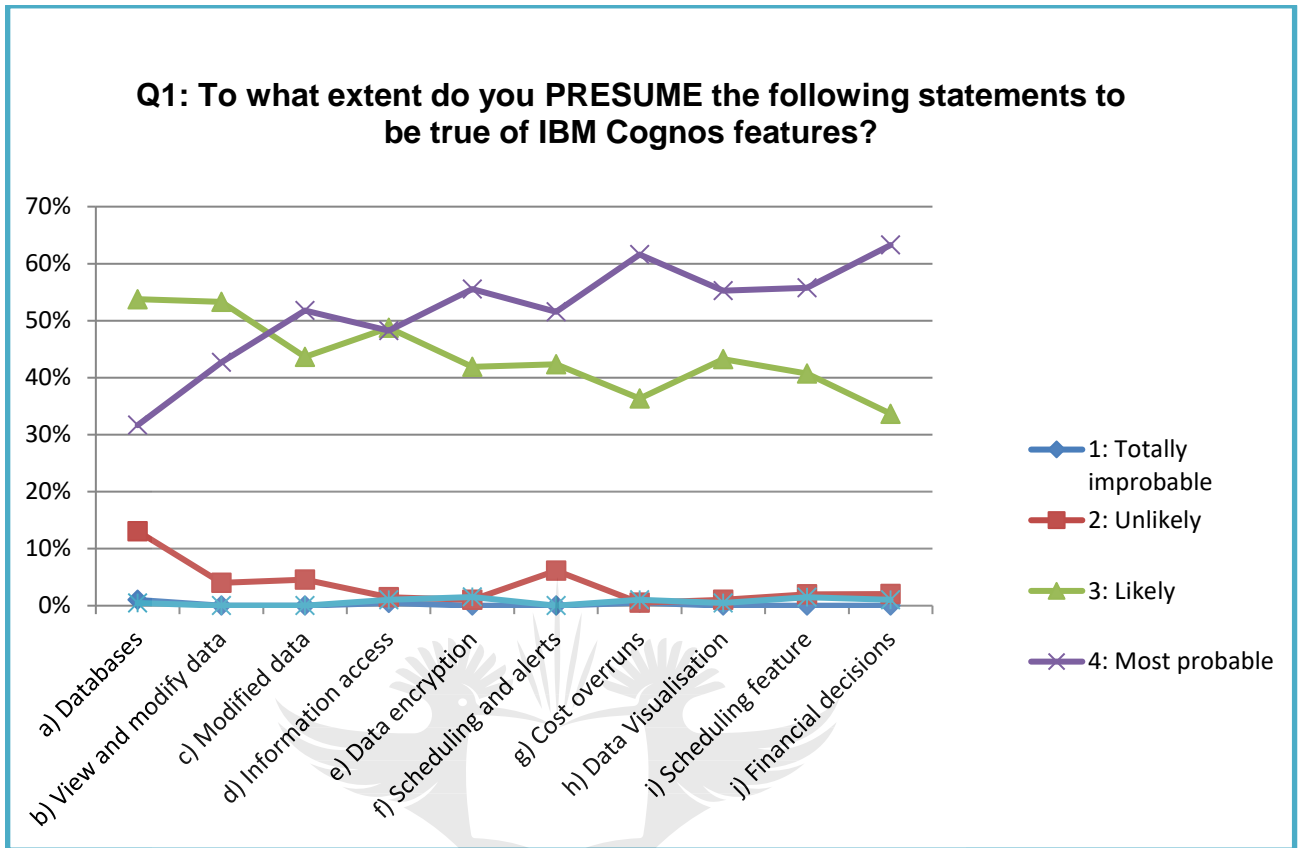


Figure 4.3: Presumed BI tool features (own source developed for this study, 2018)

Figure 4.3 presents the results for first question of the questionnaire. The question asked from the respondents was related to what extent they presumed the statements to be true about IBM Cognos. Under the first question, there were 10 statements shown on the category axis (*cf* Appendix B). Each statement was related to the characteristic of IBM Cognos. The four options given to respondents were: totally improbable, unlikely, likely, and most probable. Figure 4.3 at a), the presumed notion that IBM Cognos databases allow the decision-makers to resolve issues in the organisation was answered as totally improbable showing that the minority of respondents had a neutral response to this statement, 13.07% of respondents presumed it as unlikely, 31.66% of respondents said that it is most probable, whereas the majority, 53.77% of respondents, presumed it as likely that IBM Cognos databases allow SME decision-makers to resolve issues in the organisation.

Figure 4.3 at b), the second statement is related to whether it is presumed easy to view and modify data, that is, the convenience or not. None of the respondents answered do not know, 4.02% of respondents answered unlikely, the majority, 53.27% of respondents answered likely, and 42.71% of respondents answered most probable to presume IBM Cognos makes it easy to view and modify data.

Figure 4.3 at c), the third statement was related to whether modified data helps to solve the queries or not; 1.01% of respondents answered do not know, 4.57% of respondents answered unlikely, 43.65% of respondents answered likely, and the majority, 51.78% of respondents answered most probable.

Figure 4.3 at d), the fourth statement shown above is related to whether the user of the BI tool is allowed to access the information or not. The responses were 1.01% of respondents answered do not know, 1.01% of respondents answered unlikely, 48.24% of respondents answered likely, and the other 48.24% of respondents answered most probable.

Figure 4.3 at e), the fifth statement shows what the respondents presume about the BI tool, that is, whether the data is encrypted with codes or not: 1.01% of respondents answered do not know, 1.01% of respondents answered unlikely, 41.92% of respondents answered likely, and the majority, 55.56% of respondents answered most probable.

Figure 4.3 at f), the sixth statement was related to presumptions as to whether scheduling and alerts keep information up to date or not: 0.00% of respondents answered do not know, 6.12% of respondents answered unlikely, 42.35% of respondents answered likely, and the majority, 51.53% of respondents answered most probable.

Figure 4.3 at g), the seventh statement was related with whether IBM Cognos alerts the business with any cost overruns or overbearing expenses: 1.01% of respondents answered do not know, 1.01% of respondents answered unlikely,

36.36% of respondents answered likely, and the majority, 61.62% of respondents answered most probable.

Figure 4.3 at h), the next statement was related to whether data visualisation helps to take better decisions or not: 0.50% of respondents answered do not know, 0.50% of respondents answered unlikely, 43.22% of respondents answered likely, and 55.28% of respondents answered most probable.

Figure 4.3 at i), the second last statement asked from respondents was related to whether IBM Cognos provides scheduling feature or not: 1.51% of respondents answered do not know, 1.51% of respondents answered unlikely, 40.70% of respondents answered likely, and 55.78% of respondents answered most probable

Finally in Figure 4.3 at j), the the last statement of question one was whether scheduling and alerts help in decision-making or not: 1.02% of respondents answered do not know, 2.04% of respondents answered unlikely, 33.67% of respondents answered likely, and the majority, 63.27% of respondents answered most probable.

Next, Figure 4.4 showcases the extent that users predicted that SME's business decision-making ability will change as a consequence of IBM Cognos features.

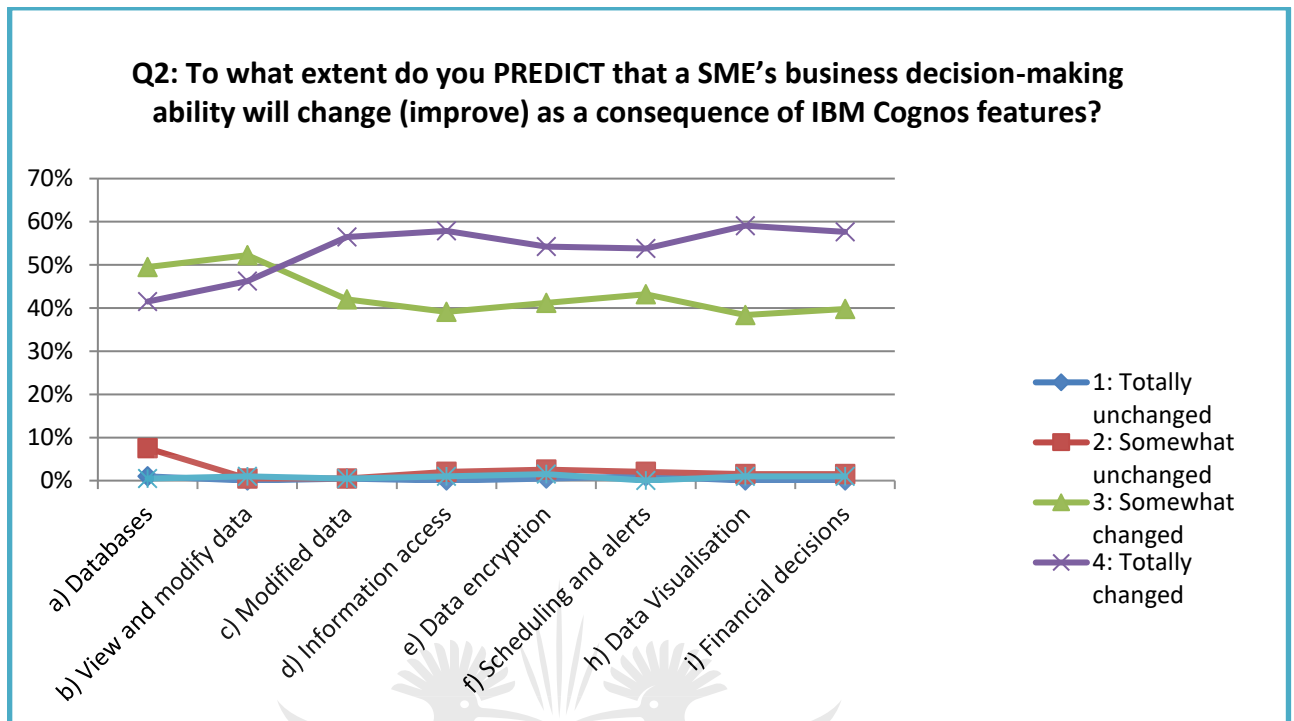


Figure 4.4: Predicting that SME's business decision-making ability will change as a consequence of IBM Cognos features (own source developed for this study, 2018)

The second question of the questionnaire was related with, to what extent it can be predicted that SME's business decision-making ability will change as a consequence of IBM Cognos features. Different set of features are described in the eight statements, a) to i) in Figure 4.4. The statements have specific themes such as databases are available to resolve issues, data is modified easily, solving queries, user will be allowed to access information, data is encrypted, scheduling and alerts, data visualisation and scheduling, and alerts helping in decision-making.

Figure 4.4 shows that apart from database availability and modification of data, all respondents PREDICT that decision-making in SMEs will totally change because of these IBM Cognos features: at h) data visualisation, at d) access to information, at e) data encryption, at f) scheduling and alerts, and that IBM Cognos would change SMEs' financial decisions for the better in the future, at i) of Figure

4.4, where the majority responses were in favour of totally changed. The trend line of totally changed is increasing with the number of features that are being identified.

Figure 4.5, question three showcases the statements in relation to the extent to which respondents prized certain IBM Cognos features above certain other features. The different features included:

- a) View data easily and conveniently
- b) Modify data easily and conveniently
- c) Modified data help the organisation to address the queries of users
- d) Access to relevant information
- e) Data encryption with the help of codes or passwords
- f) Scheduling and alerts allow keeping the information up to date
- g) Being made aware of any cost overruns or overbearing expenses
- h) Data visualisation helps to take better decisions in the organisation
- i) Scheduling enables the organisation to take better business decisions
- j) Scheduling enables the organisation to take better financial decisions
- k) Alerts enable the organisation to take better business decisions
- l) Alerts enable the organisation to take better financial decisions

In Figure 4.5 the results show that the last four statements at i) to l) in relation to scheduling, are prized features and the most prized feature of IBM Cognos was data visualisation, at h) 66.50%. Overall the results show that modifying data, view data easily, access to information, data encryption, scheduling and alerts, data visualisation, and making better financial and business decisions are considered highly important.

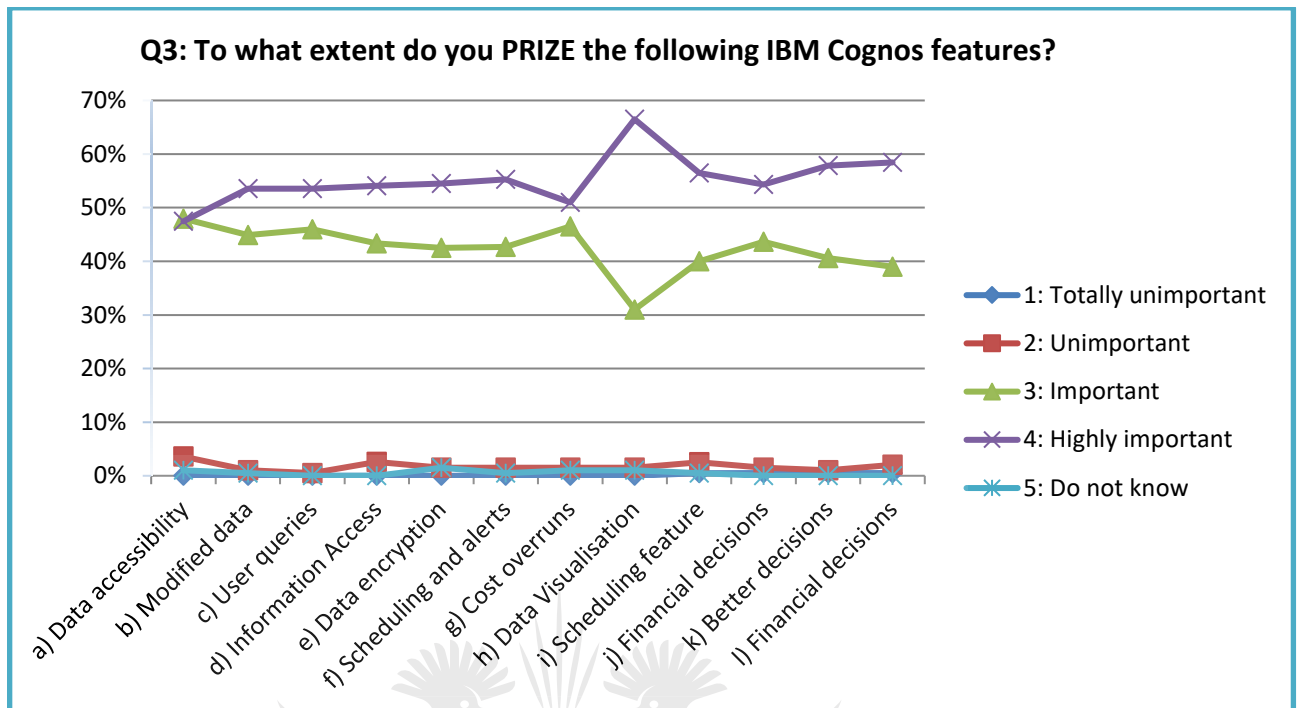


Figure 4.5: Prized IBM Cognos features (own source developed for this study, 2018)

In Figure 4.5, the trend line of highly important was highest at data visualisation helping in decision-making whereas lowest point of the highly important trend line was of first statement related to data accessibility.

Figure 4.6, question four, showcases PERCEIVE as the theme of this question. In this section of the questionnaire the objective was to collect data in order to determine the perception of the respondents related to features of IBM Cognos since the purpose of the research was to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. Perception of value is the fourth component of the signification framework used in this study (cf Section 1.5 and Appendix B).

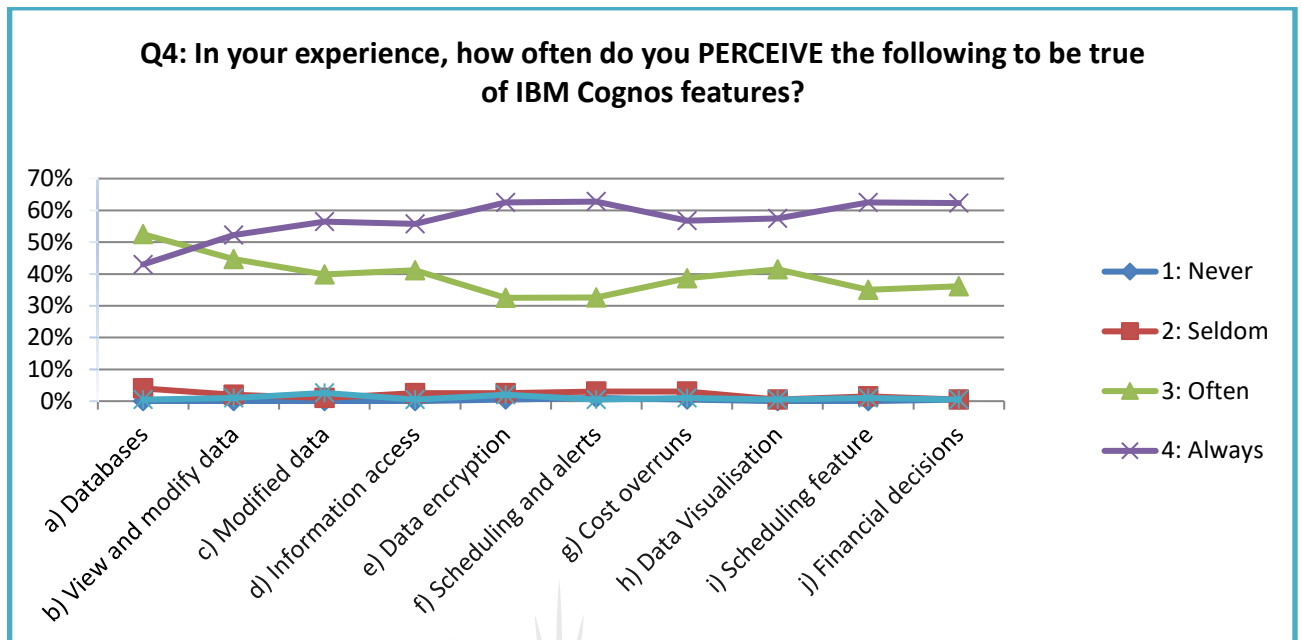


Figure 4.6: Identification of IBM Cognos features as perceived by respondents (own source developed for this study, 2018)

In Figure 4.6, the theme of question four was PERCEIVE. It means that the perception of the respondents related to features of IBM Cognos were utilised in order to identify IBM Cognos' fundamental features. For example, the features that were highlighted in the findings above such as the feature to view and modify data, view data easily, access to information, data encryption, scheduling and alerts, data visualisation, scheduling and alerts help in making better financial and business decisions. In this section of the questionnaire, the impetus is on whether these features of IBM Cognos are actually perceived as helpful or not. In Figure 4.6, the trend line of Always shows the respondents who perceive that these features always are true for IBM Cognos. The trend line shows that features at e) data encryption, f) scheduling and alerts, i) scheduling feature, and especially h) financial decisions, were perceived by the respondents as fundamental features.

Next, Figure 4.7, question five, showcases results related to the PRODUCT of IBM Cognos features.

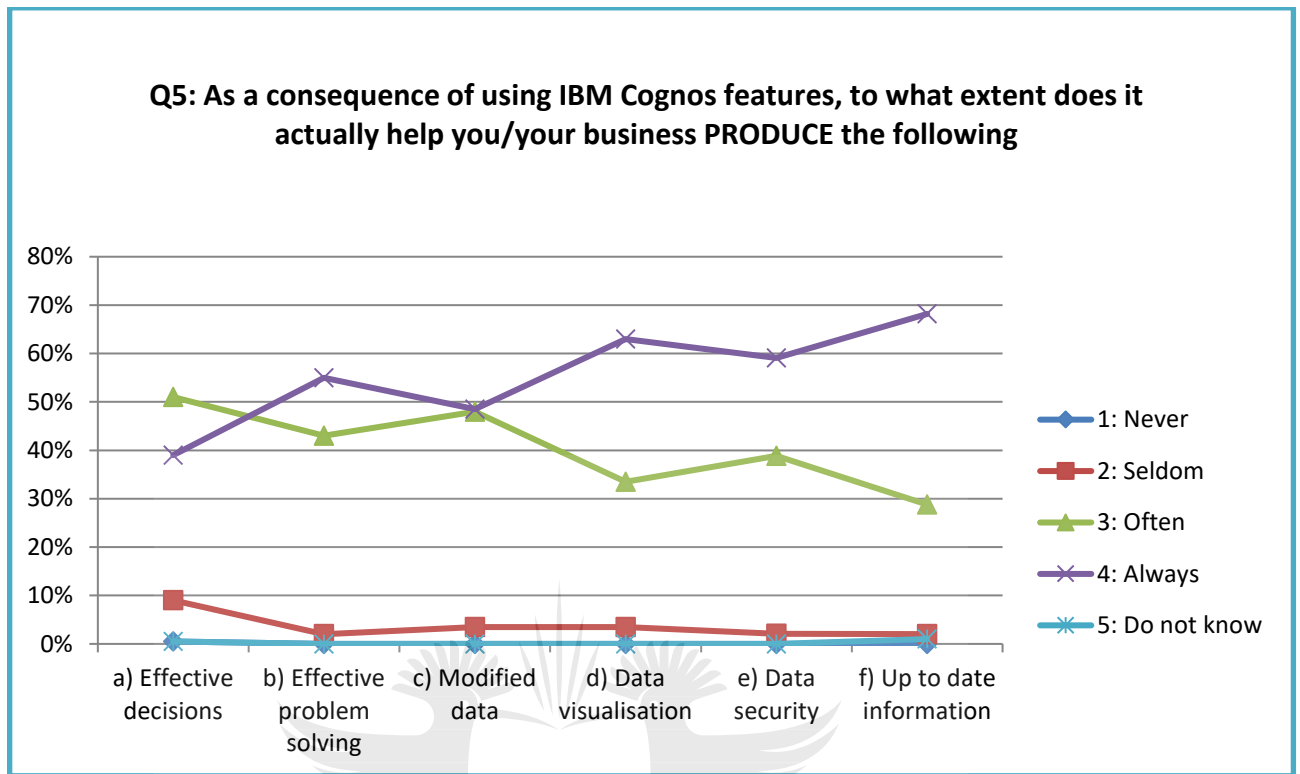


Figure 4.7: Product of IBM Cognos features (own source developed for this study, 2018)

Figure 4.7, depicts the results related to the PRODUCT of IBM Cognos features. The different statements that are part of this question include a) effective decision-making, b) effective problem solving, c) modified data, d) data visualisation, e) data security, and f) up to date information. On the basis of the results obtained in the trend line for Always, that data visualisation and up to date information were the two most produced features of IBM Cognos. For example, 51% of the respondents indicated that effective decisions were often a product of IBM Cognos, whereas 39% of respondents said effective decisions were always a product of IBM Cognos. On the other hand, 68% of the respondents indicated that up to date information was always a product of IBM Cognos, whereas 28% of respondents said up to date information was often a product of IBM Cognos.

The next question, illustrated in Figure 4.8, asked if the respondents agreed with statements relating to the features present in IBM Cognos in order to identify fundamental features.

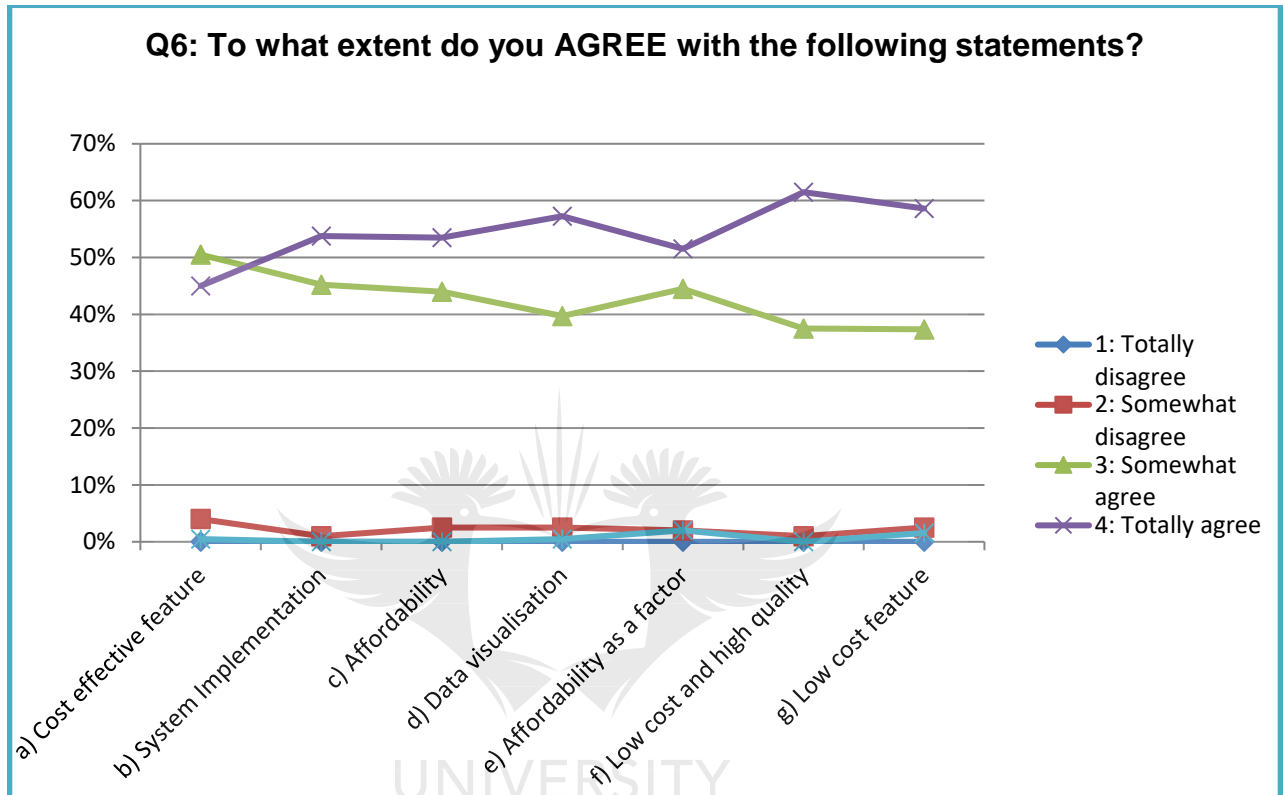


Figure 4.8: Fundamental IBM Cognos features (own source developed for this study, 2018)

In response to question six, illustrated in Figure 4.8 above, the respondents mostly agreed that the fundamental features required of IBM Cognos were: f) low cost and high quality, g) low cost, d) data visualisation, b) leads towards system implementation, and c) affordability, which should be part of SMEs' toolkit for making decisions. Affordability is important for SMEs, the small sized companies can opt for BI tools if they are offered at low cost and high quality and finally, cost overruns are avoided. The trend line of totally agree shows clearly that the majority of respondents have answered in totally agreement with the statements. Finally, the last question of the questionnaire was aimed at the relevance ascribed to IBM Cognos decision-making tools, illustrated in Figure 4.9.

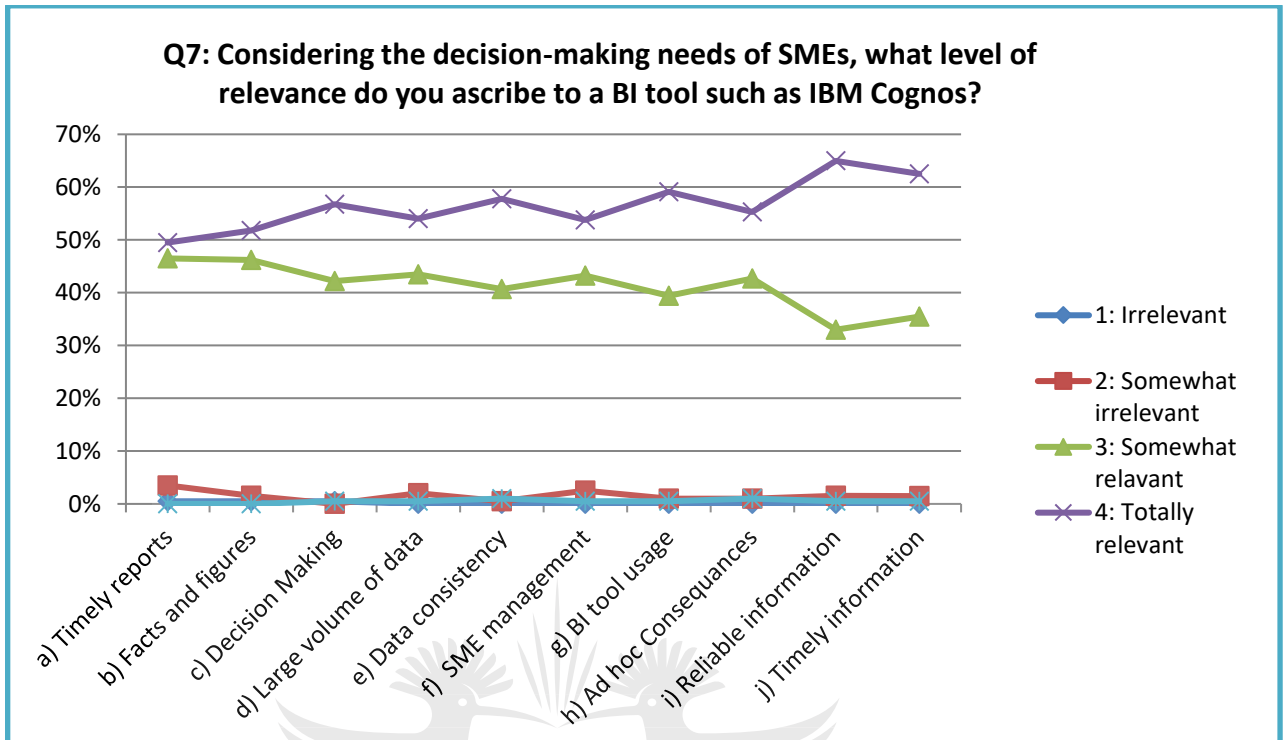


Figure 4.9: Relevance of IBM Cognos features (own source developed for this study, 2018)

Figure 4.9, question seven, showcases the relevance ascribed to IBM Cognos features in consideration of the decision-making needs of SMEs. All the statements that are shown above in the figure are linked with the features of IBM Cognos. The decision-making in SMEs is done on the basis of large volume of data, availability of facts and figures and how BI is able to help organisation to gain a better position. The trend line of totally relevant shows that highest number of respondents agreed that reliable information is important for the SMEs to take decisions as 65% of respondents agreed with it.

At the start of the questionnaire, illustrated in Figure 4.3, it was revealed that IBM Cognos is engaged in offering services to the customers that require data information and analytics for improving their overall productivity where the SMEs are dependent on the features of IBM Cognos to apply different methods and advanced techniques for data security and information. However, in Figure 4,9, it has been contradicted that since SMEs are dependent on the overall decisions that they make

for the company hence, it is evident that a SME has to incorporate advanced ways of business intelligence as a tool to achieve objectives. Moreover, if IBM Cognos is rendering advanced features for SMEs, in a few years from now, SMEs will be contributing a significant share in the country's prosperity (*cf* Hüsing *et al*, 2015; Pereshybkina, *et al*, 2017; BMI Research Technology Report, 2018; Jones and George, 2018).

At the next set of questions, illustrated in Figure 4.4 to Figure 4.7, the sets of questions that were asked from the respondents were related to whether they agree with given statements or not. The patterns of answers obtained to questions were different and unique. Most of the respondents believed that they agree that they will opt for BI tool which is of low cost and high in quality whereas some also answered those low cost features of IBM Cognos help them to avoid cost overruns.

In addition to this, some of the respondents had also shared that they somewhat agree with the first three statements that features of IBM Cognos are cost effective, systems can be implemented easily in SMEs and since IBM Cognos features are affordable therefore SMEs will be able to report quickly and easily. This evidently shows that the respondents are well aware of how effective are business intelligence as a tool for growing companies. However, few respondents only stated that they do not know about the features and benefits of IBM Cognos for SMEs because all the other respondents participated and eagerly answered all questions. In comparison with the response of the other questions, a similar pattern can be analysed.

The pattern or trend shown in these questions is associated with the technical knowledge of respondents mainly the managers, developers and consultants. It clearly shows that they are aware of the benefits and they know that with the current advancement in technology, SMEs are playing a vital role in stabilising the economy. Moreover, the statements that are considered to be strongly agreed depict that the respondents feel that if business intelligence continues to become part of their business models and processes so, it will take few years only for SMEs to gain strong

position in market and contribute in increasing employment. IBM Cognos has become the base of helping the SMEs in making effective decisions for growth and development.

The last two sets of questions asked from the respondents were related with level of relevance is ascribed to business intelligence type of tools such as IBM Cognos. On the basis of the results of the study, it was found that majority of the respondents feel that IBM Cognos gives the chance and opportunity to SMEs to make decisions with reliable information as well as also helps in taking timely decisions. Other factors of relevance that were answered by the respondents include availability of facts and figures, large volume of data is kept protected for making decisions, and most importantly convenience and consistency of SME management plays a crucial role in making decisions.

This then concludes the reporting of the findings of the questionnaire conducted with BI consultants, SME BI developers and SME managers who shared what they believed is the significance of IBM Cognos features. The next section presents the themes that emerged based on respondents current perception of BI tools.

4.4 Current perception of BI tools

The data provided above in the form of graphs and tables clearly show that BI is a broad field and can be used as a tool for solving various issues faced by the SMEs. Three themes emerged from the data, namely; the SME business decision-making context, affordability, and BI tool features, in other words, a BI tool is able to solve issues through their features. All the questions asked from the respondents were associated with the features of BI and how they are effective for decision-making in SMEs and the results can be grouped in these three categories:

a) In accordance with the statistical data extracted from the results of respondents, it is identified that current perception of respondents is that, BI features

such as modifying data, data encryption with codes, scheduling and alerts, data visualisation, information about costs overruns and expenses and security of data. These are some of the ways through which BI plays a significant role in decision-making by SME's.

b) The BI tool allows users to view data with the help of their data analysis techniques which are applied for breaking the complex data into simpler one.

c) Although the BI tool allows the users to modify the data because the software allows the users to change the data and add their information as required, the affordability is more important for SMEs. Small sized companies can opt for BI tools if they are offered at low cost and high quality and finally, cost overruns are avoided. Therefore the opinion of all respondents has also agreed that BI would be very helpful in terms of managing the data more systematically if it was affordable.

Next, the discussion of the findings elaborates on these three themes.

4.5 Discussion of findings

The research objective was to analyse the significance of BI tools in the SMEs by identifying affordable and suitable features from IBM Cognos based on SMEs' needs and business functions using a signification framework. It has been discussed in the literature review section that the one important concern for SMEs has been the management of data required by SMEs to remain sustainable and competitive. From the discussion in the literature review section the indication was that there exists a certain type of data that SME need to deal with. For example, the data such as customers' information, product-related data, employees' databases and other are some of the most commonly data that SMEs need to effectively manage in order to remain sustainable and competitive.

The literature review section revealed that BI tools convert data into meaningful information, which in return helps firms to take appropriate decisions (Wagner *et al*, 2003; Gangadharan and Swami, 2004; Sin Tan *et al*, 2009; Olszak

and Ziemba, 2012; Ramrathan and Sibanda, 2014; Wagner and Paton, 2014; Cascetta *et al*, 2015). Furthermore, the research conducted by Ghazanfari *et al* (2011), Khan and Quadri (2012), and Roitzsch *et al* (2012), has identified that organisations like SMEs need to manage the data effectively in order to remain competitive and sustainable. This is consistent with the findings from this study's primary data which has identified that SMEs need to have all the reports on time.

This implies that organisations that successfully manage to update and manage data efficiently, acquire sustainability and competitive edge from others. It is mainly due to the reason that businesses through efficient data management approaches enable themselves to improve the overall efficiency of their businesses operations which in the consequences assists business to achieve an edge over their competitors and to further improve the sustainability of their businesses.

Furthermore, the study has also suggested that for SMEs, one important and beneficial action that helps SMEs to remain competitive and sustainable is to effectively manage the organisation data and by keeping the record of the organisation in the form of organisation's facts and figures. The findings of this study have suggested that business that effectively manages their data in terms of managing operations record assists SMEs to achieve competitive edge and sustainability. Furthermore, the results of this study also highlight that when organisations focus on effectively managing their data and keep their record, enable themselves to take a better decision on the basis of the facts and figures. This is in line with the literature review findings that efficient management of the records that are in the form of timely and updated facts and figures help businesses to predict and propose better policies and decisions for the organisation.

The obtained results show that BI tools resolve several issues for the organisation. For instance, it is evident from the results that around 92% of the respondents were agreed with the statements that by using the BI tools, organisations were able to resolve their decision-making complications.

Furthermore, the protection of the data has been a concerning issue for the organisations.

It has been highlighted in the obtained results that 78% of the respondents were agreed with the statement of that BI tools guard against the impulsivity in SME decision-making process and 85% of the respondents were agreed with the statement that BI tools combat with the negative consequences of ad hoc SMEs decision-making. This implies that BI tools are effective in addressing users' queries. Furthermore, 71% of the respondents were agreed with the statement that BI tools give ability to SMEs access timely information. In this concern, it can be stated that BI tools facilitate access to relevant information.

Furthermore, it has also been discussed in the literature review and is now being validated by the obtained results that the SMEs have been facing the challenges to preserve the large volume of data and to maintain its confidentiality. The obtained results show SMEs in order to maintain the confidentiality of their data utilise different tools and approaches to overcome the challenge of data confidentiality. This helps businesses to remain competitive and sustainable because it has been observed that businesses that fail to protect their data are often complaining about significant loss which is occurred because of the loss of confidential data.

It has also been discussed in the literature review that decision-making capability of businesses like SMEs is an important factor which ensures the sustainability and provides them with a competitive edge. It is due to a reason which can also be validated through obtained results that data and information of the particular organisations need to efficiently manage and monitor because this is the data which keeps informing businesses about current potential along with the successful or failed decisions that had taken in the past by SME. However, when SMEs focus to take consideration of effective management of their data, the efficiency and performances are increased that ultimately results in the maintained sustainability and competitive edge of SMEs.

In addition to the above, it was also determined that the findings of the study have clearly revealed that respondents had shared their responses and given their honest responses in form of answering all the questions of the questionnaire. Throughout the findings and while evaluating each question, it has been observed that BI consultants, SME BI developers and SME managers in Gauteng, South Africa, know the importance of BI and they will also be able to shed light on the current scenario of SMEs very well.

The respondents had shared that the SMEs can benefit from the cost-effective techniques and data is encrypted with the help of different codes and passwords which ultimately helps SMEs in securing their data and making decisions on the basis of available data. Therefore, the respondents find it more helpful to enhance their business performance and overall productivity. All these findings help achieve the aim of the study, namely to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. For example, it was found from the existing literature as well as the findings of the empirical study that IBM Cognos is perceived as a BI tool responsible for ensuring that SMEs to get access to data that can be modified, interpreted, easily analysed and visualised.

However, despite of what respondents perceived, the respondents predicted that Bi tools will even more popular if it was affordable. From the literature, IBM Cognos itself is a huge name and data encryption, data tools and other useful techniques are applied by many organisations for making information more organised. The research results of this study indicate that better and more effective decisions can be made if SMEs had access to cost effective methods of decision making. The issue of affordability of BI tools is evident.

The literature review showed that IBM Cognos is useful for making decisions and there are various types of features that are offered by IBM Cognos, for example, a prominent feature is its smart search options. Theses IBM Cognos features enable organisations to collect and analyse any type of complex data and be able to access

all types of information. Based on the literature it could be deduced that IBM Cognos could also help SMEs to make decisions about their productivity and how they can enter into the competitive market. However, the research findings presented in this chapter determined that many presumed, perceived, predicted and prized IBM Cognos features are relevant for SME business decision-making, the issue of affordability affect what IBM Cognos features could produce in the context of SMEs in Gauteng, South Africa.

A summary of the research findings may be found in the next chapter.



CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter provides the overall view of the study to the readers and scholars by discussing the research conclusions and recommendations. As mentioned in Chapter 1, the aim of the study was to determine which of the fundamental features of IBM Cognos are affordable features for addressing the business needs of SMEs. The objective was to analyse the significance of BI tools in the SMEs by identifying affordable and suitable features from IBM Cognos based on SMEs' needs and business functions using a signification framework. This study is relevant because SMEs in South Africa have been facing obstacles in its decision-making due to lower access to credit, constraints in budgets, and the IT landscape as it moves towards the Fourth Industrial Revolution.

Therefore, the study had been conducted on analysing the fundamental features of IBM Cognos that may help in improving the decision-making process of SMEs. The first section of this chapter, Section 5.2, presents the summarised findings that consist of the overview of the preceeding chapters, which incorporates the literature review and empirical research into one conceptual framework (*cf* Figure 5.1). Then the next section mentions future areas of further study and it provides a direction in further improving the study regarding the fundamental features of BI tools of relevance to SMEs' business needs. Recommendations are made as to how the SMEs located in South Africa can improve decision-making process based on the fundamental features of IBM Cognos. The last section of this chapter is the conclusion of the study.

5.2 Summarised findings

The research objective was to analyse the significance of BI tools in the SMEs by identifying affordable and suitable features from IBM Cognos based on SMEs'

needs and business functions using a signification framework. Hence, several research questions had been drawn for understanding the fundamental features of IBM Cognos as well as the data of the SMEs that need to remain sustainable and competitive. Empirical research had been mainly conducted by means of online questionnaire that had been distributed to respondents. The sample size consisted of 200 participants in which 80 of the participants were BI consultants from consultancy firms, 60 were the SME BI developers, and 60 were the SME managers. Once the data had been collected, it was analysed through the statistical tools and techniques. The tools used for analysing the data were frequency analysis.

The frequency analysis findings highlight certain themes from the literature review that match the variables that were present in the signification framework *viz* IBM Cognos BI tool features, BI tool affordability, and SMEs' decision-making. Figure 5.1 incorporates the research findings into the conceptual framework developed by this study. The conceptual framework links the fundamental features of BI tools to SME business decision-making with the mediating variable of affordability. In Figure 5.1, the key features of BI tools include; intuitive interface, contextualising smart search, data protection, report integrity, scheduling and alerts, and best automatic visualisations. The signification framework served as a useful structure to bring together the most important aspects of SME business decision-making in the study's conceptual framework. These aspects include; consistency, comfort, avoiding impulsivity, increasing acceptance and commitment, and increase legitimacy. The mediating link between a BI tool's key features and SMEs' decision-making, is affordability. Again, the significance framework served as a useful structure to identify and group together the most important aspects of affordability, namely; cost effectiveness, availability of information, reporting quickly and easily, and avoiding cost overruns. Figure 5.1 presents this study's conceptualisation of the significance of affordable key features of BI tools in the context of SME business decision-making.



Figure 5.1: Significance of affordability of BI tools in SME business decision-making context (own source developed for this study, 2018)

The research objective was to determine the fundamental features of IBM Cognos that supports data needs in addressing SME business decision-making. Based on the research findings, Figure 5.1 presents a conceptualisation of the significance of affordable key features of BI tools in the context of SME business decision-making. From the literature review, BI tools were found to be mostly used by large organisations due to aspects related to affordability. This does not mean that SMEs have not been utilising BI tools. In fact, Roitzsch *et al* (2012), and Pereshybkina *et al* (2017) describe the benefits of BI tools for business decision-making. For example, IBM Cognos supports SMEs in planning, monitoring and forecasting and can be used in platforms such as notebook, tablet, smart phone, and desktop computers (Chung and Chung, 2013; Rusaneanu, 2013).

The main purpose of the IBM Cognos BI tool is that it ensures that the organisation obtains any kind of data through convenient access that is gathered with ease and at faster rate. This study identified various key affordable features of IBM Cognos based on the existing studies that are said to be useful in the SME business decision-making context. However, based on this study's empirical research of SMEs in Gauteng, South Africa, the presumed, predicted, prized, perceived, and produced value indicators of this study's signification framework indicate that IBM Cognos' intuitive interface is one of its most significant features. It relates to the ease and convenience of authoring content, building, designing, and securing the reports to the organisation that overall improve the decision-making process.

From the literature review, another fundamental feature of IBM Cognos BI tools is to conduct contextual smart search that enables the organisation in gathering and collecting all sort of data and information (*cf* Section 2.6.3; Rainer *et al*, 2013). IBM Cognos supports organisations in improving their data privacy and data protection that are considered important dimensions for improving the quality of the data. For example, Kaisler *et al* (2013) indicated that organisations, whether large or small, are required to keep data safe and confidential. IBM Cognos supports organisations in keeping their data secure through the help of codes and passwords. Also, from the literature review, another fundamental feature of IBM Cognos has been determined *viz* measuring through data along with scheduling and alert features (Ebbers *et al*, 2013). For example, when the organisation has been experiencing overbearing expenses, the IBM Cognos would alert the management regarding its expenses. The last fundamental feature of IBM Cognos that had been determined through the literature is the visualisation of the data. The data collected from the IBM Cognos is represented in a user-friendly and an easily interpreted manner that supports the management in making effective decision.

Similarly, the results gathered from this study's questionnaire, indicated that the same fundamental features are presumed, predicted, prized, perceived, and

produced. That is, IBM Cognos BI tool features support the organisation in viewing and modifying the data easily and conveniently, the data collected from the IBM Cognos is highly protected and secure due to passwords and codes, the scheduling and alerts support the organisation in updating the information as well as avoiding overbearing costs, and the scheduling and alerts features help the organisation in making better financial decisions.

Furthermore, the research results demonstrate that the fundamental features of IBM Cognos brings changes to the decision-making abilities that overall brings improvement to the decision-making. IBM Cognos has helped the SMEs in making effective decision based on the relevant information. It has also supported in solving the problems and issues of the organisation if the data is relevant. The features of scheduling and alerts have provided help in updating and modifying the information. So far, the above summarised findings address one of the two sub questions stated in Section 1.4, namely, *which affordable features found in IBM Cognos can address the business needs of SMEs?*

The other sub question was, *What are the data needs for SMEs looking to remain sustainable and competitive?* Based on the critical analysis of the literature review, there are various types of data that are available in an organisation that consist of customer's data, employee database, financial data, product-related data and many others. It is imperative for SMEs to manage these particular data as it helps in remaining sustainable and competitive. In light of the research by Roitzsch *et al* (2012), and Seuter (2014), it becomes clear that SMEs increasingly face many challenges regarding the large size of data, lack of knowledge regarding the analysis of data, and lack of information. Therefore, SMEs are required to adopt BI processes such as the IBM Cognos for storing and analysing the data in an effective and efficient manner. According to Adkison (2013), IBM Cognos features enable the user for exploring and assembling the data for the purpose of generating a unique business perspective. Moreover, the BI tools could support in representing the data in user-friendly manner that can be easily interpreted by the management.

The study of Steinrowska-Streb and Steiner (2014) has indicated that IBM Cognos has led to the improvement of data consistency that supports in the decision-making process with respect to the facts, figures and information. The consistency of the data has enabled the management for analysing the situations logically as well as providing plausible solutions for solving issues and problems. Therefore, consistency is a critical element required in the data among the SMEs for improving the decision-making process (*cf* Figure 5.1, top right). This study's primary data corroborate the literature review (*cf* Section 4.4; Figure 4.9).

The research findings highlight that IBM Cognos plays a crucial role on the decision-making process as it enhances comfort and convenience, but if it is not affordable, then it does not address the critical needs of the decision-making process in the SME context. The use of the BI tools such as the IBM Cognos supports the organisation in gaining authentic and reliable information that overall improves the reliability of the data. SME would most likely be able to gain competitive advantage through accessing reliable data with the help of BI tools, but this study highlights the role of affordability as the mediating variable in the SME business decision-making context.

Moreover, the literature review emphasised that data must be reliable for improving the accuracy of the decision-making process that would lead to sustainable growth of the organisation (*cf* Section 2.7). For example, Pettigrew (2014) emphasises that data must contain legitimacy that helps the organisation in maintaining its data safe and secured. This means data must be gathered and utilised according to the law which would lead to making an ethical decision to address business problems and issues. The fundamental features of the BI tools are highly important among the SMEs for the purpose of providing timely information. The literature review has shown that IBM Cognos supports organisations in saving time from data collection, data entry and manipulation. However, many BI related processes require IT professionals, which may pose a problem to SMEs as many of

the organisations lacks a skilled IT professional which leads in difficulties of collecting reliable and analysing data.

Therefore, the literature review finds, SMEs must have skilled and talented IT specialist that would be able run, manage and optimally utilise a tool such as IBM Cognos which would overall result in improving the data needs of the SMEs. On the contrary, the study of Yeoh and Popvic (2016) has indicated that the use of IBM Cognos software would help the users in analysing, assembling and extracting the data *without even having technical knowledge*. Many of the SMEs are faced with the risk of losing data or stolen data; therefore, the companies are required to implement strong protection software for securing the data as well as having a physical back-up of the data in case of corruption.

The effective process for maintaining the data privacy and protection is through implementing the IBM Cognos BI software. This would support the SME in ensuring that the confidential data are protected and secured. Conclusively, the needs of SMEs on the critical data for remaining sustainable and competitive is through using the BI tools to improve the data consistency and obtaining reliable data for overall improving the decision-making process for remaining competitive and sustainable in the competitive environment.

As mentioned above, one of the sub questions of the study was to determine the affordable features found in IBM Cognos for addressing the business needs of SMEs. The research question has been answered through conducting the questionnaire survey and had been analysed through quantitative reasoning. Majority of the respondents has indicated that the IBM Cognos has improved the data visualisation that has ultimately contributed towards the decision-making process. Similarly, the study of Chen and Zhang (2014) has highlighted that the automatic visualisation of the data through the use of BI tools provides recommendation for making effective and efficient decision-making. The primary data of this study corroborate these other studies, for example, data visualisation is a fundamental feature of IBM Cognos as evidenced by the presumed, predicted,

prizes, perceived, and produced value indicators discussed throughout Section 4.3 and Section 4.4.

Also, the IBM Cognos alert system helps the organisation and management for taking better financial decision through addressing the overbearing costs or any other high expenses for the purpose of reducing it. For example, half of the participants have agreed with the statement that the use of IBM Cognos always enables the organisation in resolving the issues through effective decisions and the other half said IBM Cognos sometimes helped the organisation in solving the issues. Similarly, the literature review and empirical findings agree that SME business decision-making must be based on the authentic and reliable information in which the use of IBM Cognos has enabled the organisation in acquiring authentic and reliable information for making effective decisions.

Again, the literature review and empirical findings agree in demonstrating that the affordability of the fundamental features of IBM Cognos along with its ease or convenience of use can provide the business analytics on improving SMEs' business activities that consist of reporting, analysis, planning, forecasting and budgeting. The results from this study's questionnaire iterate the study of Steinerowska-Streb and Steiner (2014), that the facts and figures must contain consistency for the purpose of improving SMEs decision-making process. It also iterates the issue of affordability and corroborate the findings of Ebbers *et al* (2013), investigating the actual purchase price of IBM Cognos along with allocation of maintenance and support costs.

The research participants highlighted the benefit of IBM Cognos for SMEs *viz* SMEs are able to develop the reports more quickly and easily. The empirical findings iterate the literature review, for example, Hermida *et al* (2013) has indicated that the major components of the BI tools is contextualised smart searching so that the organisation is able to search the data easily that overall helps in preparing the report more quickly and easily. Moreover, the report by IBM (2012), albeit biased, reveals the features of IBM Cognos that provide proactive management and task-based

system to the IT department for managing the data cost effectively, which corroborates the mediating role of affordability as illustrated in Figure 5.1.

Overall the results have indicated that the majority of research participants were mostly in agreement with the elements of this study's significance framework. Mainly, three themes emerged from the study: 1) the SME business decision-making context, 2) affordability, and 3) BI tool features. The significance framework was introduced in Section 1.5 in order to provide this dissertation with a structure that would guide the process of developing a data collection instrument. In this manner it was possible to operationalise the research questions.

Generally, the analysis and interpretation of findings in Chapter 4 in the form of graphs and tables indicate that BI is a broad topic and IBM Cognos is an instrument that helps in performing a wide range of activities that supports in solving issues and problems that are faced by the SMEs. The research participants had a good knowledge regarding the features of BI and also the methods for effective decision-making. The results of respondents helped this researcher to identify the fundamental features of IBM Cognos, namely; intuitive interface, contextualising smart search, data protection, report integrity, scheduling and alerts, and best automatic visualisations.

Specifically, the analysis and interpretation of findings in Chapter 4 corroborate the research of South African researchers such as Mabinane and Edoun (2017), Mayeng and van Vuuren (2017), Ndjike and Rambe (2017), Nguza-Mduba (2017), Rankhumise (2017), and Siwadi (2017), emphasising that the affordability and cost effectiveness of the BI tool plays an important role among the SME for reducing the cost as well as improving the functions effectively. Affordability has a mediating role in the SME business decision-making context. Affordable BI tools could empower SME employees as well as making them effective decision-makers through reducing the time spent on data entry and manipulation.

In conclusion, this study utilised a signification framework in order to determine the fundamental features of BI tool for SME business decision-making. The findings mostly focused on the lowering of cost and avoiding cost overbearing through the alert system. The IBM Cognos scheduling system features provide the opportunity to the management to keep data updated. Affordable BI software would benefit SMEs in protecting and securing a growing volume of data.

5.3 Limitations and future Implications

This study has been formulated by utilising the quantitative research design in which quantitative aspects have been covered regarding the BI tool for SMEs' decision-making needs. The researcher chose to perform the quantitative data analysis without external help from the University of Johannesburg's Statistical Consultation Services. In this manner the researcher enters the minor dissertation for examination with a truthful presentation of the researcher's ability to conduct quantitative research. However, future studies would benefit from a larger sample size and multivariate factor analysis. Thus, there is opportunity for future studies with an increased sample size in order to widen the scope of their study. A larger sample size would help in determining the average value of each of elements present in signification framework of this study. Future studies could follow a longitudinal design which involves a greater sample to increase the significance level.

Though this study provides sufficient evidence regarding BI, highlighting the fundamental features of BI tools for the decision-making needs of SME, the study had a limited scope – it only investigated one BI software. By including other BI systems, future researchers would be in a better position to develop an enhanced signification framework of BI tools for SME business decision-making.

Lastly, signification frameworks are more likely associated with qualitative studies than quantitative studies. But, the researcher desired to develop quantitative data analysis skill. Although the quantitiave research approach was appropriate, this study lags the qualitative evidence that would have made it a richer study. Thus,

future studies should also add qualitative evidence in order to further diversify the findings. It is due to the reason that the qualitative evidence allows researchers to explore a research study in a more critical and in-depth manner.

5.4 Recommendations

This study presents a signification framework of a BI tool for SME business decision-making. Although this study identified the fundamental features of IBM Cognos, the following recommendations can be effective for SMEs while adopting and implementing other BI tools within the organisation:

Firstly, it is a notable fact that BI tools play an instrumental role in business decision-making. Therefore, it is recommended to SMEs to acquire such BI tools that can assist SMEs in their business needs. Even though there have been developed various data management software and tools that can provide assistance to SMEs in managing their daily functions, this study's signification framework shows that BI tools provide assistance to SMEs regarding their decision-making needs.

Secondly, though BI tools are assumed as the best option for SMEs by which the information of the organisation is well managed along with the decision-making operation; it has also been identified as an expensive decision-making capability. The recommendation is to carefully investigate the presumed, predicted, prized, perceived and actual produced value of the BI tool's decision-making functionality prior to its acquisition.

Thirdly, BI software developers together with SMEs should discuss the mediating role between the required features and their affordability. This forms part of an important aspect for SMEs to push for the adoption of BI tools. It was evident in the research, that the lack of BI adoption in SMEs is mostly likely due to the affordability aspects, hence affordable BI features that can ensure the quality of the information will be desired by SMEs that look to remain competitive.

Fourthly, because this study did not focus on technical aspects relating to BI system management and due to the reasons that SMEs hardly have the resources to hire experienced IT professionals, it is necessary for SMEs to consider the affordability aspects of BI tools that requires less maintenance and are more self service orientated and requires little or less IT background. Therefore, this continually forms part of an important step to ensure that there is sustainable efficient decision-making process within the management team.

5.5 Conclusion

Recently, the SMEs of South Africa have been facing various problems and issues in respect to budgeting, decision-making, lower availability of credit, and technology developments linked to the Fourth Industrial Revolution. Therefore, the study had been conducted on analysing the BI tools that may ultimately improve the decision-making needs of the SMEs that are established in Gauteng, South Africa.

The study primarily focused on IBM Cognos, which is a BI tool used for collecting and analysing the data for the purpose of making decisions and the research was divided into two sub questions. Based on the literature, IBM Cognos contains a wide range of features that has ultimately contributed towards the decision-making process. The features in the IBM Cognos consist of the smart search in which the organisations are able to gather data sources that enable them to prepare reports quickly and easily. Moreover, it has also supported the organisation in improving the quality of data through data protection and security.

Based on the one sub-question, the critical data needs for SMEs for looking to remain sustainable and competitive are the customer's data, employee database, financial data, product-related data and others. It is critical for the SMEs to manage these particular data for the purpose of remaining sustainable and competitive in the market. Thus, the SMEs can be expected to implement BI tools such as the IBM Cognos if they aim to address the critical data needs for their business.

Based on the other sub-question, it is critical for SMEs to be able to identify the fundamental features of a BI tool. These include features to maintain the confidentiality of the business information. The BI tool provide codes and passwords protecting the information. The other features that are also included on the BI tool IBM Cognos is scheduling and alerts. The scheduling enables the management to maintain and update the data whereas alerts are given to the SME management in case of overbearing costs and high expenditures.

Based on research findings, the conceptual framework in Figure 5.1 had been formulated for determining the importance of IBM Cognos on SMEs' decision-making needs. A questionnaire has been administered to the participants that consisted of SME BI developers, SME managers and BI consultants. The questionnaire was based on a signification framework aimed at determining the affordable fundamental features found in IBM Cognos which helps in addressing the needs of SMEs. The fundamental features are; intuitive interface, contextualising smart search, data protection, report integrity, scheduling and alerts, and best automatic visualisations. Although these features of IBM Cognos may lead large organisations to being cost effective, the theme of affordability emerged in this study as a mediating variable in the conceptual framework, illustrated in Figure 5.1.

The IBM Cognos feature of data visualisation has proven to assist SMEs in analysing the data effectively for making decisions. Moreover, the tool has helped the participants in gathering reliable information and avoiding any impulsivity in the decision-making process that may cause negative impact on the sustainable growth of the organisation. Based on the empirical findings, the SMEs established in South Africa should adopt the IBM Cognos tool for supporting its decision-making process and needs. Moreover, the tool would also help improve the consistency of the facts, figures and information that are available for effective decisions. It would provide comfort and convenience to the employees and users for collecting and analysing the information.

In conclusion, the fundamental features of a BI tool support SMEs' business decision-making in formulating solutions based on the realistic issues. By utilising the affordable features of a BI tool, it is possible to make effective decisions that would improve the growth and profitability of the business. Thus, IBM Cognos is an important tool for SMEs in that it aids in gathering relevant data and interpreting the data for making effective decisions.



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CONSENT FORM

Study	Signification framework of a BI tool for SME's business decision-making
Degree	MCom (Business Management)
Faculty	College of Business and Economics
Objective	Obtain consent from research participants in writing and set out the conditions of participation

I, the undersigned, (Mr / Mrs / Ms) _____ hereby indicate that I have read and understand the conditions set out below for participation in the above-mentioned research. I at this moment give written permission to the researcher, that he may conduct this online survey for data collection, given the following conditions of participation:

- Participants will at all times be fully informed about the research purpose and process; if requested, online survey questions will be provided to participants in advance.
- Respondents will have the option to participate by providing answers to questions in an online survey format, answering and submitting their response to the researcher. Therefore, professionalism etiquette will govern the survey process, through communication, formally requesting respondents to participate in ten minutes online survey.
- The survey responses will be recorded once submitted and analysed using a secure survey tool; the researcher undertakes to store data in a secure environment.
- Participation is voluntary and opportunity to comment on the findings from the online survey 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, the keeping of agreements and loyalty in interpersonal relationships are central to the reputation of the researcher, the research supervisor, and the educational institution. For this reason, the personal and corporate identity of the participant and his or her affiliated institution will not be made public.

Please note that by clicking **OK** you do agree to participate in the study.

Name: Research Participant

Terminology and abbreviations:

- **BI:** Business intelligence refers generally to the technology, tools and applications used to “help a business acquire a better understanding of its commercial context” and is often used to describe the “collected information itself” (Ryan, 2009:46).
- **SMEs:** Small and medium sized enterprises represented by between 5 and 1000 users of the BI tool and features.
- **Presume:** To suppose that (a specified thing) is the case on the basis of probability (likelihood).
- **Predict:** To say or estimate that (a specified thing) will happen in the future or will be a consequence of (a specified thing).
- **Prize:** To value (a specified thing) as extremely highly valuable.
- **Perceive:** To interpret or regard (a specified thing) in a particular way.
- **Produce:** To lead to or cause (a specified thing) to happen or exist.

QUESTIONS

1. To what extent do you **PRESUME** the following statements to be true of IBM Cognos features?

1: <i>improbable</i>	<i>Totally</i>	2: <i>Unlikely</i>	3: <i>Likely</i>	4: <i>probable</i>	5: <i>Do not know</i>
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Please select only one option per statement

a) If all the databases are available, IBM Cognos allow decision makers to resolve issues in the organisation	1	2	3	4	5
b) With IBM Cognos, it is possible to view and modify data easily and conveniently	1	2	3	4	5
c) Modified data help the organisation to address the queries of users	1	2	3	4	5

d) With IBM Cognos, the user is allowed access to relevant information	1	2	3	4	5
e) Data is being encrypted with the help of codes or passwords	1	2	3	4	5
f) The scheduling and alerts allow keeping the information up to date	1	2	3	4	5
g) IBM Cognos alert the businesses of any cost overruns or overbearing expenses	1	2	3	4	5
h) Data visualisation helps to take better decisions in the organisation	1	2	3	4	5
i) SMEs are provided with the feature of scheduling in IBM Cognos	1	2	3	4	5
j) Scheduling and alerts enable the organisation to take better financial decisions	1	2	3	4	5

2. To what extent do you **PREDICT** that a SME's business decision-making ability will change (improve) as a consequence of IBM Cognos features?

1: <i>unchanged</i>	<i>Totally</i>	2: <i>unchanged</i>	<i>Somewhat</i>	3: <i>changed</i>	<i>Somewhat</i>	4: <i>changed</i>	<i>Totally</i>	5: <i>Do not know</i>
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Please select only one option per statement

a) If all the databases are available, it will allow to resolve issues in the organisation Available databases for resolving issues.	1	2	3	4	5
b) It will be possible to view and modify data easily and conveniently View and modify data easily and conveniently	1	2	3	4	5
c) Modified data will help the organisation to address the queries of users Modified data for addressing user queries	1	2	3	4	5
d) The user will be allowed access to relevant information Allowed acces to relevant information	1	2	3	4	5
e) Data will be encrypted with the help of codes or passwords Data encrypted	1	2	3	4	5

f) The scheduling and alerts will allow keeping the information up to date Scheduled alerts	1	2	3	4	5
g) Data visualisation will help SME to take better decisions in the organisation Data visualisation	1	2	3	4	5
h) With scheduling and alerts the SME will be able to take better financial decisions Scheduling and alerts	1	2	3	4	5

3. To what extent do you **PRIZE** the following IBM Cognos features?

1: <i>unimportant</i>	<i>Totally</i>	2: <i>Unimportant</i>	3: <i>Important</i>	4: <i>Highly important</i>	5: <i>Do not know</i>
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Please select only one option per statement

a) View data easily and conveniently	1	2	3	4	5
b) Modify data easily and conveniently	1	2	3	4	5
c) Modified data help the organisation to address the queries of users	1	2	3	4	5
d) Access to relevant information	1	2	3	4	5
e) Data encryption with the help of codes or passwords	1	2	3	4	5
f) Scheduling and alerts allow keeping the information up to date	1	2	3	4	5
g) Being made aware of any cost overruns or overbearing expenses	1	2	3	4	5
h) Data visualisation helps to take better decisions in the organisation	1	2	3	4	5
i) Scheduling enables the organisation to take better business decisions	1	2	3	4	5
j) Scheduling enables the organisation to take better financial decisions	1	2	3	4	5
k) Alerts enable the organisation to take better business decisions	1	2	3	4	5
l) Alerts enable the organisation to take better financial decisions	1	2	3	4	5

4. In your experience, how often do you **PERCEIVE** the following to be true of IBM Cognos features?

1: Never	2: Seldom	3: Often	4: Always	5: Do not know
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Please select only one option per statement

a) It allows decision makers to resolve issues in the organisation	1	2	3	4	5
b) It is possible to view data easily and conveniently	1	2	3	4	5
c) It is possible to modify data easily and conveniently	1	2	3	4	5
d) Modified data help the organisation to address the queries of users	1	2	3	4	5
e) The user is allowed access to relevant information	1	2	3	4	5
f) Data encryption is adequate	1	2	3	4	5
g) Scheduling and alerts allow keeping the information up to date	1	2	3	4	5
h) IBM Cognos alert the businesses of any cost overruns or overbearing expenses	1	2	3	4	5
i) Data visualisation helps to take better decisions in the organisation	1	2	3	4	5
j) Scheduling and alerts enable the organisation to take better decisions	1	2	3	4	5

5. As a consequence of using IBM Cognos features, to what extent does it actually help you/your business **PRODUCE** the following?

1: Never	2: Seldom	3: Often	4: Always	5: Do not know
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Please select only one option per statement

a) Effective decision-making as a result of relevant information	1	2	3	4	5
b) Effective problem-solving as a result of relevant information	1	2	3	4	5
c) Modified data help the organisation to address the queries of users	1	2	3	4	5
d) Data visualisation helps to take better decisions in the organisation	1	2	3	4	5
e) Data security	1	2	3	4	5
f) Up to date information	1	2	3	4	5

6. To what extent do you **AGREE** with the following statements?

1: Totally disagree	2: Somewhat disagree	3: Somewhat agree	4: Totally agree	5: Do not know
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Please select only one option per statement

a) The features of IBM Cognos are cost effective	1	2	3	4	5
b) Cost effective features of IBM Cognos lead towards better implementation of the system	1	2	3	4	5
c) Depending on the affordability of IBM Cognos features, SMEs will be able to report quickly and easily	1	2	3	4	5
d) SMEs need to have an affordable feature of data visualisation	1	2	3	4	5
e) Affordability is the main factor for SMEs opting for incorporating BI tools	1	2	3	4	5
f) I would opt for a BI tool that is of low cost and high quality	1	2	3	4	5
g) Low cost features of IBM Cognos allow us to avoid cost overruns	1	2	3	4	5

7. Considering the decision-making needs of SMEs, what level of relevance do you ascribe to a BI tool such as IBM Cognos?

1: Irrelevant	2: Somewhat irrelevant	3: Somewhat relevant	4: Totally relevant	5: Do not know
----------------------	-------------------------------	-----------------------------	----------------------------	-----------------------

Please select only one option per statement

a) The organisation needs to have all the reports timely available	1	2	3	4	5
b) The availability of facts and figures helps SME to make better decisions	1	2	3	4	5
c) The organisation is in a better position to take decisions on the basis of available facts and figures	1	2	3	4	5
d) Within SMEs the large volume of data must be kept protected and confidential	1	2	3	4	5
e) Consistency in facts and figures is important for decision-making process	1	2	3	4	5

f) Convenience, for the SME management, plays a crucial role in effective decision-making	1	2	3	4	5
g) A BI tool assists with guarding against impulsivity in SME decision-making process	1	2	3	4	5
h) IBM Cognos features combat the negative consequences of ad hoc SME decision-making	1	2	3	4	5
i) IBM Cognos give SMEs an ability to take decisions with reliable information	1	2	3	4	5
j) IBM Cognos give SMEs an ability to take decisions with timely information	1	2	3	4	5



Appendix C Survey results

Q1: To what extent do you **PRESUME** the following statements to be true of IBM Cognos features?

	1: TOTALLY IMPROBABLE (1)	2: UNLIKELY (2)	3: LIKELY (3)	4: MOST PROBABLE (4)	5: DO NOT KNOW (5)	TOTAL	WEIGHTED AVERAGE
a) If all the databases are available, IBM Cognos allow decision makers to resolve issues in the organisation	1.01% 2	13.07% 26	53.77% 107	31.66% 63	0.50% 1	199	3.18
b) With IBM Cognos, it is possible to view and modify data easily and conveniently	0.00% 0	4.02% 8	53.27% 106	42.71% 85	0.00% 0	199	3.39
c) The modified data help the organisation to address the queries of users	0.00% 0	4.57% 9	43.65% 86	51.78% 102	0.00% 0	197	3.47
d) With IBM Cognos, the user is allowed access to relevant information	0.50% 1	1.51% 3	48.74% 97	48.24% 96	1.01% 2	199	3.48
e) Data is being encrypted with the help of codes or passwords	0.00% 0	1.01% 2	41.92% 83	55.56% 110	1.52% 3	198	3.58
f) The scheduling and alerts allow keeping the information up to date	0.00% 0	6.12% 12	42.35% 83	51.53% 101	0.00% 0	196	3.45
g) IBM Cognos alert the businesses of any cost overruns or overbearing expenses	0.51% 1	0.51% 1	36.36% 72	61.62% 122	1.01% 2	198	3.62
h) Data visualisation helps to take better decisions in the organisation	0.00% 0	1.01% 2	43.22% 86	55.28% 110	0.50% 1	199	3.55
i) SMEs are provided with the feature of scheduling in IBM Cognos	0.00% 0	2.01% 4	40.70% 81	55.78% 111	1.51% 3	199	3.57
j) Scheduling and alerts enable the organisation to take better financial decisions	0.00% 0	2.04% 4	33.67% 66	63.27% 124	1.02% 2	196	3.63

BASIC STATISTICS						
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION	
a) If all the databases are available, IBM Cognos allow decision makers to resolve issues in the organisation	1.00	5.00	3.00	3.18	0.69	
b) With IBM Cognos, it is possible to view and modify data easily and conveniently	2.00	4.00	3.00	3.39	0.56	
c) The modified data help the organisation to address the queries of users	2.00	4.00	4.00	3.47	0.58	
d) With IBM Cognos, the user is allowed access to relevant information	1.00	5.00	3.00	3.48	0.57	
e) Data is being encrypted with the help of codes or passwords	2.00	5.00	4.00	3.58	0.54	
f) The scheduling and alerts allow keeping the information up to date	2.00	4.00	4.00	3.45	0.61	
g) IBM Cognos alert the businesses of any cost overruns or overbearing expenses	1.00	5.00	4.00	3.62	0.54	
h) Data visualisation helps to take better decisions in the organisation	2.00	5.00	4.00	3.55	0.53	
i) SMEs are provided with the feature of scheduling in IBM Cognos	2.00	5.00	4.00	3.57	0.56	
j) Scheduling and alerts enable the organisation to take better financial decisions	2.00	5.00	4.00	3.63	0.54	

Q2: To what extent do you PREDICT that a SME's business decision-making ability will change (improve) as a consequence of IBM Cognos features?

	1: TOTALLY UNCHANGED (1)	2: SOMEWHAT UNCHANGED (2)	3: SOMEWHAT CHANGED (3)	4: TOTALLY CHANGED (4)	5: DO NOT KNOW (5)	TOTAL	WEIGHTED AVERAGE
a) If all the databases are available, it will allow to resolve issues in the organisation	1.00% 2	7.50% 15	49.50% 99	41.50% 83	0.50% 1	200	3.33
b) It will be possible to view and modify data easily and conveniently	0.00% 0	0.50% 1	52.26% 104	46.23% 92	1.01% 2	199	3.48
f) The scheduling and alerts will allow keeping the information up to date	1.01% 2	2.01% 4	43.22% 86	53.77% 107	0.00% 0	199	3.50
e) Data will be encrypted with the help of codes or passwords	0.50% 1	2.51% 5	41.21% 82	54.27% 108	1.51% 3	199	3.54
c) Modified data will help the organisation to address the queries of users	0.50% 1	0.50% 1	42.00% 84	56.50% 113	0.50% 1	200	3.56
d) The user will be allowed access to relevant information	0.00% 0	2.03% 4	39.09% 77	57.87% 114	1.02% 2	197	3.58
h) With scheduling and alerts the SME will be able to take better financial decisions	0.00% 0	1.53% 3	39.80% 78	57.65% 113	1.02% 2	196	3.58
g) Data visualisation will help SME to take better decisions in the organisation	0.00% 0	1.52% 3	38.38% 76	59.09% 117	1.01% 2	198	3.60

BASIC STATISTICS					
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
a) If all the databases are available, it will allow to resolve issues in the organisation	1.00	5.00	3.00	3.33	0.66
b) It will be possible to view and modify data easily and conveniently	2.00	5.00	3.00	3.48	0.53
c) Modified data will help the organisation to address the queries of users	1.00	5.00	4.00	3.56	0.54
d) The user will be allowed access to relevant information	2.00	5.00	4.00	3.58	0.55
e) Data will be encrypted with the help of codes or passwords	1.00	5.00	4.00	3.54	0.60
f) The scheduling and alerts will allow keeping the information up to date	1.00	4.00	4.00	3.50	0.59
g) Data visualisation will help SME to take better decisions in the organisation	2.00	5.00	4.00	3.60	0.54
h) With scheduling and alerts the SME will be able to take better financial decisions	2.00	5.00	4.00	3.58	0.54

	1: NEVER (1)	2: SELDOM (2)	3: OFTEN (3)	4: ALWAYS (4)	5: DO NOT KNOW (5)	TOTAL	WEIGHTED AVERAGE
a) It allows decision makers to resolve issues in the organisation	0.00% 0	4.00% 8	52.50% 105	43.00% 86	0.50% 1	200	3.40
b) It is possible to view data easily and conveniently	0.00% 0	2.01% 4	44.72% 89	52.26% 104	1.01% 2	199	3.52
c) It is possible to modify data easily and conveniently	0.00% 0	1.04% 2	39.90% 77	56.48% 109	2.59% 5	193	3.61
d) Modified data help the organisation to address the queries of users	0.00% 0	2.51% 5	41.21% 82	55.78% 111	0.50% 1	199	3.54
e) The user is allowed access to relevant information	0.50% 1	2.50% 5	32.50% 65	62.50% 125	2.00% 4	200	3.63
f) Data encryption is adequate	1.02% 2	3.06% 6	32.65% 64	62.76% 123	0.51% 1	196	3.59
g) Scheduling and alerts allow keeping the information up to date	0.50% 1	3.02% 6	38.69% 77	56.78% 113	1.01% 2	199	3.55
h) IBM Cognos alert the businesses of any cost overruns or overbearing expenses	0.00% 0	0.50% 1	41.50% 83	57.50% 115	0.50% 1	200	3.58
i) Data visualisation helps to take better decisions in the organisation	0.00% 0	1.50% 3	35.00% 70	62.50% 125	1.00% 2	200	3.63
j) Scheduling and alerts enable the organisation to take better decisions	0.50% 1	0.50% 1	36.18% 72	62.31% 124	0.50% 1	199	3.62

BASIC STATISTICS							
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION		
a) It allows decision makers to resolve issues in the organisation	2.00	5.00	3.00	3.40	0.57		
b) It is possible to view data easily and conveniently	2.00	5.00	4.00	3.52	0.56		
c) It is possible to modify data easily and conveniently	2.00	5.00	4.00	3.61	0.56		
d) Modified data help the organisation to address the queries of users	2.00	5.00	4.00	3.54	0.56		
e) The user is allowed access to relevant information	1.00	5.00	4.00	3.63	0.59		
f) Data encryption is adequate	1.00	5.00	4.00	3.59	0.61		
g) Scheduling and alerts allow keeping the information up to date	1.00	5.00	4.00	3.55	0.60		
h) IBM Cognos alert the businesses of any cost overruns or overbearing expenses	2.00	5.00	4.00	3.58	0.51		
i) Data visualisation helps to take better decisions in the organisation	2.00	5.00	4.00	3.63	0.53		
j) Scheduling and alerts enable the organisation to take better decisions	1.00	5.00	4.00	3.62	0.54		

Q3: To what extent do you PRIZE the following IBM Cognos features?

	1: TOTALLY UNIMPORTANT (1)	2: UNIMPORTANT (2)	3: IMPORTANT (3)	4: HIGHLY IMPORTANT (4)	5: DO NOT KNOW (5)	TOTAL
a) View data easily and conveniently	0.00% 0	3.57% 7	47.96% 94	47.45% 93	1.02% 2	196
b) Modify data easily and conveniently	0.00% 0	1.02% 2	44.90% 88	53.57% 105	0.51% 1	196
c) Modified data helps the organisation to address the queries of users	0.00% 0	0.51% 1	45.96% 91	53.54% 106	0.00% 0	198
d) Access to relevant information	0.00% 0	2.55% 5	43.37% 85	54.08% 106	0.00% 0	196
e) Data encryption with the help of codes or passwords	0.00% 0	1.50% 3	42.50% 85	54.50% 109	1.50% 3	200
f) Scheduling and alerts allow keeping the information up to date	0.00% 0	1.51% 3	42.71% 85	55.28% 110	0.50% 1	199
g) Being made aware of any cost overruns or overbearing expenses	0.00% 0	1.50% 3	46.50% 93	51.00% 102	1.00% 2	200
h) Data visualisation helps to take better decisions in the organisation	0.00% 0	1.50% 3	31.00% 62	66.50% 133	1.00% 2	200
i) Scheduling enables the organisation to take better business decisions	0.50% 1	2.50% 5	40.00% 80	56.50% 113	0.50% 1	200
j) Scheduling enables the organisation to take better financial decisions	0.51% 1	1.52% 3	43.65% 86	54.31% 107	0.00% 0	197
k) Alerts enable the organisation to take better business decisions	0.51% 1	1.02% 2	40.61% 80	57.87% 114	0.00% 0	197
l) Alerts enable the organisation to take better financial decisions	0.51% 1	2.05% 4	38.97% 76	58.46% 114	0.00% 0	195

BASIC STATISTICS						
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION	
a) View data easily and conveniently	2.00	5.00	3.00	3.46	0.58	
b) Modify data easily and conveniently	2.00	5.00	4.00	3.54	0.53	
c) Modified data helps the organisation to address the queries of users	2.00	4.00	4.00	3.53	0.51	
d) Access to relevant information	2.00	4.00	4.00	3.52	0.55	
e) Data encryption with the help of codes or passwords	2.00	5.00	4.00	3.56	0.55	
f) Scheduling and alerts allow keeping the information up to date	2.00	5.00	4.00	3.55	0.54	
g) Being made aware of any cost overruns or overbearing expenses	2.00	5.00	4.00	3.52	0.55	
h) Data visualisation helps to take better decisions in the organisation	2.00	5.00	4.00	3.67	0.52	
i) Scheduling enables the organisation to take better business decisions	1.00	5.00	4.00	3.54	0.58	
j) Scheduling enables the organisation to take better financial decisions	1.00	4.00	4.00	3.52	0.56	
k) Alerts enable the organisation to take better business decisions	1.00	4.00	4.00	3.56	0.55	
l) Alerts enable the organisation to take better financial decisions	1.00	4.00	4.00	3.55	0.56	

Q4: In your experience, how often do you PERCEIVE the following to be true of IBM Cognos features?

	1: NEVER (1)	2: SELDOM (2)	3: OFTEN (3)	4: ALWAYS (4)	5: DO NOT KNOW (5)	TOTAL	WEIGHTED AVERAGE
a) It allows decision makers to resolve issues in the organisation	0.00% 0	4.00% 8	52.50% 105	43.00% 86	0.50% 1	200	3.40
b) It is possible to view data easily and conveniently	0.00% 0	2.01% 4	44.72% 89	52.26% 104	1.01% 2	199	3.52
c) It is possible to modify data easily and conveniently	0.00% 0	1.04% 2	39.90% 77	56.48% 109	2.59% 5	193	3.61
d) Modified data help the organisation to address the queries of users	0.00% 0	2.51% 5	41.21% 82	55.78% 111	0.50% 1	199	3.54
e) The user is allowed access to relevant information	0.50% 1	2.50% 5	32.50% 65	62.50% 125	2.00% 4	200	3.63
f) Data encryption is adequate	1.02% 2	3.06% 6	32.65% 64	62.76% 123	0.51% 1	196	3.59
g) Scheduling and alerts allow keeping the information up to date	0.50% 1	3.02% 6	38.69% 77	56.78% 113	1.01% 2	199	3.55
h) IBM Cognos alert the businesses of any cost overruns or overbearing expenses	0.00% 0	0.50% 1	41.50% 83	57.50% 115	0.50% 1	200	3.58
i) Data visualisation helps to take better decisions in the organisation	0.00% 0	1.50% 3	35.00% 70	62.50% 125	1.00% 2	200	3.63
j) Scheduling and alerts enable the organisation to take better decisions	0.50% 1	0.50% 1	36.18% 72	62.31% 124	0.50% 1	199	3.62
BASIC STATISTICS							
			MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
a) It allows decision makers to resolve issues in the organisation			2.00	5.00	3.00	3.40	0.57
b) It is possible to view data easily and conveniently			2.00	5.00	4.00	3.52	0.56
c) It is possible to modify data easily and conveniently			2.00	5.00	4.00	3.61	0.56
d) Modified data help the organisation to address the queries of users			2.00	5.00	4.00	3.54	0.56
e) The user is allowed access to relevant information			1.00	5.00	4.00	3.63	0.59
f) Data encryption is adequate			1.00	5.00	4.00	3.59	0.61
g) Scheduling and alerts allow keeping the information up to date			1.00	5.00	4.00	3.55	0.60
h) IBM Cognos alert the businesses of any cost overruns or overbearing expenses			2.00	5.00	4.00	3.58	0.51
i) Data visualisation helps to take better decisions in the organisation			2.00	5.00	4.00	3.63	0.53
j) Scheduling and alerts enable the organisation to take better decisions			1.00	5.00	4.00	3.62	0.54

Q5: As a consequence of using IBM Cognos features, to what extent does it actually help you/your business **PRODUCE** the following?

	1: NEVER (1)	2: SELDOM (2)	3: OFTEN (3)	4: ALWAYS (4)	5: DO NOT KNOW (5)	TOTAL
a) Effective decision-making as a result of relevant information	0.50% 1	9.00% 18	51.00% 102	39.00% 78	0.50% 1	200
b) Effective problem-solving as a result of relevant information	0.00% 0	2.00% 4	43.00% 86	55.00% 110	0.00% 0	200
c) Modified data help the organisation to address the queries of users	0.00% 0	3.50% 7	48.00% 96	48.50% 97	0.00% 0	200
d) Data visualisation helps to take better decisions in the organisation	0.00% 0	3.50% 7	33.50% 67	63.00% 126	0.00% 0	200
e) Data security	0.00% 0	2.07% 4	38.86% 75	59.07% 114	0.00% 0	193
f) Up to date information	0.00% 0	2.02% 4	28.79% 57	68.18% 135	1.01% 2	198

BASIC STATISTICS						
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION	
a) Effective decision-making as a result of relevant information	1.00	5.00	3.00	3.30	0.66	
b) Effective problem-solving as a result of relevant information	2.00	4.00	4.00	3.53	0.54	
c) Modified data help the organisation to address the queries of users	2.00	4.00	3.00	3.45	0.56	
d) Data visualisation helps to take better decisions in the organisation	2.00	4.00	4.00	3.60	0.56	
e) Data security	2.00	4.00	4.00	3.57	0.54	
f) Up to date information	2.00	5.00	4.00	3.68	0.53	


Q6: To what extent do you **AGREE** with the following statements?

	1: TOTALLY DISAGREE (1)	2: SOMEWHAT DISAGREE (2)	3: SOMEWHAT AGREE (3)	4: TOTALLY AGREE (4)	5: DO NOT KNOW (5)	TOTAL
a) The features of IBM Cognos are cost effective	0.00% 0	4.00% 8	50.50% 101	45.00% 90	0.50% 1	200
b) Cost effective features of IBM Cognos lead towards better implementation of the system	0.00% 0	1.01% 2	45.23% 90	53.77% 107	0.00% 0	199
c) Depending on the affordability of IBM Cognos features, SMEs will be able to report quickly and easily	0.00% 0	2.50% 5	44.00% 88	53.50% 107	0.00% 0	200
d) SMEs need to have an affordable feature of data visualisation	0.00% 0	2.51% 5	39.70% 79	57.29% 114	0.50% 1	199
e) Affordability is the main factor for SMEs opting for incorporating BI tools	0.00% 0	2.00% 4	44.50% 89	51.50% 103	2.00% 4	200
f) I would opt for a BI tool that is of low cost and high quality	0.00% 0	1.00% 2	37.50% 75	61.50% 123	0.00% 0	200
g) Low cost features of IBM Cognos allow us to avoid cost overruns	0.00% 0	2.53% 5	37.37% 74	58.59% 116	1.52% 3	198
BASIC STATISTICS						
		MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
a) The features of IBM Cognos are cost effective		2.00	5.00	3.00	3.42	0.58
b) Cost effective features of IBM Cognos lead towards better implementation of the system		2.00	4.00	4.00	3.53	0.52
c) Depending on the affordability of IBM Cognos features, SMEs will be able to report quickly and easily		2.00	4.00	4.00	3.51	0.55
d) SMEs need to have an affordable feature of data visualisation		2.00	5.00	4.00	3.56	0.55
e) Affordability is the main factor for SMEs opting for incorporating BI tools		2.00	5.00	4.00	3.54	0.57
f) I would opt for a BI tool that is of low cost and high quality		2.00	4.00	4.00	3.61	0.51
g) Low cost features of IBM Cognos allow us to avoid cost overruns		2.00	5.00	4.00	3.59	0.57

Q7: Considering the decision-making needs of SMEs, what level of relevance do you ascribe to a BI tool such as IBM Cognos? <insert image>

Appendix D Research Ethics Clearance

CBEREC and SUBCOMMITTEES 2017



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**CBE RESEARCH ETHICS COMMITTEE
ETHICAL CLEARANCE REPORT**

Applicant	Tshepo Magoma
Supervisor	Mr Sthe Khumalo Prof Tanya du Plessis
Student/staff number	201149141
Title	Developing a signification framework of a business intelligence tool for SME business decision-making
Decision date at meeting	2018-10-03
Decision at Department / School	MCom research proposal was accepted at a departmental committee meeting in 2017 prior to the ethical clearance processes of the current CBE.
Decision at College Meeting	The IKM departmental research ethics committee reviewed IKM postgraduate research project progress reports and confirmed clearance of ethical compliance on 14 June 2018 (see also IKM DHDC minutes of meeting 2018-06-14 and 2018-10-03).
Decision at CBE REC	
Reviewers	CR, KJB, CN, TdP
Ethical clearance code	IKM2018_033_KHUMALO_DUPLEISSIS_MAGOMA
Rating of most recent application	CODE 01

CODE 01 - Approved
 CODE 02 - Approved with a stipulation will not re-submission
 CODE 03 - Not approved, may re-submit
 CODE 04 - Not approved, no re-submission allowed


RESEARCH COMPLIES WITH	COMPLIANCE	NON-COMPLIANCE / DETAILS / RECOMMENDATIONS / CONDITIONS OF APPROVAL
The right to privacy, confidentiality and anonymity	Yes	
The right to equality, justice, human dignity/life and protection against harm	Yes	
The right to freedom of choice, expression and access to information	Yes	
Right of the community and science community	Yes	

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The researcher will not experience any harm in conducting the research	Yes	
Informed consent/letters of request	Yes	

Signatures

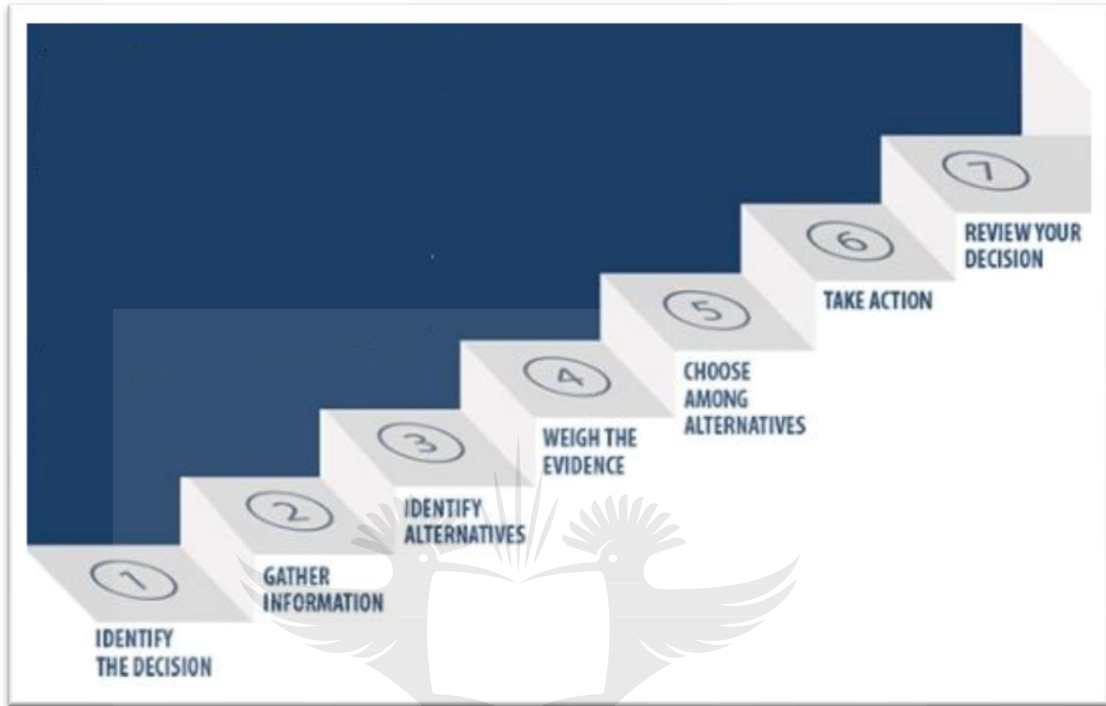
 Chairperson / School	3 October 2018 Date 4/10/18
	Date

Chairperson CBE REC	Date
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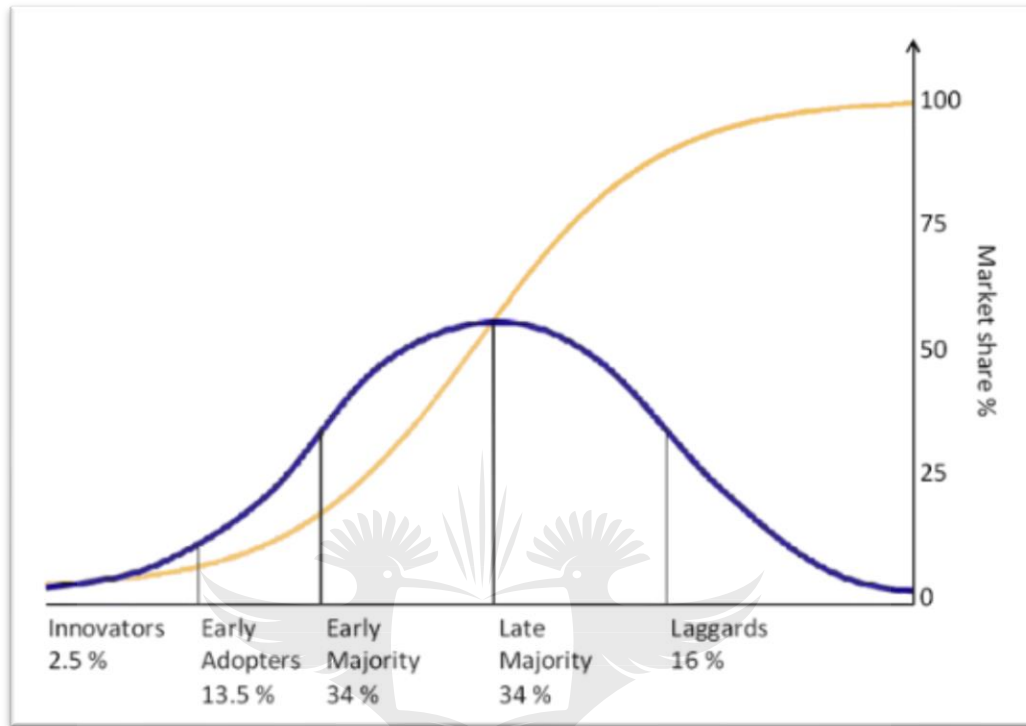
Appendix E
Decision-making Model



Source: <https://www.umassd.edu/fycm/decisionmaking/process/>

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**Appendix F
Diffusion of Technology**



Source: <https://ondigitalmarketing.com/learn/odm/foundations/5-customer-segments-technology-adoption/>

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–| end of dissertation |–