

UNIVERSITY *of the* WESTERN CAPE



The effect of Mobile BI on  
organisational managerial  
decision-making

by

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A thesis submitted in fulfillment for the  
degree of Master in Information Systems

in the

Faculty of Economic and Management Sciences  
Department of Information Systems

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Co-Supervisor: Dr. Felix Olu Bankole

February 2014

# Declaration of Authorship

I declare that *The Effect of Mobile BI on Organisational managerial decision-making* is my own work, that it has not been submitted for any degree or examination in any other university and that all the sources I used or quoted have been indicated and acknowledged by appropriate references.

**YASSER BUCHANA**

Signed:

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Date:

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*“All men by nature desire knowledge.”*

Aristotle



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## *Abstract*

Faculty of Economic and Management Sciences

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Managerial decision-making has always involved the use of numerous distinct information resources. Modern managerial decision-making processes require a wealth of information that is enhanced and transformed into knowledge in order to take effective action. Mobility in business is increasingly exercising influence on core business processes of organisations. The shift to wireless technologies coupled with the rapid growth of mobile devices in business has led to a new era in business computing. Mobile Business Intelligence (Mobile BI) is a system that has been conceived to assist, accelerate and to enhance the managerial decision-making processes.


This thesis focuses on the effect of Mobile BI on managerial decision-making. This thesis was able to answer the research question and to meet the research objectives through an extensive study of literature on the two most important spheres of influence *i.e.* Business Intelligence and Managerial decision-making. Moreover, the objectives were met through the implementation of practical empirical research. The latter was carried out through a survey research design using questionnaire method of data collection. This research produced an number of findings. The results indicated that Mobile BI played an important influencing role in the way managers make decisions. This study found that Mobile BI improved the quality of decisions made by managers used it for decision support subsequently improving performance of the organisation. Overall, four factors were found to be the predictors of Mobile BI for managerial decision making in organisations: Perceived Ease of Use of Mobile BI, Attitudes towards Use of Mobile BI, Perceived Value of Mobile BI with Behavioural Intention to Use of Mobile BI emerging as the most important predictors of Managerial Organisational decision-making.

# *Acknowledgements*

First and foremost, I would like to express my gratitude to the lord almighty Allah for all the blessings in my life. Secondly, I would like to express my sincere appreciation to the following people for their invaluable contributions towards the completion of my masters thesis:

1. My family, for all the sacrifices they have made for me to be where I am today. My mother Sada Mukamunana in particular. I finally understand that it is not easy for a single mother like you to raise a man on your own. My brother Faycal Buchana and my sister Habiba Buchana, thank you from the bottom of my heart for all the patience you've had from the first day when I began this journey.
2. My friends. It would be very hard for me to name all of you, but I am very appreciative of all the input contributions you have made towards this project.
3. My supervisor Professor Visvathan Naicker and Co-Supervisor Dr Felix Olu Bankole. I am very appreciative of the guidance you have given me throughout this project.
4. Mrs Womba Mwamba for all the administrative work. I am very thankful for all your efforts.
5. My HPR family. Guillaume Ndayambaje, Mr Karangwa for the data analysis, Vieux Clement for the late nights consultations and data analysis, Jose Ufita, Gloria Irakoze, Chantal and last but not least, Ricardo Tshikongo my fellow masters student for the discussions, suggestions and everything else research related.

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# Abbreviations

Mobile BI	Mobile Business Intelligence
BI	Business Intelligence
IT	Information Technology
PEOU	Perceived Ease Of Use
PU	Perceived Usefulness
TAM	Technology Acceptance Model
TAM2	Technology Acceptance Model 2
TAMMS	Technology Acceptance Model for Mobile Services
TRA	Theory of Reasoned Action

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*This research study is dedicated (in loving memory) to my father Habib Bucyana. My father taught me at an early age the value of a formal education and always believed in my abilities. May the Almighty Allah grant him a high place in Janaah-tul-Firdaous (InshaAllah).*

*This study is also dedicated (in loving memory) to my friend Issa ‘Boubou’ Habimana. Issa was a close friend and a mentor. Although being a close friend, he also became my lecturer in one of my courses in the first year of my study at University. When I was in high school, he always encouraged me to get good grades and always was there for me when I needed advice. In 2008, when I was in the second year of my studies, he suddenly passed away from an unexpected cardiac arrest. I am pretty sure he would have been proud of this research effort.*

*This study is also dedicated to my mother Sada Mukamunana, who gave me the freedom to follow my dreams in life. My mother sacrificed a lot for me to be where I am today. To this day, she continues to support and empower me with her infinite wisdom. She is my heart in a human form.*

# Chapter 1

## Introduction

### 1.1 Background

In recent years, information has become one of the most important assets for organisations to treasure (Hinton, 2012). Every year, many organisations spend a significant amount of money to maintain their enterprise systems that process, manage and deliver information to and from business units (Kanaracus, 2008). The fundamental logic behind using enterprise systems to manage information is to allow organisations to organise, supervise and operate business processes on the basis of accurate and complete business knowledge (Hinton, 2012; Laudon, Laudon, et al., 2011).

Business Intelligence (BI) is the rigorous process of transforming data into information, and then into actionable knowledge (Golfarelli, Rizzi, & Cella, 2004). The collected data from numerous sources in the enterprise is converted and transformed into information and then into knowledge through processing and analysis. The resulting knowledge provides the foundations for strategic business decision-making (Olszak & Ziemba, 2006).

An increase in the accessibility and availability as well as improved performance of mobile systems facilitates flexibility of on site data gathering and analysis, consequently extending Business Intelligence to mobile devices. This is known as Mobile Business Intelligence. Mobile Business Intelligence is a system that has been conceived to assist, accelerate and to ease the managerial decision-making

process through the information delivered by such a system (Brodzinski, Crable, Ariyachandra, & Frolick, 2013).

Managerial decision-making has always involved the use of numerous distinct information resources (Young, 1983; Rode, 1997). However, the modern decision-making processes require a wealth of information that is enhanced and transformed into knowledge in order to take effective action. The strategic importance of mobile technologies in business cannot be underestimated (Sheng, Nah, & Siau, 2005). Thus the purpose of a Mobile BI system is to provide a solution that allows for flexibility, device independence, and cross platform integration to consume and make the most of business intelligence capabilities (Sajjad, Mir, Khawar, Bashir, & Tariq, 2009; Brodzinski, Crable, Ariyachandra, & Frolick, 2013).

In order to facilitate the process of supporting managerial decision-making, there is a need for the availability of high quality integrated as well as tailored information (March & Hevner, 2007). This information should then be delivered to decision-makers in a manner that is strategic and easily understood.

Currently, there is a worldwide growing trend with regards to the adoption of Mobile BI by many organisations. This trend has largely been a result of a number of factors, such as, the need to improve and support managerial decision-making. Also, this growth has been fuelled by the maturity of mobile computing devices such as tablets and five inch smartphone devices. Figure 1 illustrates the Mobile BI deployment plans of organisations of different sizes through 2015.

Dresner (2012) market study on Mobile BI revealed a modest penetration of Mobile BI. The bulk of organisations surveyed reported a 10% company wide workforce adoption from 0% since 2010. This number is staggering given that the Mobile BI is largely targeted at executives and managers who make up less than 5% of an entire organisation's workforce. Moreover interestingly, Dresner's market study also revealed an aggressive implementation plans through 2015 as illustrated in Figure 1.1

Illustrated in Figure 1.2, is the importance of Mobile BI in relation to the organisation size. Figure 1.2 further corroborate the growing trend between smaller and large organisations with respect to the importance of Mobile BI as opposed to midsize organisations.

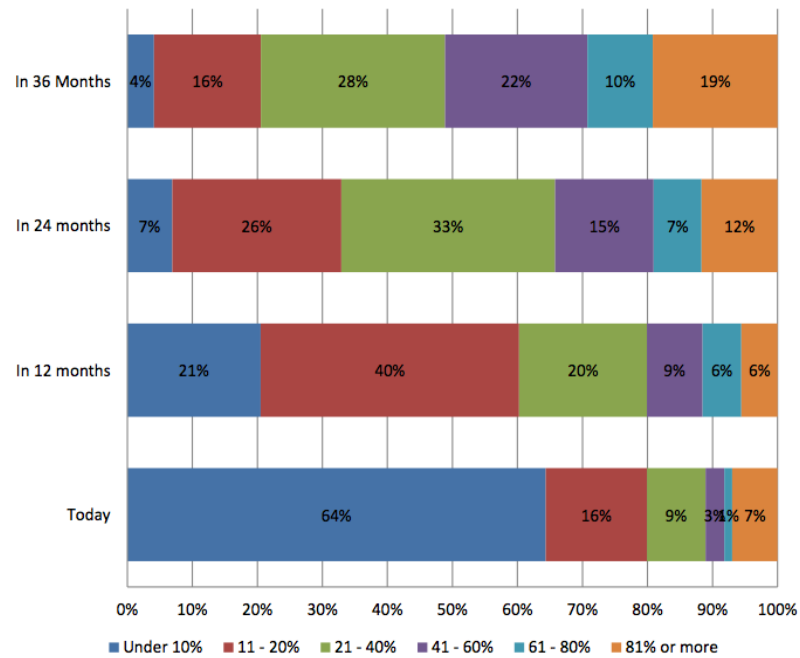


FIGURE 1.1: Mobile BI Deployment Plans Through 2015

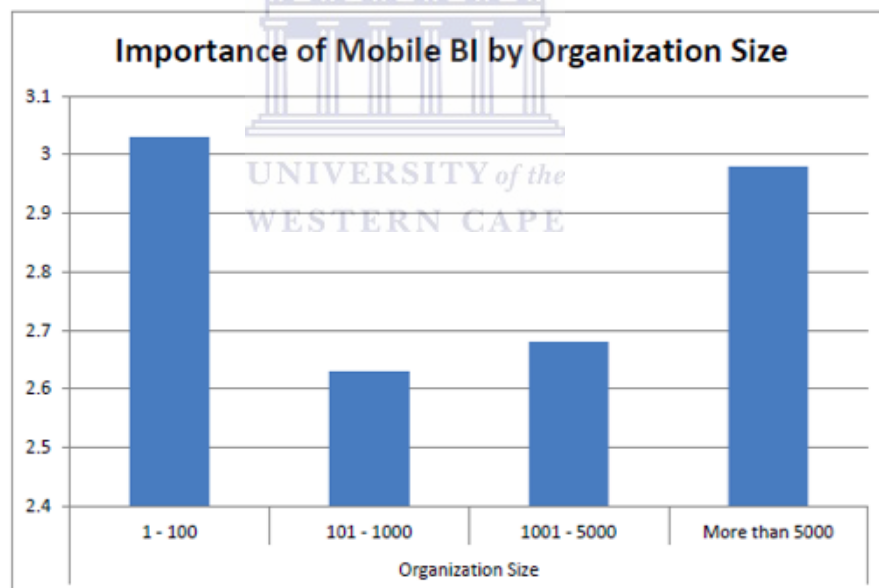


FIGURE 1.2: Mobile BI Importance by Organisation size

Two important properties are noted: (a) smaller organisations tend to be more agile and can more readily integrate new technologies into their businesses and (b) larger organisations tend to have more resources available to address new and emerging technologies (Dresner, 2011).

This study has been envisioned to investigate the effect of Mobile BI for managerial decision-making in organisations. Drawing on the rich literature of mobile



computing, managerial decision-making and Business Intelligence (BI), this study will further bring forward discussions on Mobile BI with respect to managerial decision-making. In the section to follow, the research problem and the research questions of this study will be discussed.

## 1.2 Research problem and research questions

In the modern interconnected information economy, it is no longer viable to make business decisions on the basis of “intuition” or “gut feeling” (Riabacke, 2006). In the past, countless critical business decisions have been made on the basis of intuition as opposed to what the information says (Dane & Pratt, 2007). Currently, in order for organisations to be able to support decision-makers, there is an unprecedented demand to consolidate data from many sources, to analyse and understand business information as well as to predict change (Williams & Williams, 2010).

Business users need BI solutions that are designed to provide agility, the capability to assess, reinvent and adjust to organisation changes. Mobile Business Intelligence is one form of technology that delivers these solutions thanks to its realtime characteristics (Azvine, Cui, & Nauck, 2005; Brodzinski, Crable, Ariyachandra, & Frolick, 2013). Thus the advent of mobile devices such as smart phones and tablets, better telecommunication systems such as 3G, as well as cheaper connectivity rates, has permitted the ‘modern’ workers to become more mobile by spending time away from their office desks (Henry, 2012; Antoniou, Theodoridis, Chatzigiannakis, & Mylonas, 2012).

Mobile BI has facilitated the accessibility of corporate information through managers mobile devices. This relative flexibility has since given rise to a trend of company managers that spend a great deal of their time away from the office travelling, attending meetings or visiting different company or client sites (Ellwood, 2005). Therefore the necessity of mobile workers to receive up-to-date BI information in real time in order to make instantaneous decisions is of critical importance (Chaudhuri, Dayal, & Narasayya, 2011). This access to real time information in turn allows managers to perform some of their job tasks easier and to make the most of out decision-making. Daily managerial tasks such supervising and coordinating functional as well as operational processes in the organisation becomes easier through Mobile BI.

Due to its real time characteristics, Mobile BI is radically growing to become an important enabler of value and performance in organisations (Chaudhuri, Dayal, & Narasayya, 2011). This is simply because, without real time access to business information, managerial decisions and actions become adjourned, which inevitably results in constraints and delays.

On a regular basis, managers in organisations are required to execute critical decisions under complicated and unpredictable conditions (Z. Wu & Pagell, 2011). However, more often than not, managers do not have the conventional skills of problem solving and decision making methods necessary to make decisions (Kunc & Morecroft, 2010; Chaffey & White, 2010). For this reason, managers need decision support systems to aid them to make decisions (G. Huber, 2013). Mobile BI is one such decision support system that aid managers to make decisions. However, the effect of Mobile BI on managerial decision-making is currently unknown (Airinei & Homocianu, 2010). There is very little empirical evidence in literature that demonstrate it (Airinei & Homocianu, 2010; Elbashir, Collier, & Davern, 2008). Therefore the purpose of this study to investigate the influences Mobile BI has on managerial decision-making in organisations. Hence, this guides us to the main research question of this study.

### **What is the effect of Mobile BI on managerial decision-making in organisations?**

In order to find answers to the main research question, the main research question is further broken down into three sub-questions:

- Q:1** What are the factors influencing the usage of Mobile BI for managerial decision-making?
- Q:2** What impact does Mobile BI have on a manager's behaviour in relation to decision-making in an organisation?
- Q:3** What kind of effect does the decisions taken using Mobile BI have on the organisation's performance?

Having presented the research question as well as sub-questions, the section to follow will present the research objectives and the rationale of this study.

### 1.3 Research objectives and rationale of the study

This research study is entitled The effect of Mobile BI on organisational managerial decision-making. The aim of this thesis was to develop a model of technology acceptance that will have the capacity to explain acceptance and usage behaviour of Mobile BI. This was achieved using managers that make use of Mobile BI as subjects of the study within Cape Town small, medium and large organisations.

A good understanding of the model could possibly assist managers to evaluate the causes of acceptance or resistance towards mobile BI and in so doing, would help explaining the effect of Mobile BI on managerial decision-making. Moreover, this understanding might also facilitate practitioners to take effective actions in order to improve the user acceptance and usage of Mobile BI, as well as to improve decision-making.

Davis (1989) point out that practitioners analyse and review systems mainly for two reason. (a) To forecast acceptability and (b) To identify the reasons causing deficiency in acceptance in order to take appropriate action to improve user acceptance. Thus, the aim of this research leads to the delineation of the following research objectives.

The objectives of the study seek:

1. To investigate the extent to which using Mobile BI helps to improve managerial decision-making.
2. To review previous literature relating to Mobile BI and Business Intelligence technologies as well as the adoption and usage within context of managerial decision-making at both the individual and organisational level.
3. To formulate a model of technology acceptance of Mobile BI for managerial decision making using previous Technology acceptance models in literature.

Having discussed the research aim and objectives, the section to follow will discuss the research design and methodology.

## 1.4 Research design and research methodology

The primary purpose of this study was to examine the effect of Mobile BI on managerial decision-making, of which some theoretical knowledge based on evidence from literature was constructed in chapter 2. The focus was on finding answers to the research questions and to meet the research objectives. For this reason, this study required a research approach that was appropriate to explain the complexity associated with what the study was seeking to understand. This is because the study sought to investigate an emerging discipline (Mobile BI) while in the same process attempting to measure how much of an influence Mobile BI has on managerial decision-making at an individual level as well as at organisational level. Therefore for the above discussed reasons, this study was primarily quantitative in nature.

In using a quantitative approach and a survey to gather numeric information about the factors that influence the decisions made by managers using Mobile BI, this resulted in discovering knowledge about the relationships between the different factors that influence the usage of Mobile BI for managerial decision-making.

Therefore, a quantitative approach was seen as the appropriate approach for investigating the research questions as well as to achieve the aim and objectives of this study. Furthermore, the quantitative method approach was also chosen to allow the researcher to make contextual interpretations as well as the flexibility to choose the best strategy to address the research questions. Moreover, the survey method design was used. This allowed the researcher to develop a more complete and well substantiated conclusion about the use effect of Mobile BI on managerial decision-making given the time and resources available.

## 1.5 Scope of the study

This study targeted only company workers occupying managerial positions within the Western Cape, and in particular, the Cape Town area. Total population of this study was comprised only of experienced users and consumers of Business Intelligence on their mobile devices (mobile phones or tablets).

This study focused on managerial usage behaviour of Mobile BI. The managers studied were distributed around the Cape Town area. Managers were asked to

evaluate their current usage of mobile BI together with a prediction of their future usages of Mobile BI associated with their job tasks.

The motivation behind delineating this scope in this way, (i.e. by only including within managers who use Mobile BI and not all other managers) is that, this strict inclusion criteria increased the accuracy and focus of the study. This in turn allowed the possibility to generalise the findings back to the managerial population, not only in the Western Cape, but in the entire country.

## 1.6 Structure of the thesis

This thesis is arranged to provide a review of relevant information regarding Business Intelligence, Managerial decision-making, as well as some of the most prominent frameworks and theories relating to technology acceptance. Following that, the research methodology, theoretical framework and research hypotheses are outlined and discussed. After that, the data collected is analysed to provide a foundation for support of the hypotheses. The research findings as well as the final research model produced are then used to bring forth important discourses for the understanding of usage behaviour of Mobile BI by managers in the context of decision-making.

The research is made up of 5 chapters, and its structure is presented as follows:

### **Chapter 2: Literature Review**

This chapter elaborates on the literature review of the study, and provides an explanation of how and why an Information Systems approach was taken by the study.

### **Chapter 3: Research Framework and Hypotheses**

This chapter proposes a theoretical framework used in this study which is made up of important factors expected to influence usage behaviour of Mobile BI for managerial decision-making in organisations. This chapter also proposes the research hypotheses.

**Chapter 4: Research Design and Methodology**

This chapter outlines – in detail – the basis for the research design and the methodology that was used to carry out the study design. All the instruments used in the design and data analysis will be explained, and the theoretical validation is also discussed.

**Chapter 5: Data Analysis**

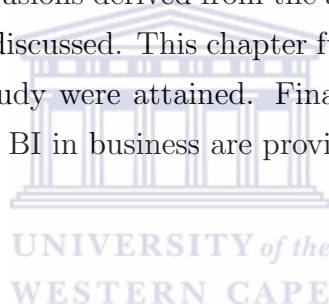
Chapter 4 presents the analysis of data. This leads to the discussion of the findings in the subsequent chapter.

**Chapter 6: Findings and Discussion of Results**

Chapter 5 presents the findings of the study. The findings from the data analysis are discussed in detail.

**Chapter 7: Conclusion and Recommendation**

The resulting conclusions derived from the analysis, findings and discussions are presented and discussed. This chapter further looks at the level to which the goals of the study were attained. Finally, recommendations for future research on Mobile BI in business are provided.



## 1.7 Chapter summary

This chapter provided an overview and an introduction to this research which began by discussing the motivation for undertaking the study. Thereafter, the research questions, the aims and objectives of the research were discussed. Following that, the rationale of the study was also presented. A summary of the proposed research design and proposed research methodology were then discussed and finally an overview of the entire thesis structure was presented.

The next chapter (2) will provide an indepth analysis of the the literature review and the theoretical framework which layout a foundation for the research model as well as the hypotheses that was tested in the study will be presented in chapter 3. Chapter four will then provide a comprehensive expansion on the research design and methodology that was undertaken to achieve the research objectives.



# Chapter 2

## Literature Review

### 2.1 Introduction

This chapter provides the review and analysis of the literature on theories, models, frameworks and concepts that make up the two most important themes in this study, i.e. Mobile Business Intelligence (Mobile BI) and managerial decision-making. This chapter also discusses the related research and current trends in Business Intelligence and managerial decision-making, with particular emphasis on the aspect of mobility for managerial decision-making.

Section 2.2 begins by introducing and discussing some of the most important concepts that make up Business Intelligence and managerial decision-making. Definitions of each of the sub-concepts that constitute the two main ideas are presented in vivid detail. Thereafter a cohesive approach to expand on the above mentioned concepts with literature is undertaken. This is done to gain a comprehensive understanding (of the two most important concepts) in order to build a foundation on which this research is based upon. Finally a summary is drawn.

### 2.2 Business Intelligence

Business Intelligence is one of the most widely researched topics in Information systems literature (Lahrmann, Marx, Winter, & Wortmann, 2011). There exist many different definitions of Business Intelligence. Over the last few years,



researchers and experts have also adopted their own definitions of Business Intelligence. This is a result of the absence of a common consensus between researchers and experts regarding a concrete, unequivocal definition of Business Intelligence. Sahay et. al, (2008) note that because of this lack of a common definition, experts and researchers, thus consider BI in different ways.

The term 'Business Intelligence' was first used by Dressner in 1989 as a unified term for describing a set of constructs, techniques and methods used to improve business decision-making (1989)(Dressner, 1989). Since then, the term has evolved to include numerous components. For instance, Ghazanfari (2011) reckons that Business intelligence is an integration and analysis of data to provide the relevant information to the right people in the organisation, with the aim of improving strategic and tactical decisions. Adelman, Moss and Barbusinski (2002) consider BI as a construct that is made up of a range of analytical systems and solutions for collecting, consolidating, analysing and providing access to information in such a way that allows organisations improve business decisions-making.

Golfarelli et al., (2004) considers BI as a process of transforming data into information and then into knowledge. Sahay et al., (2008) further substantiates that Data Warehouse (DW) experts may consider BI as supplementary system while Data Mining (DM) experts may view BI as a set of advanced decision support systems with some data mining techniques and application algorithms. However, Shari and Fisher (2003) maintain that the course to business insight follows the process of integration of data from different internal and external sources(B. S. Sahay & Ranjan, 2007). This requires applying analytical systems and methods to gain insight into the information drawn from the data.

Perhaps the most simplified definition of Business Intelligence is given by Golfarelli et al., who consider BI as, a process of turning data into information and then into knowledge. The authors further note that, BI allows for the capability to analyse business information with the objective of supporting and improving management decision-making throughout a wide range of business activities. Over time, as the concept of BI matured, other definitions of BI have also emerged (refer to table 2.1). Yet, while some definitions choose to focus on BI as a complex and complicated practice to organisational decision support (Moss & Atre, 2003) other definitions approach BI from a more technical perspective, (Burton et al., 2006; Bill Hostmann, Nigel Rayner, 2009).

TABLE 2.1: Summary of prominent definitions of BI in literature

<b>Business Intelligence Definition</b>	<b>Author('s)</b>	<b>Definition Focus</b>
Business Intelligence adheres various methodologies, techniques, and tools to turn data into information	Brockmann et al., (2012)	Organisational and Technical
Business intelligence is the integration and the analysis of data with decision-analysis tools to provide the right information to the right persons throughout the organisation, with the purpose of improving strategic and tactical decisions	Ghazanfari et al., (2011)	Organisational and Technical
Business intelligence (BI) is a data-driven DSS that combines data gathering, data storage, and knowledge management with analysis to provide input to the decision process.	Negash (2008)	Organisational and Technical
Business intelligence is a business management term used to describe applications and technologies which are used to gather, provide access to and analyze data and information about the organisation, to help make better business decisions.	Wu et al., (2007)	Organisational
A managerial philosophy and tool that helps organisations manage and refine information with the objective of making more effective decisions	(Lönnqvist & Pirttimäki, 2006)	Organisational
The use and analysis of information that enable organisations to achieve efficiency and profit through better decisions, management, measurement and optimization	(Burton & Hostmann, 2005)	Organisational
BI is a process of turning data into information and then into knowledge.	Golfarelli et al., (2004)	Organisational and Technological
An umbrella term to describe the set of concepts and methods used to improve business decision-making by using fact based support systems	Dresner (1989)	Technological

Table 2.1 highlights a summary of the different definitions of Business Intelligence as perceived by the corresponding supporting authors as well as the definition focus. The rationale behind this, is to provide an illustration of the various views point of different authors, since there is lack of a common consensus of what Business Intelligence actually means.

Given that this study's aim is to investigate the effect of a technology (Mobile BI) on a population group (Managers), for the purpose of this study Ghazanfari et al., (2011) definition of Business Intelligence was considered to as the most fitting

definition. This is because Ghazanfari et al., (2011) addresses both the Organisational and Technical aspects of Business Intelligence. For this above stated reason, it is thus logical to consider both the technological and organisational perspectives of Business Intelligence – this will be discussed next.

### **2.2.1 Business value of Business Intelligence**

For the modern enterprise, BI is an invaluable asset because it helps reduce IT infrastructure costs by getting rid of excess data extraction procedures and duplicate data stored in independent data pools with the organisation (Watson & Wixom, 2007). BI allows enterprise decision makers to improve business decisions on the basis of consistent acquisition, processing, analysis, interpretation and use of information (Yogev, Even, & Fink, 2013; J.-Y. Wu, 2010) .

Li, Shue, and Lee (2008) point out that BI is made up of concepts, techniques and processes to help improve decision-making in the enterprise. Like most information systems concepts, Business Intelligence also consists of people, processes and technology components. According to academic and expert literature, (Plessis, 2012; Seufert, 2005; L. Wu, Barash, & Bartolini, 2007; Xi & Hongfeng, 2009) these components can be grouped into three distinct categories: people, processes and technology. These will be discussed next.

#### **2.2.1.1 The People aspect**

There exist three different groups of participants of whose perspectives are taken in consideration by enterprise planners for all the Business Intelligence, Performance management and analytics initiative in the enterprise (Bill Hostmann, Nigel Rayner, 2009). These are Consumers of BI, Producers and Enablers of BI.

However, in this study, the attention is mainly fixated on the consumers of BI, in other words, managers. This is because, (a) Managers are the important people in this group who make use of analytic results and related information for making decisions and (b) they are the responsible people for managing performance of the organisation (Cheng & Cheng, 2011).

The following are the three different groups of BI participants:

1. **Consumers of BI:** Managers who make their decisions and manage performance purely on the basis of analytic results and related information.
2. **Producers of BI:** Analysts who determine the essential quality of information and perform field-specific and spontaneous analyses.
3. **Enablers of BI:** IT workers who determine, formulate and support the technology constituents.

### 2.2.1.2 Processes facet

In order to move from a tactical approach to a strategic approach, Business Intelligence requires a set of key business processes. These are the following : **(a) Business and Decision Processes, (b) Analytics Processes, (c) Information Infrastructure processes**(Bill Hostmann, Nigel Rayner, 2009). These are discussed below:

#### **Business and Decision Processes**

Over the years, there has been a great deal of investment in business applications such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and Supply Chain Management (SCM) of which its primary focus is on automating business processes (Kirchmer, 2008). However, numerous business analytics methods and information infrastructure processes that underpin them have for the most part, been different and independent from the business and decision processes relating to the specific business applications (Weske, Goesmann, Holten, & Striemer, 1999).

Although various analytical applications and methods yield valuable analysis and information to control as well as govern business processes, only a handful are capable of truly delivering outstanding decision support . This problem has partly been responsible for lower than expected adoption and use of analytical systems and methods among business process users. According to Hostmann and Rayner (2009), when the aptitude for information analysis and BI are integrated into the business processes, this leads to decisions being more consistent, measurable, it is also easy to track them and more importantly, they are accurate.

**Analytics Processes:**

Process Analytics is a set of tools and techniques that are applied to Business Process Management procedures and activities to facilitate as well as support decision making in the enterprise (Muehlen, 2009). Process Analytics also allows focusing on the outcomes of formerly completed processes, provides a way to assess the behaviour of real-time running processes, and more importantly it permits the forecasting of the performance of BI processes in the future.

**Information Infrastructure processes:**

Information infrastructure processes provide the capacity for the organisation to deliver all the information related activities such as the ability to deliver data mining and analytics (Lawton, 2006). Depending on the firm's strategic vision, infrastructures will always vary with different organisations. In other words, an organisation's strategic goals will drive the information (Hanseth & Monteiro, 1998). Bowker, Baker, Millerand, and Ribes (2010) argue that the process of grouping of information within infrastructures provide a mechanism for keeping up to date by sharing information amongst workers in an organisation. The authors further note that, this process has a broad implication on the organisation.

**2.2.2 The Technology aspect**

The following discussion will deal with all the relevant characteristics of the technology aspects within the realm of Business intelligence. These consist of **Analytics Applications** and **Information Infrastructure**.

**Analytics Applications**

Analytics applications consists of a specialised set of applications that organises the BI capacity for a given business problem or specialised business requirement (Shanks et al., 2001). The authors further articulate that these are made up of well defined unambiguous process workflows as well as distinctive data models, activities and delivery competence. However, Analytics applications do not operate in a vacuum; they require a strong integration with a particular business process (Shanks, Bekmamedov, & Sharma, 2011).

## **Information Infrastructure**

Nowadays, every organisation regardless of the industry, has an unprecedented need to access, manage, store and deliver information (Arnott & Pervan, 2005; Citroen, 2011; Edmunds & Morris, 2000). Information has become to many organisations, a strategic asset which is a critical enabler to making managers smarter in their everyday operations and decision making (Melé, 2010).

The amount of information flowing in and out of the organisation has increased over the last few years and will continue to grow with time (Edmunds & Morris, 2000). Therefore, accessing, managing and storing important organisational information has become more important than ever before (Basole, 2005). Researchers and experts have looked up to information infrastructure to solve and help prevent the any crisis of too much information. Furthermore, Information Infrastructure consolidates under one umbrella, all technologies that help the organisation to acquire access, store, and manage and the delivery the information (Hanseth & Monteiro, 1998; Bowker, Baker, Millerand, & Ribes, 2010). The information infrastructure is therefore an important factor because, as far as BI is concerned, it helps setting up the foundation to which delivery of the correct information to the relevant people at the right time.

### **2.2.2.1 Summary**

From the above discussed literature, it is clear that Business Intelligence is a multifaceted concept which consists of a number of distinct components, models, frameworks and technologies. Added to the traditional BI is the Mobility component which gives rise to the concept of Mobile BI. This will be discussed next.

## 2.3 Mobile Business Intelligence

Given that Mobile BI is relatively a new research field, this therefore means that research specifically devoted to Mobile Business Intelligence is extremely limited (Brockmann, Stieglitz, Kmiecik, & Diederich, 2012). This is in spite of large amount of research in information systems literature dedicated to Business Intelligence, as well as, Mobile Enterprise Applications.

The concept of Mobile Business Intelligence (Mobile BI) is, to a certain extent, not easy to define unilaterally. This is particularly because; it consolidates two distinctive concepts; Business Intelligence and Mobility.

Mobile BI is a new research field for real-time and integrated BI systems. It is a combination of BI with wireless communication technologies and internet standards to facilitate the consumption of Business Intelligence on mobile devices (Tablets or smartphones). Sajjad et al., (2009) refers to Mobile BI as taking the front end view of traditional Business Intelligence onto mobile devices.

With the third Generation (3G) wireless communication, it is possible to overcome the limitations of traditional mobile communication networks such as low data transmission speed, quality and security (Zhu & Huang, 2012). 3G can provide extremely high speed and a variety of mobile multimedia services, which can greatly improve the Mobile BI systems (Y.-L. Wu, Tao, & Yang, 2008; Zhu & Huang, 2012).

Business Intelligence (BI) technologies provide the capability to analyse business information to facilitate and improve management decision making throughout a wide range of business activities (Elbashir, Collier, & Davern, 2008; Azvine, Cui, & Nauck, 2005). On one hand, mobility can be considered as the most important feature of the two; because it embodies the primary distinguishing advantage upon which the deployment of mobile services that can generate any value proposition. Because Mobile BI is essentially an extension to traditional BI, this means that Mobile BI aims to fulfil the main requirements of traditional BI systems (Aydin & Halilov, 2012). Figure 2.1 provides an illustration of a Mobile BI architecture, demonstrating how the different Business Intelligence systems interact in order to deliver intelligence to Mobile device for consumption.

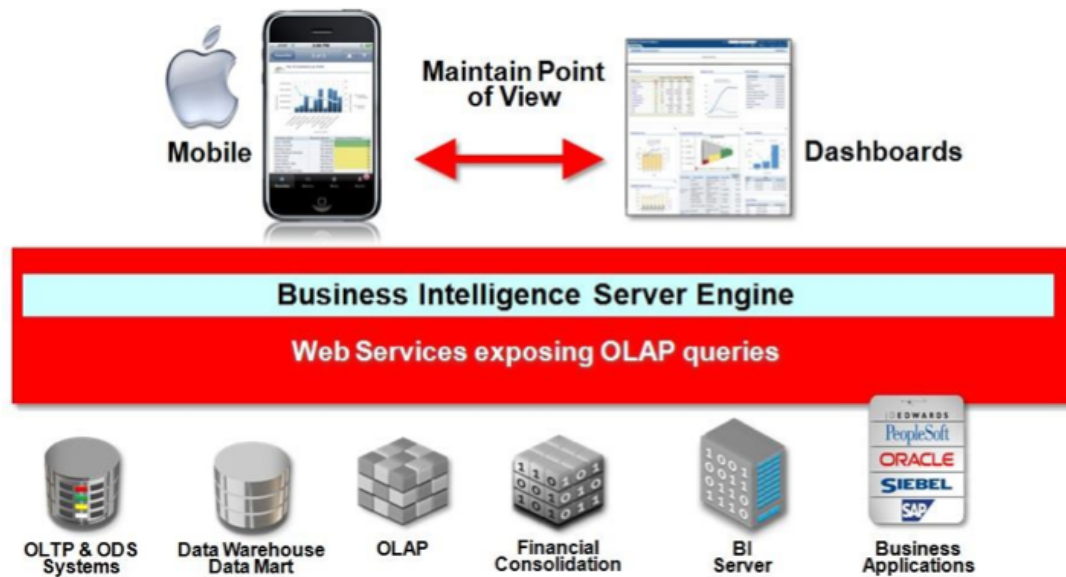


FIGURE 2.1: Example of Mobile BI Architecture, Source: Vailiev (2010)

Moreover, mobility generates numerous distinctive benefits that can be associated with some important mobility characteristics (Vailiev, 2010). These include for example, the flexibility of movement (services can be accessed while being mobile), pervasiveness (the potential of accessing services anywhere, anytime). Furthermore, data about a user's location can be taken advantage of in order to provide location-based services.

Moreover, mobility also gives the benefit of instantenious connectivity (always on) and personalisation (personal device, customisation to the mobile user's needs)(Müller-Veerse, 2000). On the other hand, going back to Golfarelli's definition of Business Intelligence (2004), which states that BI is a process of turning data into information and then into knowledge. This means that the idea of Mobile BI which comes into existence when the concept of mobility and traditional BI are fused together becomes therefore an important enabling technology for managers. However, different managers in the organisation have different needs and requirements when it comes to decision making.

According to Brockmann et al., (2012) Mobile BI has the potential to support managers significantly beyond the boundaries of the office by supplying crucial real-time information for decision-making. Table 2 sets forth the different Mobile BI users in an organisation, as well as, their corresponding needs and requirements.



TABLE 2.2: Mapping User to Mobile BI Requirements (Adapted from: Eckerson, 2011)

User	Mobility	Mobile BI Tasks	Data	Need
Executive	Travel to and from customer and work sites Nights/week-ends	Dashboards: <i>Check KPI status with simple drill down and time series views.</i>	Historical, Summary	High
Mid-level Manager	Travel to and from conference rooms	KPI-dashboards: Check status with simple drill down and time-series views.	Historical, Summary, Detail	Low
Line-Manager	Supervise domain by walking and talking	Operational Reports: <i>Check inventory, shipments, complaints, staffing.</i> Actions: Scan inventory, order products, schedule meetings, award merits/demerits, etc.	Historical, Summary, Detail, Real time	high

## Summary

Mobile BI users can be viewed, in many instances, as company workers who need accurate, relevant, complete, up-to-date and real-time business information to make decisions. These users generally are business executives or company managers (Sajjad, Mir, Khawar, Bashir, & Tariq, 2009; Eckerson, 2011).

As indicated in the table 2, the three different types of Mobile BI users have different requirements. Business executives who travel often mainly have the need to check Key Performance Indicators (KPI) and complete reports of the entire business. While mid-level and line managers need dashboards to monitor the status of projects and operations within the organisation.

## 2.4 Theoretical basis of managerial decision-making

Decision-making is a fundamental characteristic of management in any type of organisation. Huber (1991) defines decision-making as a process through which a course of action is chosen. A more recent definition of decision making is given by Eisenfuhr (2011), who describes decision-making as a course of action of making a selection from a wide range of alternatives in order to arrived at a particular wanted result. Decision-making, however, is widely regarded by many researchers as a process by which a given problem is identified and, to facilitate solving it, the decision-maker formulates one or more sets of objectives (Citroen, 2011; Dillon, 1998; Riabacke, 2006). These objectives then lead to a set of alternative actions, to which one is chosen after being referenced and compared to certain criteria or standards (Gachet & Brézillon, 2002; Snowden, 2005).

To arrive at a correct decision, this process requires a rigorous exploration and establishment of alternative solutions which are evaluated and then compared. Harrison (1999), maintains that a complete decision making process also involves a follow-up and control of the outcomes. If the outcomes are not entirely satisfactory, a new decision making cycle should begin from the start (Harrison, 1999, pp. 84-89).

Managerial-decision making is concerned with creating events and shaping the future (Gachet and Brzillon, 2002). The decision-making process involves a series of actions leading up to the moment of selecting an alternative outcome and beyond, whereas a decisions means to reach a conclusion upon a particular choice or course of action (Drummond, 1996).

Academic literature such as (Ghazanfari, Jafari, & Rouhani, 2011; Hogue, 2012; Melé, 2010) categorise decision-making in organisations into two kinds of decisions: (a) operational and (b) strategic decisions (Ortt & Duin, 2008; Dillon, 1998). Operational decisions are concerned with daily running of the company while Strategic decisions are more concerned with setting the overall direction and policies of the organisation. Both are important for the growth and survival of the organisation (Drummond, 1996).

Early research by Huber (1980), point to two principal techniques to management decision making as a whole. Huber argues that, the first is mainly interested in the improvement and use of normative decision rules which are founded on

logic derived from statistics and economics. While the second is concerned with describing and explaining how people make decisions, arrive at certain judgments and settle on certain choices.

Shanteau (2001), argues that the conceptual roots of normative decision rules go back to the earlier work by Morgenstern and Neumann (1947) whereby, numerous techniques were derived from Theory of games and economic behaviour. A direct contrast between riskless (certain outcomes) choices and risky (uncertain outcomes) choices are often made.

Discussions on these important techniques will follow next. Starting with *Decisions with UnCertain Outcomes* and then will be followed by *Decisions with Certain Outcomes*. Under *Decisions with Certain Outcomes*, Multi Attribute Utility (MAU) technique will be discussed first, while under *Decisions with Uncertain Outcomes*, two theories and one model will be discussed. These are Information Integration Theory (IIT), Naturalistic decision making Theory and Decision-Tree Analysis Model. This section will culminate with discussion on Expert decision making which is another important facet to managerial decision making.

### 2.4.1 Decisions With Uncertain Outcomes

**Decision-Tree Analysis Model:** Decision tree analysis in a managerial decision-making context, is a structured technique which facilitates the attainment of knowledge in order to make decisions. Decision trees makes it possible for managers to break down complex problems into smaller; more manageable tasks in order to make small-scale conclusions along the way to accomplish the best possible decisions (Doğanavşargil & Fattori, 2008).

**Information Integration Theory (IIT):** Information integration theory was first developed by Norman Anderson in 1950's. Information integration theory, in the managerial decision making context, tries to explain how several co-acting stimuli such as personal experience and direct observation are linked by a manager, in an attempt to generate a decision outcome (Norman 1976b, 1976c, Anderson 1974, Leon, Oden, and Anderson 1973). Anderson (1974) further explains that since information integration theory is so widely defined and broadly applied in

different fields, outcomes may be in the form of utilities, preference and difference judgments.

**Naturalistic decision making Theory:** Naturalistic Decision Making Theory was developed by Klein (1993) to explain on-line decision making by experts in situations whereby time is a crucial factor. Naturalistic decision making is marked by an understanding of real-time situations and decision biases. Klein, Orasanu, Calderwood and Zsombok (1993) base their definition of naturalistic decision-making according to the following six features:

1. Stands out in dynamic and constantly changing situations.
2. Epitomises real-time responses to these changes.
3. Encompasses ad-hoc defined activities and goals.
4. Settles itself under the management of knowledgeable decision makers.
5. Makes use of condition assessment ahead of consequential choice.
6. Aims to satisfy instead of optimising.

According to Klein (1993), the concern with Naturalistic decision theories is that they are only restricted by the lack of a definable, foreseeable set of outcomes.

## 2.4.2 Decisions with Certain Outcomes

### 2.4.2.1 Multi-Attribute Utility:

The universal difficulty of determining the effectiveness of alternatives that constantly change on numerous dimensions is of utmost importance to decision researchers. Multi-Attribute Utility (MAU) are appropriate for decisions that are made with outcomes that involve relative certainty.

Earlier research by Gardiner and Edwards (1975) corroborate that MAU is concerned with attaining a utility value for each decision alternative and then choosing an option with the highest possible value. While the number of circumstances that need these kinds of evaluations is quite high, prior research by Einhorn and

McCoach (1978, pp 87-115) found that, the most common way of accomplishing such tasks has been independent intuition. In other words, the decision maker makes a mental analysis of the different features and choices in order to arrive at a particular decision.

Managerial decision-making, much like other types of decision-making make use of models or frameworks to solve problems and to make decisions. However, there is sometimes a difference of opinion in literature as what are the differences between models and frameworks.

Harrison and Treagust (2000), describe a model as “an abstract, simplified, representation of a system of phenomena that makes its central features explicit and visible, and can be used to generate explanations and predictions”. In simplistic terms, a model is basically a simplified view of reality. In a managerial decision making context, models are often used by managers to get a world view of the situation concerned, in order to help them make decision, solve problems and predict outcomes in a structured way.

Various authors define ‘framework’ differently. Each of the definitions refers to the particular domain in which the framework is applicable. Perhaps the most relevant definition in line with managerial decision making is given by Zachman (1997), who defines framework as a generic classification scheme for design artefacts that is descriptive representation of any complex object. Again, from a managerial decision making perspective, decisions can be thought of as design artefacts, and complex objects can be thought of as problems or situations that require managers to act up on by making a decision.

In conclusion, while in other disciplines such as economics, statistics and mathematics, the difference between framework and model might be subtle and of critical importance, however, with respect to managerial decision making, the difference between the two is not necessarily an important one. In other words, there exist numerous decision making models and frameworks in decision making literature; many of which share similarities in practical and rational characteristics. In their dispositions, both decision-making frameworks and models generally begin with a logical and objective outlook, and then move from a meticulous and comprehensive problem statement, to the analysis of stakeholder interests and consideration

of values and principles. Thereafter, the process culminates with the identification, classification and selection of the final decision to be implemented. For the purpose of this study, the term model' will be used.

As mentioned before, there exist numerous decision making models. The following section 2.3.2 will look at some of the prominent decision making models in literature that are relevant to this study.

### **2.4.3 Managerial Decision-making models**

In general models represent a specific part of the real world in specific situations, as well as, under changing conditions. From a decision making perspective, models are usually based on critical conjectures and comprise of components that facilitate to better comprehend the complex nature of decision making (Lunenburg, 2010). They help managers to make decisions in a structured way, by significantly decreasing and breaking down the amount of composite variables in decision making to smaller manageable and understandable factors (Lahrmann, Marx, Winter, & Wortmann, 2011).

There exist various decision making models in literature, of all the models, interdisciplinary namely: Rational, Organisational, Political and Process. Of these four, this study is only interested in three, i.e. Rational which is also known as the classical model, Organisational also referred to as neoclassical and Process sometimes referred to as managerial.

#### **2.4.3.1 The Rational model**

Harisson argues that the rational model is normative. This means that instead of a descriptive approach to decision-making, the rational model takes a prescriptive approach. Towler (2010), states that under the rational model, the decision maker, i.e. the manager, perform decisions under the condition of certainty. Thus, the decision maker knows beforehand the alternatives available at his or her disposal; the possible outcomes are known, as well as, the decision criteria. Furthermore, the decision maker has also the added ability to make the best possible selection amongst the alternatives and then put it into operation.

Schoenfeld (2010) notes that the rational model can be classified into 6 different steps, namely, Identifying the problem, Generating alternatives, Evaluating alternatives, Choosing an alternative, Implementing the decision and finally, Evaluating decision effectiveness. Figure 2.2 depicts how these different steps in the rational model flow cohesively.

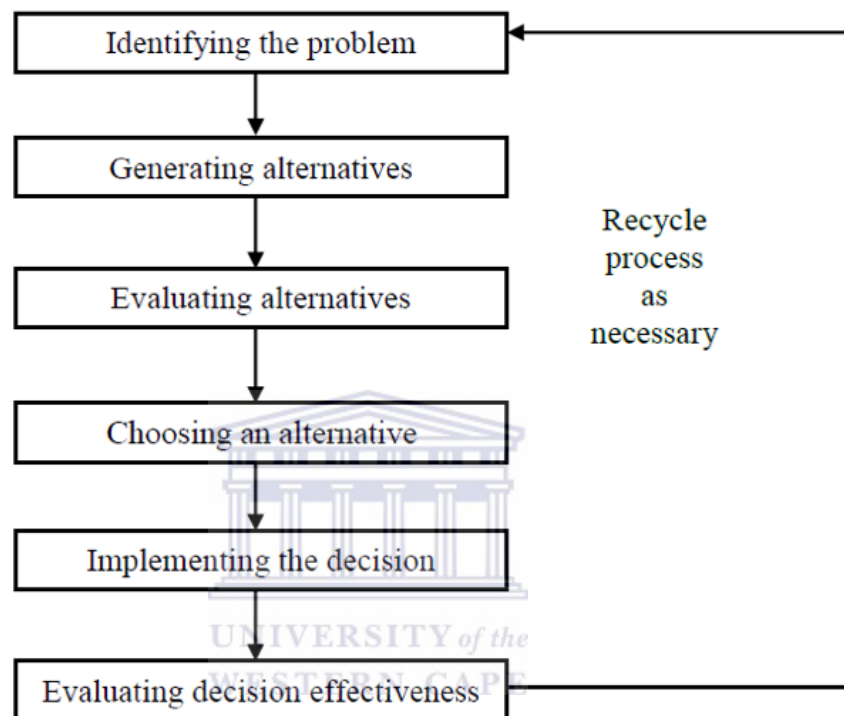


FIGURE 2.2: Rational Decision Making Model (Schoenfeld, 2011), Adapted from Lunebrug 2010

#### 2.4.3.2 Organisational model

The organisational decision making model point out that decision makers in an organisation, contribute to various organisational aims and objectives that are constantly changing and sometimes conflicting in nature (Kharbanda & Stallworthy, 1990; Lillrank, 2003). This model further point out that if a decision maker, (i.e. the manager), does not have adequate or sufficient knowledge of the potential alternatives and of their respective consequences, this will lead to a satisfactory level of achievement, but will not lead to the maximum desired outlook (Harrison, 1993). The organisational model, also known as the neo-classical model due to its roots in

economics, combines quantitative analysis with behavioural disciplines (Harrison, 1993). This model completely abandons the explicit standards and procedures of the rational model and then substitutes them with more open techniques. This helps to deal with the numerous behavioural and environmental constraints previously imposed on managerial decision makers by the classical model.

However, there exist a few basic similarities between both the rational and the organisational models. A short term viewpoint is necessitated by the rational model while at same time, calling for maximized results (Seufert, 2005). The organisational model is seen to yield faster results. However, both models have short term scope and focuses towards instant results. Another similarity is that both models function within various perceptible restrictions. The rational model for instance, is limited by the normative orientation of the quantitative disciplines (Lunenburg, 2010; Talley, 2011). Correspondingly, the organisational model is restricted by internal organisational processes and policies as well as the desire towards rapid outcomes. The most important distinction between the two models is that the rational model tries to maximize results, while the organisational model agrees to satisfactory results.

#### **2.4.3.3 Process model**

The process model of decision making has substantial managerial importance. This is due to its outcomes which are geared towards objectives-oriented results (Melé, 2010). When it comes to decisions which involve a high degree of uncertainty with potential influence on the results this model is seen as the most ideal model for decision making (Harrison, 1993).

These decisions consist of those taken by upper and middle level managers, whereby the effect of these decisions is of great importance to the entire organisation (Ford & Gioia, 2000). Furthermore, the process model is ideal for strategic decisions as well as decisions which involve careful allocation of resources aimed at improving the long term outlook of the entire organisation. It is geared towards organisational change and innovation. One major distinction between the process model and other models (i.e. Rational and Organisational), is that the process model places an strong emphasis on organisational planning and long-term results, while other models only focus on instant results.



#### 2.4.3.4 Multi-Criteria Decision Analysis

Multi-Criteria Decision Making (MCDM) is a well-established discipline in decision making science. MCDM methods are decision-making techniques, which tackle decision-making procedures in situations where multiple criteria and objectives are involved (Triantaphyllou, 2000). A manager is required to make selection between quantifiable or non-quantifiable as well as multiple criteria (Ho, Xu, & Dey, 2010).

Decision outcomes vastly depend on the manager's preference and thus objectives are generally conflicting in nature. In general, MCDM is involved in aligning and finding solutions to problems concerning multiple criteria (Triantaphyllou, Shu, Sanchez, & Ray, 1998). The rationale behind using MCDM for decision-making is to help managers deal with such problems involving multiple criteria.

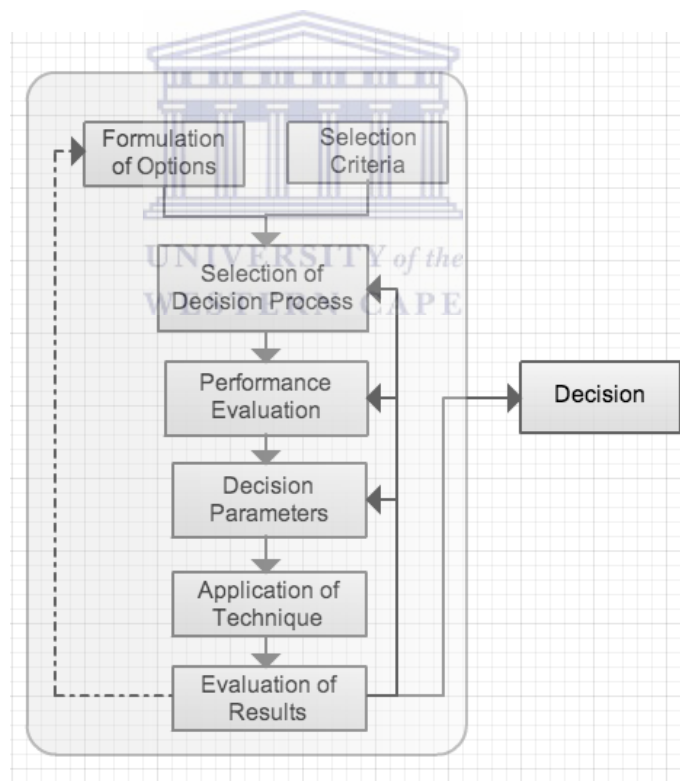


FIGURE 2.3: Multi-Criteria Decision Analysis, Adapted from Pohekar et al., (2003)

In the context of managerial decision-making using Mobile BI, MCDM can be considered useful in supporting business decision making. This is because there

has recently been an extensive use of computers and information technology tools in business, such as mobile devices, which has in turn, resulted in enormous amount of information (Triantaphyllou, 2000; Triantaphyllou, Shu, Sanchez, & Ray, 1998). Decision-makers, or in this context, managers can use mobile devices to support decision making while following MCDM methods.

## 2.5 Chapter summary

In this chapter, an extensive review of literature pertaining to discussions of all relevant aspects of the two central themes that constitutes this study; namely Business Intelligence and Managerial decision-making were presented.

TABLE 2.3: Summary of Decision-making Models

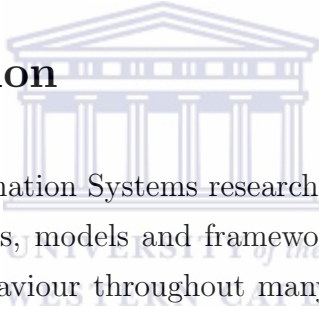
Model	Decision making Approach/ Principle	Key Properties
Rational	Prescriptive approach,	Short term vision, Maximising results
Organisational	Satisfactory results Acceptable	Short term vision, Maximising results
Process	Objectives oriented outcomes	Long term vision, highly structured
MCDM	Multiple Criteria oriented	Driven by objectives

Table 2.3 summarises the different decision-making models discussed in this section with their corresponding principles as well as properties. Having discussed the underlining concepts and models that comprise the focus of this research, the Research Framework and formulation of hypotheses will be presented next.

# Chapter 3

## Research framework and Research hypotheses

### 3.1 Introduction



A large number of Information Systems research studies are fundamentally interested in studying theories, models and frameworks that have the capabilities to forecast and explain behaviour throughout many different domains (Legris, Ingham, & Collerette, 2003; Oliveira, Martins, & Lisboa, 2011). The common goal behind these studies is to examine strategies, which help encourage technology usage while at the same time, examining which factors impede the use and intention to use of technology (Venkatesh, Morris, & Ackerman, 2000; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010).

In this regard, the importance of studying such theories and models is therefore of tremendous benefit. This is since it is anticipated that, the theoretical concepts derived from these IS theories will help provide a firm foundation for developing a research model that would appropriately validate the usage of Mobile BI for managerial decision-making in organisations. This would in turn address the third research objective (Refer to Chapter 1).

From this perspective, this chapter looks at the five widely studied frameworks in information systems literature, namely: The Diffusion of Innovation Model (DOI), Theory of Reasoned Action (TRA), The Unified Theory of Acceptance and Use of Technology (UTAUT), Technology Acceptance Model (TAM1 and TAM2) as

well as the Technology Acceptance Model for Mobile Services (TAMMS). The rationale behind the selection of these five adoption models is that, they are the most widely studied models in Information Systems literature with respect to the adoption of new technology and closely connected to the requirements of this study. Most of these theories are commonly used to study, as well as, understand factors influencing user adoption of new technology (Gustavsson & Gustavsson, 2009).

This chapter therefore forms the theoretical foundation for which the study is based upon. Furthermore, the research model and framework of the entire study is also presented. A coherent discussion on the selection of a model which best suits this research – in light of the research questions – is also provided. Finally, this chapter culminates with discourses on the different relationships between the proposed factors in the research model leading to the formulation of the research hypotheses.



## 3.2 Diffusion of Innovation Model (DOI)

The term ‘Diffusion of Innovation’ describes the process by which innovation propagates through certain channels over a time period between members of population group in a community system. Rogers’ Diffusion of Innovations theory (DOI) seeks to provide an explanation and understanding of how these innovations disseminate through a population (Rogers, 2003). An innovation can be said to be an idea, philosophy, product, behaviour or a practice that is perceived by its audience as being new. Diffusion of Innovation theory is generally considered an important transformation criterion for guiding technological innovation through which the innovation is customised and showcased in ways that addresses the needs and requirements of the different group of adopters.

Furthermore, DOI also emphasises the significance of communication and collaboration within the adoption process (Rogers, 2003). Often in many organisations, the innovation process always involves several groups of people; both supporters and challengers of new innovations. Each of these people have an input contribution to the innovation decision. Rogers observes that these individuals in a company always have different levels of enthusiasm with respect to adopting new innovations. The DIO is often associated with the adoption of the S-Curve, which illustrates how an innovation is adopted in an organisation over a period of time. Moreover, a segment of the population adopting a new innovation is distributed on average over a period of time.

From the illustration in Figure 3.1, there exist five adoption categories. These are the following: (1) The Innovators, (2) Early adopters, (3) Early majority, (4) Late majority, and (5) Laggards. Furthermore, the five innovators categories follow a standard deviation-curve of which at the beginning, very few innovators (2.5 percent ) adopt the innovation. The early adopters account for 13.5 percent while the early majority make up and the late majority account for 34 percent respectively. The laggards come in last and account for the remaining 16 percent.

### Summary

The diffusion of innovation model seeks to explain how a new idea or a new innovation is diffused through society. Moreover, it also gives an explanation of how

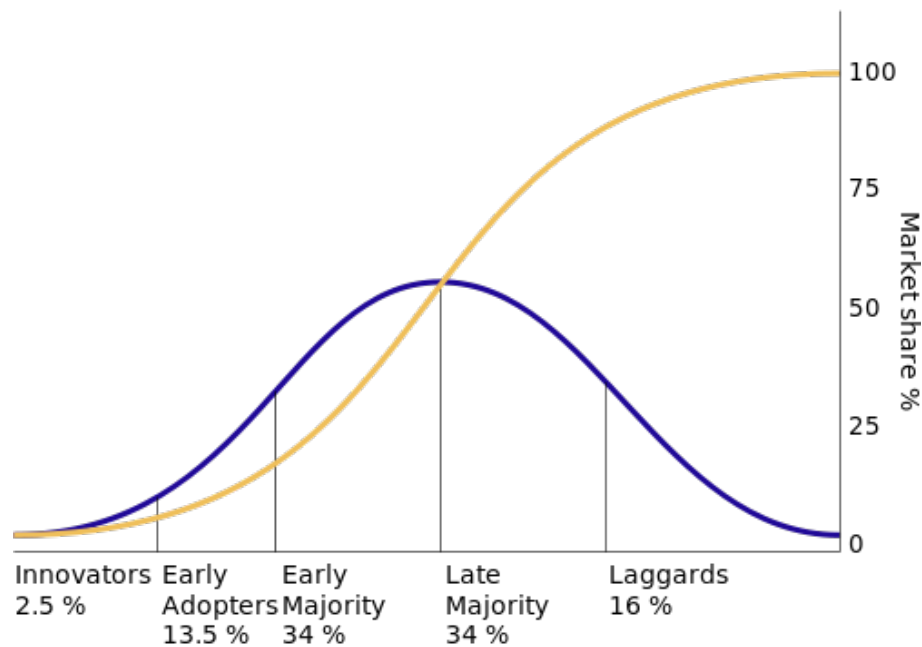


FIGURE 3.1: Diffusion of Innovation Theory, Rogers (1995)

an innovation is adopted and then becomes fully integrated into people's daily use. According to Rogers (2003), an innovation is an evolutionary process consisting of several stages. Following the DOI model, the subsequent section will discuss another theory, the Theory of Reasoned Action (TRA), which seeks to explain the behavioural attitudes of users in line with adopting new technology.

### 3.3 Theory of Reasoned Action (TRA)

Theory of Reasoned Action (TRA) was initially developed by Fishbein and Ajzen (1980) out of sheer frustration with the lack of agreement in academic literature in relation to the concept of attitude' with its conflicting results in its measurements. In so doing, TRA was successful in developing a consistent structure by delivering a model that tries to forecast deliberate behaviour. Thus, TRA is simply a model that facilitates the understanding of a person's behaviour (B) as a positive function of their behavioural intention (BI) to carry out a particular behaviour. Moreover, according to Hale et al., (Hale, Householder, & Greene, 2002), TRA states that behavioural intention is the finest forecaster of behavioural engagement. The

following mathematical function helps illustrate TRA in its utmost basic form:

$$BI = AB(W)_1 + SN(W)_2 \quad (3.1)$$

The Behavioural intention is represented by BI; SN represents the subjective norm and the Attitude towards Behaviour is given by AB. The measurement weight given to each element is represented by two W's. Figure 3.2, provides an illustration of the TRA framework.

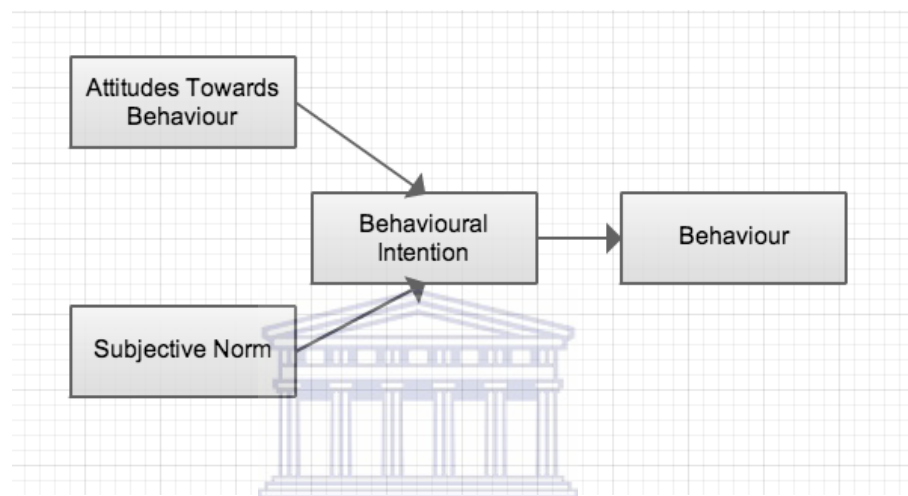


FIGURE 3.2: Theory of Reasoned Action, (Ajzen and Fishbein, 1980)

From the following illustration in Figure 3.2, an individual's intention to perform a particular behaviour is influenced by positive assessment of the behaviour, while the attitude towards behaviour is a reflection of the individual's prominent behavioural beliefs (Hassandoust and Perumal, 2010; Bock et al., 2005).

## Summary

TRA model seeks to facilitate the understanding of a user's behaviour as a positive function of their behavioural intention to perform a specific behaviour. Moreover, intention the best forecaster of behaviour as noted in Figure 3.2. Given that intention is the cognitive representation of a person's eagerness to carry out a particular behaviour, intention is therefore considered as a direct antecedent of behaviour. Furthermore, this behaviour is decided by three important constructs: A person's

Attitude toward a particular behaviour, their subjective norms and their perceived behavioural intention. Following discussion on the TRA, the following section will discuss another important model in line with technology acceptance. This model is Unified Theory of Acceptance and Use of Technology (UTAUT), this follows next.

### **3.4 Unified Theory of Acceptance and Use of Technology (UTAUT)**

In an attempt to consolidate all the adoption models into a universal model, Venkatesh, Morris and Davis, developed the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT highlights the key single-stage factors that affect technology, but also points out the contingencies that would strengthen or restrain the effects of these factors (Venkatesh & Zhang, 2010).

Venkatesh further argues that there exist four factors that play a major role as direct influencers of user acceptance and usage behaviour (Venkatesh, Morris, Davis, & Davis, 2003). These are the following: performance expectation, effort expectation, social influence, and facilitating conditions. UTAUT maintains these four fundamental construct influence directly the intention to use and behaviour (Venkatesh, Morris, Davis, & Davis, 2003).

Gender, age, experience, and voluntariness of use are control variables that monitor the impact of the four main factors on the intention to use and the behaviour of use. Venkatesh et al., further argue that, the UTAUT offers managers an instrument to establish the prospect of success for a new technology. (Venkatesh, Morris, Davis, & Davis, 2003). Depicted in Figure 3.3, is UTAUT's theoretical framework, with its four fundamental constructs.

#### **Summary**

In summary, Venkatesh, Morris and Davis developed the Unified Theory of Acceptance and Use of Technology (UTAUT) in an attempt to give a unified theoretical



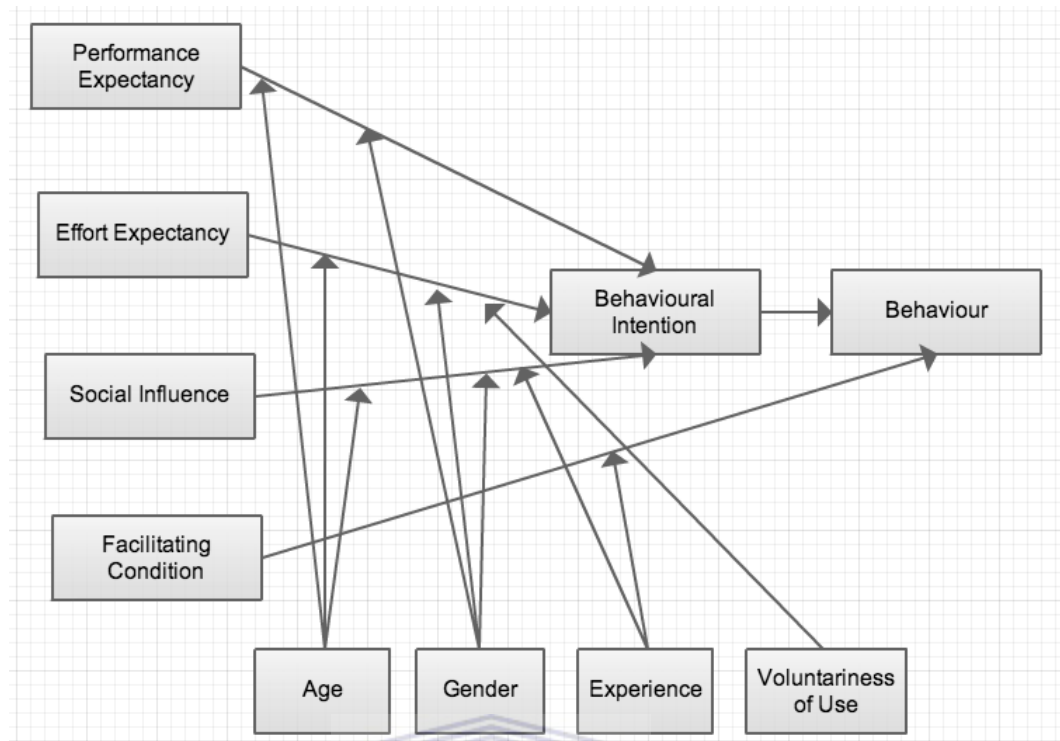


FIGURE 3.3: Unified Theory of Acceptance and Use of Technology (UTAUT)  
(Venkatesh et al., 2003)

foundation from which to facilitate information system (IS) adoption research. UTAUT proposes that four key factors namely: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions, are direct determinants of Behavioural intention and eventually Behaviour (Venkatesh, Morris, Davis, & Davis, 2003). The effect of the four above mentioned key factors is moderated by another four important variables. These are: Gender, Age, Experience, and Voluntariness of use (Venkatesh, Morris, Davis, & Davis, 2003).

Having discussed the Theory of Reasoned Action Model, the following section will discuss the Technology Acceptance Model, which is one of the widely studied models in accordance with the adoption of technology in information systems literature.

### 3.5 Technology Acceptance Model (TAM1 and TAM2)

The Technology Acceptance Model (TAM) was developed to describe and explain the adoption of a particular technology as well as its usage. TAM was essentially developed by Davis (1986) mostly as an extension of the Theory of Reasoned Action (TRA). TRA further maintains that attitude towards using a technology is an important determinant in its usage (Davis Jr, 1986).

TAM is mainly used to forecast the individual adoption and use of new technologies within a business environment (Venkatesh, Morris, Davis, & Davis, 2003). Moreover, TAM asserts that the behavioural intentions of an individual to use a particular technology is mainly determined by two distinct elements: (a) The Perceived Usefulness (PU), which is described as the magnitude to which a person considers the use of a specific technology will improve their job performance, and (b) The Perceived Ease of Use (PEOU), which is defined as the degree to which an individual considers that the use of a particular system will be effortless (Davis, 1989).

Over time, several revisions of the original TAM model have been made. TAM2 was developed by Venkatesh re-evaluates the usage of the subjective norm (Venkatesh, Morris, & Ackerman, 2000). Nonetheless, the original model, TAM1, is still the most extensively used models in information systems research, due to its minimalism and comprehensibility (King & He, 2006). Although it has been established that TAM's components are responsible for determining user acceptance, TAM has also faced a great deal of criticism for its simplistic constituents, which have inadequate reliability and prediction influence (Bouwman & van de Wijngaert, 2009). These shortcomings are partially due to the fact that most of the above mentioned models are usually broad and mainly focus only on generic acceptance methods.

The main goal of TAM as illustrated below in Figure 3.4 is to provide an explanation of the use, intent of use, and acceptance of a particular system (Davis, 1989).

TAM outlines the effects of external factors on users' own beliefs, judgements, mind-set, and intentions of use of a system (Goodhue & Thompson, 1995). Perceived Usefulness (PU) is one of the most important forecasters of technology

usage in TAM as substantiated in Figure 3.4. While well-known models such as UTAUT, TRA as well as TAM have certain constituents that might be relevant to Mobile BI acceptance, this is only to a limited extent.

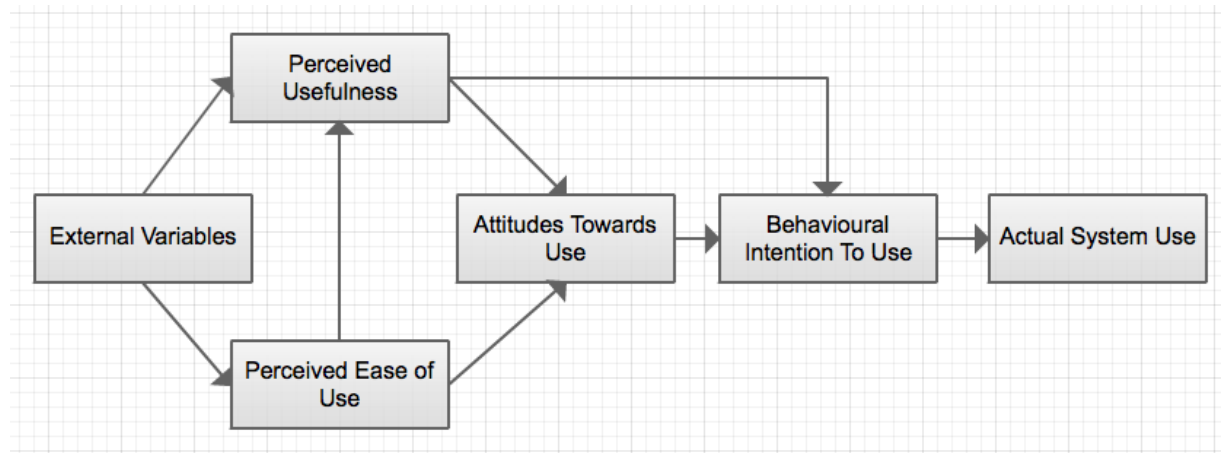


FIGURE 3.4: Technology Acceptance Model (Davis et al., 1989; Venkatesh et al., 2003)

### 3.6 Technology Acceptance Model for Mobile Services

Recent research approaches have taken different steps in developing specific models that caters exclusively for niche research areas such as this study. For instance, Holsapple et al., (2005) developed a model for the user acceptance of virtual worlds, while Park et al., (2009) developed another model for the user acceptance for digital libraries.

While the adoption and acceptance of IT services has been one of the most popular IS research domains – the recent ubiquity of mobile devices and services have called for new inquiries in investigating the adoption and acceptance of mobile services. For example, questions about the main factors influencing the adoption of mobile services, or how the context of use play an influencing role in user adoption of mobile services. Thus, there was a need for a specific model that addressed these issues. Hence, the Technology Acceptance Model for Mobile Services (TAMMS).

TAMMS was developed by Kaasinen in 2005 as an extension of the original TAM. In developing this model, Kaasinen conducted an extensive field study in an attempt to discover which tangible software characteristics that play an influencing role in the acceptance of a particular service in its use.

TAMMS also made use of some constructs from the original TAM model, but added new components based on results from Kaasinen's field study. Through these case studies, Kaasinen (2005) used the Human-centred design (ISO 13407:1999) cycles for the development of mobile services, in defining the constructs that constitutes TAMMS. According to Maguire (2011), Human-centered design is a practice that relies on user participation to allow (service and product) developers to gain a fine understanding of the user and job requirements.

In her study, Kaasinen discovered that the 'Intention to Use' of a mobile service is influenced by the 'Perceived Ease of Use', 'Perceived Value', as well as, the 'Trust'. Furthermore, she also discovered that, there is an intermediary process needed in order to get from the Intention to Use to the Actual Usage. This intermediary process is the Taking into use which, in turn, is influenced by Perceived Ease of Adoption. Figure 3.5 depicts TAMMS along its adaptation from the original TAM. The new constructs are highlighted for easier understanding.

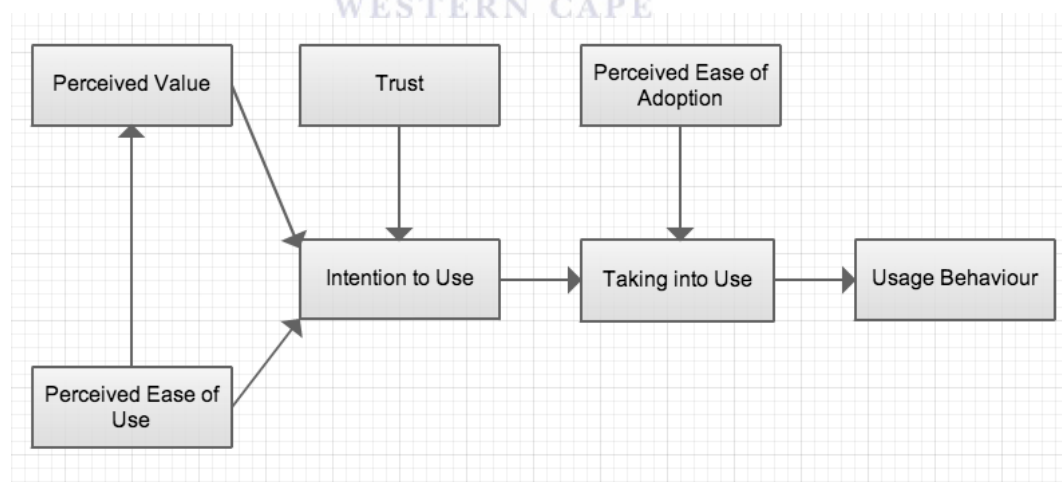


FIGURE 3.5: Technology Acceptance Model for Mobile Services (Kaasinen, 2005)

From Figure 3.5, the Perceived Usefulness construct is replaced by Perceived Value. This research study makes use of a definition of Perceived Value developed by

Chang et.al, (2013), which declares that Perceived Value as any benefits gained from the use of a system given the time and effort spent. TAMMS further proposes that Perceived Usefulness may not address motivation to acquire mobile services in a satisfactory manner. The model also point out that Perceived Value defines the most important characteristics of a product, which users love and are interested in.

TAMMS suggest that Perceived Value deals with how users perceive a mobile service to be reliable as well as the degree of control users have over their personal information when using the service. Moreover, from a mobile perspective, amongst the important factors which influence acceptance, Perceived Value is an important factor (Kim, Kim, & Wachter, 2013; Yen, 2012).

### **3.7 Towards a hybrid model**

From all the previously discussed acceptance models, no model or theory unilaterally incorporate of all factors that accommodate this study well. Therefore, there is a need for a better model that fully integrates all the relevant constructs befitting this study.

Due to the practicality, adaption to mobile services and design implication of TAMMS as well as TAM2's richness and applicability in different context in explaining user acceptance of technology – thus a hybrid model of universal validity derived from both TAMMS and TAM2 models is thus seen as the most appropriate model to explain what this study is seeking to understand.

Therefore, to explain the effect of Mobile BI on managerial decision-making in organisations, this study makes usage of a hybrid model that incorporates elements from both TAMMS and TAM2 models. Elements of the other reviewed models where not considered because they do not necessarily fit the requirements of what is being investigated, i.e, mobile BI and managerial decision-making. Discussion pertaining to the development of such a hybrid model follows next as well as the corresponding research hypotheses.

## **3.8 Research model and research hypotheses**

### **3.8.1 Introduction**

Literature about user behaviour, particularly from the above discussed models; form a firm foundation that has helped many IS researchers to establish the various factors that lead the user acceptance of numerous technologies. The following section will, therefore, explain the reasoning behind the development of the model used, which tries to explain the Effect of Mobile BI on managerial decision-making. This will consist of the theoretical relevance and the selection of appropriate constructs.

On the basis of findings from the earlier discussed literature, as well as in accordance to TAMMS and TAM, six key constructs have been identified to be used to formulate the conceptual model of this study. These constructs are based on both the TAM2 model and TAMMS. These constructs are the following: (1) Perceived Ease of Use, (2) Perceived Value (3) Quality of Information (4) Attitude towards (BI) use and (5) Behavioural Intention To Use (6) Corporate Strategy. The explanation for the addition of these new variables with their related hypotheses follows next.

### **3.8.2 Perceived Ease of Use of Mobile BI**

Perceived Ease of Use is concerned with the extent to which an individual believes that using a specific technology would be effortless (Davis, 1989, p. 82). While this effort is a limited resource, a piece of a technology perceived to be easier to use by users or in the context of this study managers, would be more likely to be accepted and used (Davis, 1989).

In the context of Mobile BI for managerial decision-making, a manager may find Mobile BI services uncomfortable if the technology is difficult to learn, understand and, or use. All the information that a manager would require to facilitate decision-making (and taking action) using Mobile BI should be presented in such a way that is easy to understand and use (Kaasinen, 2005; Duda, Aleksy, & Schader, 2008). This would in turn influence managers' attitudes as well as how they perceive

Mobile BI to be valuable in their job tasks. Thus, this leads to the formulation of the following two hypotheses:

**Hypothesis 1:**

Perceived Ease of Use positively influences Perceived Value of Mobile BI

**Hypothesis 2:**

Perceived Ease of Use positively influences managers Attitudes towards Use of Mobile BI

### 3.8.3 Perceived Value of Mobile BI

In the context of managerial decision making, Perceived Usefulness may not suggest sufficient enthusiasm to adopt Mobile BI. Findings from a study conducted by Jarvenpaa et al. (2003), points out that a user may not have a convincing reason to adopt new mobile services except if the service truly generates new alternatives in situations whereby mobility matters and if that service would positively affect the users life. Otherwise, users do not have any reason for adopting the mobile service. Hence, Perceived Value of Mobile BI takes the place of Perceived Usefulness in the model. Value consists of rational utility as well as it outlines the important characteristics of a service that is valued by the user and this is can be one of the crucial causes why users maybe show interest in the new mobile service (Kaasinen, 2005).

Value is established by clearly describing the goals and objectives, which are statements concerning what the user wishes to accomplish with the mobile service(Brockmann, Stieglitz, Kmiecik, & Diederich, 2012). These objectives are directly associated with existing problem or condition the user might be facing (Nah et al., 2005).

In concentrating on Perceived Value in user acceptance research, this helps to maintain the broader capacity of value-centred design, in which user value can be examined concurrently with business value and strategic value as suggested by Henderson (2005). Therefore this leads to the formulation of the following hypoteses:

**Hypothesis 3:**

Perceived Value positively Influences Attitudes Towards Mobile BI use

**Hypothesis 4:**

Perceived Value is positively related to the Quality of Information.

**3.8.4 Quality of Information**

Managerial decision-making processes are largely dependent on the individual decision-maker, the organisation and the environment, in which the manager operates, and the quality as well as the integrity of information at the manager's disposal (Dane & Pratt, 2007). The difficulty managers face is not so much about doing things right, instead it is about having access to the right information advising them what are the 'right' things to do and how. A number of research studies suggest that inadequate, delayed, as well as, incomplete information is considered as the most serious quality problem (Larry, 1999; Ferguson & Lim, 2001; Popovič, Coelho, & Jaklič, 2009).

Lillrank (2003) argues that information quality can be tackled using the distinction of information-as-artefacts, and information-as-deliverables. The author further maintains that the information-as-artefacts can be an issue of technical quality considerations concerning the measurement of information discrepancy while information-as-deliverables can be examined as negotiated quality whereby a number of contributions are used to agree on significance.

Lillrank (2003) further points out that another well-known approach is use a model formulated by Garvin (1988) to create a list of feasible information quality features or attributes (Salmela, 1997; Tozer, 1999). Using Gavin's framework (1988), Huang et al., (1999) created a list defining 15 features grouped into four categories:

1. Fundamental quality: completeness, not influenced by emotions or personal prejudice, trustworthy, and reputation;
2. Accessibility quality: access, and security;
3. Contextual quality: relevancy, value-added, timeliness, completeness and amount of data;
4. Representational quality: interpretability, ease of understanding, concise representation, and consistent representation.



Since the mobility aspect adds a real time advantage to Mobile BI, which allows the accessibility of information anywhere, anytime Information Quality is considered (in context of this study) as an imperative influencing construct to the usage behaviour.

**Hypothesis 5:**

Quality of Information positively influences Attitudes towards (Mobile BI) Use.

**Hypothesis 6:**

Quality of Information positively influences Behaviourial Intention To Use.

### **3.8.5 Managerial attitudes towards Mobile BI use**

Shrivastava and Lanjewar (2012) define Attitudes as an individual's comparatively continuous evaluation and assessment that develop both positive and negative feelings as well as an inclination towards a particular idea, object, person, service or product. Hubona and Geitz argue that TAM emphasize that the predictive role played by external variables upon user behaviour is intermediated via user beliefs and attitudes. (Hubona & Geitz, 1997). Fazio (1986) note that attitude influences a person's behaviour by filtering information and determining the individual's perception of a particular system. Therefore, Attitude towards Mobile BI use is an important construct which can influence the overall system use (Graham, Harvey, & Puri, 2013).

Attitude toward an innovation is a significant and dominant construct in making a decision to adopt a new innovation (Rogers, 1995). Therefore, attitude toward a particular information technology is formulated as a possible manager's form of evaluation criteria in developing an interest of using a particular technology (Davis et al., 1989) and, in accordance with TAM, subsequently influences a manager's behavioural intention to use of Mobile BI.

**Hypothesis 7:**

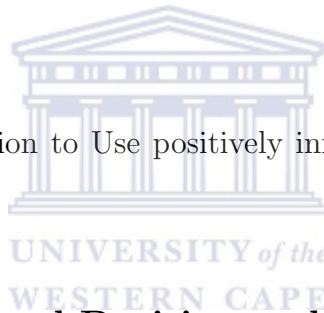
Attitudes towards Use positively influences the Behaviourial Intention to Use (Mobile BI).

### 3.8.6 Managers behavioural intention to use Mobile BI for decision-making

An important role of managers in organisations is to make decisions which are crucial due to the inherent responsibility of driving the organisational strategic direction and setting into operation organisation-based internal coordination and control (Hamilton & Gioia, 2010; Pettijohn, Keith, & Burnett, 2011; O'Fallon & Butterfield, 2013). Managers behavioural intentions can be regarded as a direct antecedent of managers behaviour, according to Ajzens (1991) theory. User Behaviour is to a large extent influenced by behavioural Intention to Use (BIU) according to prior studies (Chuan-Chuan Lin & Lu, 2000; Kuo & Yen, 2009). Thus BIU plays an important role in predicting usage behaviour. However, BIU has more predictive power of usage behaviour when users, or in this context, managers, have had prior experience with the technology. (Taylor & Todd, 1995)

#### **Hypothesis 8:**

Behavioural Intention to Use positively influences Organisational decision-making strategy.



### 3.8.7 Organisational Decision-making

An organisation as described by Robbins (1990) is a purposely-coordinated entity, with well-known boundaries, that operates on an ongoing basis to achieve a common set of objectives and goals. Critical to this definition are the concepts of objectives and goals. Organisational decision-making is the standard of decisions made by managers in an organisation that defines and reveals the aims, objectives and goals of that particular organisation (Shapira, 2002; Singh, 1986).

Organisational decision-making develops the fundamental policies and plans which are required to accomplish the organisation's objectives (G. Huber, 2013). In any type of organisation, organisational decision-making typically concerns the entire enterprise and managers play an important role in organisational decision-making.

The organisation's strategy, goals as well as objectives, are believed to be influenced by how managers use traditional advanced information technologies such as Business Intelligence (G. Huber, 2013). Since, these factors are specific to a given

organisation; they tend to vary from organisation to organisation, depending on their strategic objectives and goals (Zheng, Yang, & McLean, 2010). Nevertheless, decision makers are inclined to make decisions that are aligned to the goals and objectives of their respective organisations (Yeoh & Koronios, 2010).

In the context of this study, managerial decision-making is critical because of the influence of the decisions taken would have on an organisation's goals and objectives. The goals and objectives subsequently have an effect on transformation and performance of the organisation (Hamilton & Gioia, 2010; Henderson & Venkatraman, 1999; Leifer & Burke, 1994).

### 3.8.8 Conceptual research model

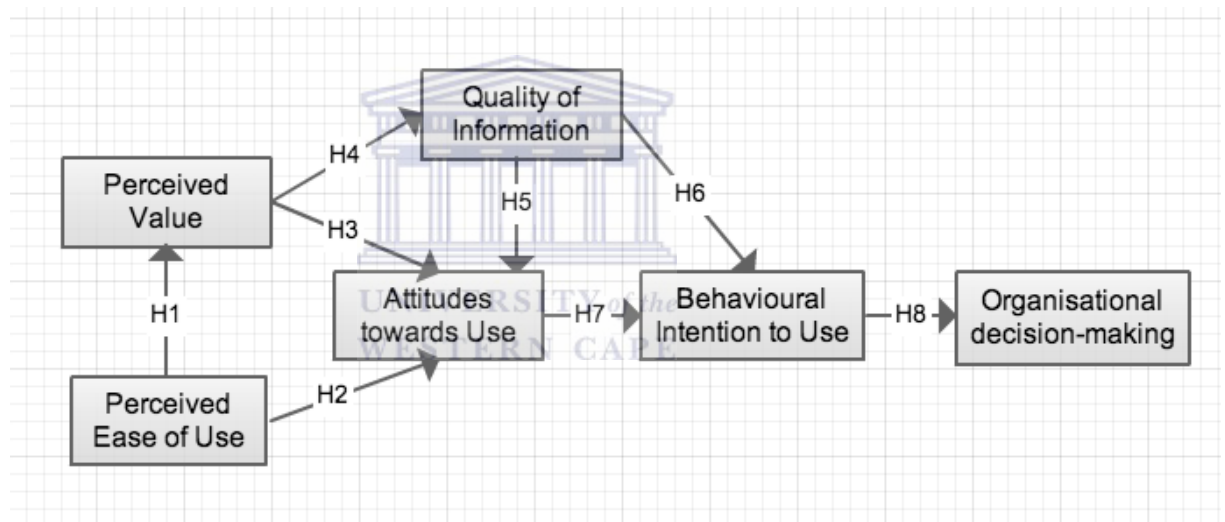


FIGURE 3.6: Proposed Research Model

Illustrated in Figure 3.6, is a hybrid derivative model deduced from both the original TAM and TAMMS models. This model consists of constructs from both models as well as newer ones to enrich it further.

### 3.9 Chapter Summary

This chapter provided an comprehensive critique of the five technology acceptance theories which are amongst the most researched topics in information systems literature. The extensively studied theories and models relating to technology acceptance have been used to form a theoretical foundation of this study. These acceptance models include Roger's Diffusion of Innovation (Rogers, 2003), The Theory of Reasoned Action, the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (1 and 2). These theories and models were found to have distinct features and significant benefits that formed the theoretical framework of this study. The theoretical foundation to which this study is based upon is hybrid model derived from both TAM2 and TAMMS. Finally, a research model with its corresponding hypothesis was formulated. In the chapter to follow, the research design and methodology will be discussed.



# Chapter 4

## Research design and methodology

### 4.1 Introduction

This chapter outlines the research design and methodology used in this study. This chapter provides a detailed research strategy adopted in this study in order to address the research questions and objectives. This chapter also provides the method of data collection for analysis. This chapter further provides the approach taken in the selection of the sample size and the analysis approach that was adopted in Chapter 3.

This chapter is structured in the following way: The first section describes in detail the background and advantages of the research methodology as applied in this study. The second section provides a justification of the research methodology used in this study while the third section discusses the Methods of data analysis. Subsequent to Methods of data analysis, the fourth section discusses how the actual research was carried out. A summary of the entire process is provided in the last section.

## 4.2 Research strategy

Quantitative and qualitative methods are two approaches to select from when carrying out research in social science (Fuchs & Hanning, 2001). The quantitative approach is also known as positivist approach and can be briefly explained as the natural-scientific process in human behavioural research while the qualitative approach is known as anti-positivist method and can be summarised as the inverse of human behavioural research. However, these two methods can also be combined into third method known as the mixed method approach (Creswell, 2013).

The main difference between quantitative and qualitative methods is that in the quantitative approach, mathematics and statistics are used to measure a certain phenomenon, while the qualitative method is concerned with the social characteristics of life and the significance people attach to it (Bernard & Bernard, 2012; Creswell, 2013). The authors further substantiate that the selection of approach is dependent upon the type of problem as well as the type of information required.

The primary purpose of this study is to examine the effect of Mobile BI on managerial decision-making in Organisations, of which some theoretical knowledge based on evidence from literature have been constructed in chapter 2. The focus is therefore on finding answers to the research questions and to meet the research objectives. For this reason, this study required a research approach that was appropriate enough to explain the complexity associated with what the study is seeking to understand. This is especially since the study sought to investigate an emerging discipline (Mobile BI) while in the same process attempting to measure how much of an influence Mobile BI has on managerial decision-making and the organisation. Therefore for the above discussed reasons, this study was primarily quantitative in nature.

### 4.2.1 Quantitative approach

Quantitative research can be described as the established scientific method to research with foundations from the philosophical paradigm for human inquiry recognised as positivism (Bryman, 2006). Charles (2009), argue that quantitative research is an approach that makes use of statistical methods and techniques of quantifying information to attain some particular results. In quantitative research,

the aim is to determine the different relationships between a dependant variable  $x$  and another independent variable  $y$  in a specific population set. Table 4.1 presents a brief comparison of the strenghts as well as the weaknesses of the quantitative approach.

TABLE 4.1: Strengths and Weaknesses of Quantitative study (adapted from Johnson and Onwuegbuzie, (1990))

Strengths	Weaknesses
Testing and validating already constructed theories about how (and to a lesser degree, why) phenomena occur.	The researchers categories that are used may not reflect local constituencies understandings.
Testing hypotheses that are constructed before the data are collected. Can generalise research findings when the data are based on random samples of sufficient size.	The researchers theories that are used may not reflect local constituencies understandings.
Useful for obtaining data that allow quantitative predictions to be made.	The researcher may miss out on phenomena occurring because of the focus on theory or hypothesis testing rather than on theory or hypothesis generation (called the confirmation bias).
The researcher may construct a situation that eliminates the confounding influence of many variables, allowing one to more credibly assess cause-and-effect relationships.	Knowledge produced may be too abstract and general for direct application to specific local situations, contexts, and individuals.

There are numerous study designs that could have been undertaken to accomplish the research goals; however, not all of them were suitable enough to address the objectives outlined by this study. Saunders et al., (2011) argues that it does not matter which label is attached to a specific strategy, instead, what matters the most is the appropriateness of the chosen strategy for the undertaken research.

In essence, objectives 1, 2 and 4 of this research sought to investigate how Mobile BI is used by managers to make certain decisions, the effect of these decisions and overall impact on the organisation. This would later be achieved by the collection and analysis of empirical data. Thus, the question arised: which research strategy is the most suitable and should be adopted in order to meet objectives of the study?

There exist many different research designs in information systems research (Creswell, 2012; Dennis & Valacich, 2001). These research designs include experimental research, survey research, ethnography, phenomenological research, grounded theory, heuristic inquiry, action research, discourse analysis, and feminist standpoint research. The exact number of research designs that have been applied to the information systems field is not exactly known. After establishing that this study was quantitative in nature, thus a suitable quantitative research method was needed.

For the purpose of this study, only three research designs categorised under quantitative research method were identified and discussed. These are the following:

1. Experimental Design
2. Field Study Design
3. Survey Research Design

These three methods were identified for two reasons. (a) They are widely applied in quantitative research methods and (b) They take into account the nature of the subject matter (i.e. contemporary technologies such as Mobile BI and the complexity of the real world situation, (i.e. the managerial decision making environment)).

A brief comparative analysis of the strengths and weaknesses of the above mentioned research designs involving quantitative measures will follow next. Thereafter, a brief discussion will follow on which research design that was best applicable to this study and why it was chosen. This is presented in the following format. Firstly, Field study is discussed, which is then followed by survey design, thereafter, experimental research design is presented and discussed.

### **4.2.2 Field Study Design**

Field study is a type of research that is undertaken in the real world, through which a more naturalistic setting is preferred rather than laboratory setting (Salkind, 2010). The laboratory environment is subject to numerous limitations and is not able to predict behaviour in real life situations. Field studies usually rule out the possibility of any form of direct manipulation of the scene by the researcher (Creswell, 2012).



Nevertheless, dependent and independent variables tend to (occasionally) exist already within the social setting under investigation when considering field study designs (Creswell, 2012). Thus, deductions can be made about certain behaviours, values, and beliefs.

In general, field studies can be classified under non-experimental designs whereby the researcher makes use of what is previously available in the social setting to make deductions (Yin, 2011). The primary strength of field research is realism (Salkind, 2010). Thus, concerns about precision and generalisability are secondary to obtaining realism.

Field studies make it hard to determine which factors are more influential in specific situations because they do not control external variables (G. P. Huber & van de Ven, 1995). Furthermore, there is also the possibility of bias in field studies (Hersch & Phillips, 2004). Bias usually occurs in field studies when testing certain hypotheses. In addition to the bias problem, there is also the problem of reproduction of the study under similar conditions (Salkind, 2010). From the above mentioned reasons, it thus implies that any original field study sample will not be entirely reflective of any other replication of that sample. As a result, this method is not suitable enough to accommodate the needs of this study which implies that another robust method is required to address the requirements of this study.

### **4.2.3 Experimental Research Design**

Experimental study designs are designs in which the researcher sets out to evaluate by comparing and contrasting two or more population groups (Dennis & Valacich, 2001). One group is classified as the experimental group while the other classified the control group. The experimental group is provided with a new or untested innovative program or intervention and the control group is given the alternatives (Study and Salkind, 2010).

The main strength of experimental research lies in accuracy and control, while its fundamental purpose is extending theories and testing hypotheses (Walker, 2005). In general, experimental research is not interested in producing generalisable results in spite of the fact that generalisation can be accomplished after gathering

a number of studies that vary the characteristics of the research design. In addition, realism and generalisability are two critical factors to take into consideration while designing experiment, yet the interest should always be placed on achieving precision above all other things. Since precision is the fundamental reason of experimental research, it thus implies that generalizability and realism can be sacrificed to accommodate precision, if ever there is any need for compromise (Dennis & Valacich, 2001).

Experimental designs, in general, first classify the dependent, independent variables and then specify in which the way randomization and statistical analysis of an experiment ought to be performed (Levy & Ellis, 2011). The main goal of experimental designs is to determine the underlying relationship between the dependent and independent variables. Another goal of experimental research designs is to deduce the highest amount of information with the bare minimum expenditure of resources (Kirk, 2009).

However, Experimental research design is inappropriate for the purpose of this study because it is subject to a number of methodological limitations that may jeopardise the validity of the research outcomes of this study. This is also because experimental research designs are only interested in producing realistic or precise results (Gravetter & Forzano, 2011, p. 385). Given that the subject being researched is a relatively new field, it would not be possible to use such a method for a field that is yet to be thoroughly explored. Therefore, if experimental research design is used, this would only result in the acquiring some knowledge about why some managers prefer to make certain decisions with or without making use of Mobile BI, of which a number of biases may arise.

Thus, Experimental research design is not considered as the ideal method that best suits this study given the time, resources and subjects.

#### **4.2.4 Survey Research Design**

The primary strength of survey research is the ability to generalise certain factors about a population group (Dennis & Valacich, 2001). In general, a survey research is used mainly to quantitatively explain certain characteristic of a population group. These characteristics usually entail investigating the relationships between independent and dependant variables (Glasow, 2005). In addition, the

necessary data gathered intended for survey research are always from individuals implying that the gathered data is often subjective.

Furthermore, a survey research makes use of a particular segment of a population group from which the outcomes are generalized back to the population at a latest stage (Andres, 2012). While it holds true that surveys can help deduce certain information about a population such as relating to attitudes, of which are otherwise not easy to measure using techniques such as observational methods (Krosnick, 1999) however, surveys methods do not provide accurate measurements. Instead, surveys only give approximations for the true population, (Salant & Dillman, 1994, p. 13).

Given the above mentioned issues, it thus follows that the survey method is the most suitable method to address the objectives of this study taking into consideration the time and resources available. Therefore, This method is seen, in the context of this study, as better method that takes into account all the ingredients as well as resources at hand in order to address the research question and research objectives.

Furthermore, this study wished to produce generalisable results with a very acceptable degree of accuracy about the managers population group. This would in turn allow to be generalised and applied back into the managers population. Thus, in using survey research design method, this resulted in discovering knowledge about the relationships between these factors and managerial decision making and thus help to test the different hypotheses. Also, by making use of the survey technique, this will help deduce information about managers to investigate the role Mobile BI plays on some of the decisions they make. Finally, this Survey research design will allow the researcher to develop more complete and well substantiated conclusions about the effect of Mobile BI on managerial decision making.

The method for measuring the effect of Mobile BI on managerial decision-making used in this study is based on Churchill (1979) methodology for designing and validating constructs. Churchills method has been widely used previously in other studies (see, for instance, (e.g., Elbashir, Collier, & Davern, 2008; Zhuang & Lederer, 2003; Sethi & King, 1994) .

Churchill (1979, p. 66) described eight steps for formulating a thorough measure of constructs. These are the following: (1) define the domain of the construct, (2) generate a sample of items to put the construct into practice , (3) collect

the data, (4) cleanse measures, (5) collect new data, (6) evaluate reliability, (7) evaluate validity, and (8) formulate norms. Zhuang et al., (2003) argue that the extensive use of Churchill's method assists to guarantee the validity and reliability of measure.

### 4.3 Sampling Technique

In general, the goal of sampling is, instead of considering all possible cases in a population, rather work out a range of methods that enables the reduction of the quantity of data needed for collection in a study. (Saunders, Saunders, Lewis, & Thornhill, 2011). There are two sampling categories to chose from in sampling (Saunders, Saunders, Lewis, & Thornhill, 2011). These are:

1. **Probability sampling:** Each instance in the sample stands an equal chance for selection. The most important feature of probability sampling is that it must represent a given population (Saunders et al., 2003). Amongst others, probability sampling includes, Simple Random Sampling, Systematic Sampling, Stratified Sampling, Probability Proportional to Size Sampling and Cluster or Multistage Sampling.
2. **Non-probability sampling:** The researcher is not able to determine the chance of an instance in the population being selected for the sample (Ayhan, 2011).

Probability sampling was chosen for this study because all the managers stood an equal chance of being selected. One of the fundamental advantages of Random Sampling (RS) is that RS allows to minimise sampling bias, and in turn approximates the findings obtained from studying a given population. Another benefit is that, RS helps to maximize the internal and external validity of a study (Dattalo, 2010). The primary objective of random sampling is to generate a sample that can be logically assumed to be a representative of the population.

Simple Random Sampling (SRS) was used in selecting the sample for this study. SRS was used for the purpose of this study for two reasons: (a) All managers had an equal probability of selection. (b) it was within reasonable distance for the researcher to personally hand-deliver and collect all the questionnaires and

responses from the interviewees. Therefore, random sampling, in this case, was the best sampling technique to enable answering the research questions and to meet the research objectives given the conditions at hand.

To carry out such a sampling strategy, the researcher first defined the population, categorised population members and then chose members to constitute the final sample size. For this procedure, a sample size calculation was necessary. The process of how the the sample size was deduced will be discussed in the section to follow.

## 4.4 Sample Size selection

The following section will discuss about how the sample size was deduced for the purpose of this study.

To generate the necessary sample, a calculation was necessary in order to determine the number of participants that were needed for data collection. However, there were a number of factors that had to be taken into consideration prior to the calculation. These are the following:

1. Confidence interval
2. Confidence Level.

### 4.4.1 Confidence Interval

Confidence interval is defined as a range that estimates the true population value for a particular statistic (Smithson, 2003, p. 11). It is mainly used to portray the level of uncertainty relating to a sample approximation of a population criterion. (Boslaugh, 2008).

### 4.4.2 Confidence Level

Confidence Level defines the variability relating to a particular sampling technique (Rafter, Rafter, Abell, & Braselton, 2003, p. 456). The confidence level is given

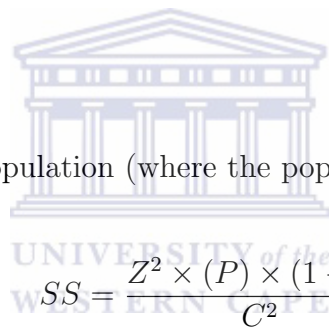
as a percentage and stands for how frequent the true percentage of the population who would select a response resides within the confidence interval. The 95 percent confidence level translate to a 95 percent level of certainty; while the 99 percent confidence corresponds to 99 percent certainty. For the purpose of this study, a 95 percent confidence level was used in calculating the sample size (Lavrakas, 2008).

### 4.4.3 Sample Size calculation

There exist three elements that decide the size of the confidence interval for any given confidence level. These are the following.

1. Sample size
2. Percentage
3. Population size

Sample Size - Infinite Population (where the population is greater than 50,000)



$$SS = \frac{Z^2 \times (P) \times (1 - P)}{C^2} \quad (4.1)$$

Where,

**SS** = Sample Size

**Z** = Z-value (e.g., 1.96 for a 95 percent confidence level)

**C** = Confidence interval, expressed as decimal.

Thus,

$$SS = \frac{196^2 \times (0.50) \times (1 - 0.50)}{0.050^2} = 386 \quad (4.2)$$

The new SS will therefore be,

$$NewSS = \frac{SS}{1 + \left(\frac{SS-1}{Pop}\right)} \quad (4.3)$$

According to the City of Cape Towns Economic Development Department (EDD) which is responsible for monitoring Cape Towns socio-economic conditions as well as promoting local economic growth it maintains that The Cape Town Regional Chamber of Commerce and Industry constitutes over 4 500 member companies and is the biggest institution of its type in South Africa (City of, 2013). By estimating 5 managers per company, therefore, the number of managers population was 22500 which is arrived at by multiplying 4500 companies by 5 managers per company.

$$NewSS = \frac{384}{1 + \left(\frac{384-1}{22500}\right)} = 376managers \quad (4.4)$$

## 4.5 Data Collection

### 4.5.1 Determining the need for data collection

Given that Mobile BI is an emerging discipline, thus, the lack of adequate secondary data involving the measurement or use of Mobile BI by managers for decision-making in South Africa or anywhere else in the world, called for a demand in the collection of data for this study. Consequently, a comprehensive analysis of the literature as reported in chapter 2, confirmed the lack of compelling data on Mobile BI use by managers that could form a framework for the measurement of its effect of managerial decision-making.

### 4.5.2 Method of data collection

Fink (2005) maintains that the method of collecting data is always guided by the practical and quality condition relating to the sort of data being gathered. Fink further substantiates that, the quality of measurement guarantees validity and reliability of the data collection tool (Fink, Thompson, & Bonnes, 2005).

In order to answer the research questions comprehensively, there was a need for impeccable data collection. Therefore, a structured questionnaire method collecting data was chosen since this study wanted to gather factual as well as behavioural data over a significantly large and widespread managers population within the constraints of time and budget. Specifically, questionnaire was chosen because of its characteristics of speed in collecting data, ease of use, anonymity and extensive

regional reach amongst the research sample. (Grandcolas, Rettie, & Marusenko, 2003; Couper, Traugott, & Lamias, 2001; Epstein, Klinkenberg, Wiley, & McKinley, 2001).

### 4.5.3 Questionnaire method for the survey

By definition, a questionnaire is a pre-developed written collection of questions to which research participants write down their answers, typically within closely defined alternatives (Sekaran 2000, 2003). Questionnaires are the most general technique used to gather primary data (Sekaran & Bougie, 2010; Crowther & Lancaster, 2009). Questionnaires tend to collect data more competently with respect to research time and available resources (Sekaran & Bougie, 2010).

In the context of this study, the main reasons behind the use of questionnaire method as a important survey tool are:

1. Survey Questionnaire was used because it has been proven in other studies as an effective data collection mechanism when the researcher has precise knowledge about what is needed and how to quantify the constructs of interest (Uma, 2003).
2. The primary advantage of using questionnaire was for the effective collection of data from a large sample with in a limited timeframe with limited resources. Questionnaire method makes it easier to administer questionnaires to large number of individuals simultaneously and less expensive and less time consuming compared to interviewing.
3. Survey questionnaires do not need as much expertise to administer in comparison with conducting interviews.
4. Survey questionnaire method facilitated the statistical analysis of a range of factors.

However, there are a number of drawbacks associated with the use of questionnaires. The most important question of concern relates to the issue of confidentiality (Hussey & Hussey 1997). To address this problem, it was stipulated in the information sheet (See Appendix A) to all managers who participated in the study



that the data collected would be strictly handled to respect their anonymity and confidentiality.

#### **4.5.4 Instrument construction**

A set of questionnaires was developed of which its purpose was to measure the effect of Mobile BI on managerial decision-making in organisations. The questionnaire also captured the attitudes as well as perceptions of managers in line with decision making. This approach was consistent with previous studies of similar nature. The following variables were included as part of the questionnaire instrument:

1. Demographic information
2. The usage of Mobile BI with respect to the decision type
3. Level experience with respect to the use of Mobile BI usage
4. Managers attitudes towards the use of Mobile BI
5. Questions relating to the perceived ease of use of Mobile BI
6. Questions relating to the behavioural attitudes towards the use of Mobile BI

#### **4.5.5 Scale Validity and Reliability**

Hussey and Hussey (1997) argue that validity is the extent to which research findings accurately represent the subject being examined. Sekaran (2003) asserts that there are numerous validity tests that can be used to test the validity of the measures. These include content validity and criterion-related validity.

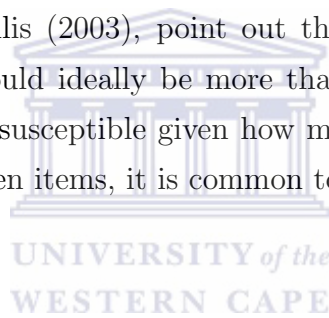
Sekaran and Bougie (2010) argue that the selection of scales has a considerable impact on reliability of the scale. Following the advice of Sekaran and Bougie (2010), both questionnaires were limited to five-point-likert scale ranging from (1) strongly disagree to (5) strongly agree.

The draft instruments were then exposed to three senior managers and two academics. This was done as a way of improving the questionnaires understandability, relevance and completeness.

These participants were chosen on the basis of their knowledge, expertise, as well as, experience within realm of the Business Intelligence. The preliminary draft containing 10 questions were sent as part of a survey instrument to 60 managers. The targeted managers were selected from the Cape Chamber of Commerces directory of companies.

Sekaran and Bougie (2010) further define Reliability as the consistency in the results that is repetitively achieved given the same measurements criteria. Reliability is mainly concerned with reducing potential biases and errors in the study. Thus, a set of steps should be presented to enable the reproduction of the same results under the same conditions. Also, Reliability should be concerned with the measurement of the accuracy of the instrument in determining if any variations occur as a result of confusion.

The most generally used measurements of internal consistency is the Cronbachs alpha coefficient. DeVellis (2003), point out that the value of Cronbach alpha coefficient of a scale should ideally be more than .7. However, Cronbach alpha values are usually quite susceptible given how many items available in the scale. Scales with fewer than ten items, it is common to find quite low Cronbach values (e.g. .5).



#### **4.5.6 Survey participants**

In order to achieve relevant, yet reliable information, some important inclusion criteria had to be strictly imposed. In order to qualify for the sample selection, two factors had to be taken into consideration.

(a) Participants needed to be in a management position in their respective departments or business units within their organisations

(b) Participants needed to have some knowledge of Business Intelligence, as well as, they must have or have been using mobile devices (phones or tablets) to consume Business Intelligence to make any business decision. These strict inclusion requirement criteria guaranteed that participants understood the nature of the questionnaire, making the questionnaire easier for them to complete.

## 4.6 Data collection process

An active database of organisations operating in Cape Town which is managed by the Cape Town Regional Chamber of Commerce and Industry which has over 4500 member companies was used to administer the final instrument to the targeted managers population. A list of 185 organisations was drawn from the 4500 companies, and a total of 925 questionnaires were hand delivered to managers from these targeted companies for completion.

The data collection began in September 2012 and ended in May 2013. On average, 3 respondents in each of the targeted organisations in the sample received the questionnaire. From the 925 questionnaires that were delivered, a total of 398 surveys were returned from 145 organisations. With 35 received online via email. 21 responses were rendered unusable because a significant amount of missing data (50 percent or more) on the main variables of the study. This resulted in 391 usable responses. In addition, 36 declined to respond to questionnaire, citing that they were not in the position to answer the survey for various reasons. A large number of the managers population turned the survey questionnaire down citing reasons such as very busy at the moment and unable to help because company policy does not allow surveys.

### 4.6.1 Generalisability

Generalisability is the extent to which the likelihood of findings of a study would be relevant to other subjects or other settings and other situations beyond those examined in the research (Sekaran 2003; Ticehurst & Veal 2000). Hussey & Hussey (1997) argues that generalisability is the degree to which conclusions about a specific population can be reached on the basis of information about a given sample. Silverman (2005) points out that generalisability is a standard, which should be aimed for in quantitative research. This can be established by a comprehensive statistical sampling procedures. Thus, to achieve broad generalisability, the research sampling design should be logically reinforced, and a number of other detailed facts in the data collection should be followed Gummesson (1991).

Given that in this research all individual managers in the population are surveyed, the sample size is big enough (263 subjects) to suggest generalisability. Thus, the

findings of the study qualifies to be generalised back into the managerial population. Moreover, the results of this research can further be generalised to a broader scope other than only the Western Cape / Cape town managerial community. It may also be generalised to other provinces in South Africa.

#### **4.6.2 Ethical consideration**

The University of the Western Cape requires researchers to apply for ethical clearance before venturing for data collection. The participants involved in the research were given comprehensive details about the research and were given the freedom to withdraw from the research if ever they felt uncomfortable about the questions asked. Finally, the data collected did not in any way entail sensitive participants information such as personal email addresses or personal phone numbers. Managers were able to provide information on their consent and this information was kept confidential and was only used for the purpose of this research.

### **4.7 Framework for data analysis**

In the quantitative Study, a survey research design was used where the sample size was 376 managers (N=376). The 376 population size was mainly selected for two reasons: (a) to ensure a high response rate and (b) also maximize the quality of data in order to derive substantial information to explain and address the primary research question. The data was collected in the Western Cape region, specifically in the Cape Town area.

The data analysis section (to be covered in Chapter 4) was carried out once all the data had been collected. The analysis was conducted as an inductive reasoning process and involved categorising text units, examining the relationships between factors and identifying and clarifying negative cases. To ensure the integrity of the findings, the information collected from managers was checked with the organisational documents and data from questionnaires.

Once the data had been gathered, in order to guarantee completeness and readability of the data each individual questionnaire was verified for accuracy, consistency and to prevent any potential errors. After that, the collected data were then captured into Statistical Package for Social Sciences (SPSS) software version 21.0.

Frequency distribution was performed on the captured data to make sure that the data were accurately captured. Data cleaning followed, before any further analysis of the data could take place due to a few errors that were encountered. A number of these errors were largely a result of human typing errors. In addition, the errors were also due to a relatively large sample size, and the fact that the questionnaire contained ten pages.

Descriptive statistics were also used in SPSS to test each individual question and to confirm if the value was out of range for each specific question. This allowed to single out any errors that were made during the capturing and coding of data. This further made it easy very the consistency of data prior to fixing the errors in the data set.

Once that the data capture and cleaning stage were over, descriptive statistics in SPSS were again conducted to guarantee complete the highest possible accuracy in the data. The following section will discuss how the collected data was analysed by making use of various statistical methods. These are the following: Co-relational analysis, regression and multipath group analysis.



## Motivation for selection of statistical tests

### Correlation

Correlation coefficient (sometimes referred as Pearson's  $r$ ) is a statistical method used to determine the degree to which two or more variables are related between a single group of people. Correlation is also used to measure the strength as well as the weakness between two variables (Privitera, 2011). Moreover, correlation coefficient helps to provide an indication of the direction of the found relationship (Privitera, 2011).

### Multiple Regression

Regression analysis makes it possible to measure relationships between one or more independent variables and one dependent variable. In this study, organizational (managerial) decision-making was chosen as the dependent variable. There are three important advantages of using regression analysis; these are the following:

1. Regression analysis helps to specify if there exist any significant relationship between the independent variables and dependent variable. (This is usually illustrated by means of a regression equation.)
2. Regression analysis helps to specify the strength of different independent variables effects on the dependent variable.
3. Regression analysis allows determining the best predictor of the dependent variable.

Correlation and Multiple Regression statistical methods were used in this study to allow the researcher to assess the degree of relationship between the different variables that were signalled in the research model. Correlation analysis was mainly used to test the hypotheses proposed in Chapter 3. In this study, correlation was used to assess the magnitude and direction of the linear relationship between all the constructs used. (Sekaran & Bougie, 2010).



## 4.8 Chapter summary

In this chapter, the research design and methodology was primarily guided by the quantitative approach. The selection of this approach was relevant to the clarification of information that casted some light on the research objectives that were outlined in Chapter 1. One of the outcomes was a questionnaire research instrument was developed, validated and distributed to research participants for completion. The questionnaire allowed for the collection of quantitative data, which in turn was analysed using a number of statistical techniques and Statistical Package for Social Sciences (SPSS) software version 21.0.

Correlation and regression statistical methods were used to analyse the data. The methodologies and procedures used added possible new dimensions to deduce results that address the research questions and research objectives. Table 4.2, gives a summary of the different research aspects of the research processes and the approaches that were used to study them.

TABLE 4.2: Summary of Research Processes

<b>Research processes</b>	<b>Approach adapted in the study</b>
Research Method	Quantitative approach
Research Design	Survey Research Design
Setting	Western Cape, (Mainly Cape town area)
Selection of sites and informants	Cape Town Chamber of Commerce database of member companies.
Data collection methods	Questionnaire
Analysis of data	Correlation, Regression, ANOVA
Ethical Issues	Informed Consent

In the next chapter, the data analysis will be presented

# Chapter 5

## Data analysis

### 5.1 Introduction

This chapter presents the findings drawn from the quantitative approach. The aim of this study was to establish the effect of Mobile BI on managerial decision-making in organisations. The study uses the correlation design which include correlation techniques and regression (multiple and linear regression) analyses. This chapter further presents statistical results that are applicable to the research question and objectives of this study.

The results presented in this study are drawn from a sample of 376 managers. Random sampling was used to calculate the sample size. An active database of organisations operating in Cape Town which is managed by the Cape Town Cape Regional Chamber of Commerce and Industry with over 4 500 member companies was used to administer the final instrument to the targeted managers population. The data for this study were collected through a hand-delivered survey questionnaires that targeted managers who use Mobile BI systems to make decisions.

The findings of this study are presented in three parts. The first part of this chapter assesses the measurement properties, i.e. Reliability and Validity. The second part discusses demographic and descriptive data. The third and final part of this chapter provides results from the correlation and regression statistical test results. The section to follow begins by reporting on demographic characteristics of respondents.



## 5.2 Assessment of measurement properties

Prior to computing any statistical tests for testing the research model of this or any other study, it is necessary to first validate the survey instrument used. There exist several different techniques to perform validity tests on survey instruments. However, the most generally used measurement of internal consistency in positivistic studies in management information systems (MIS) is the Chronbachs alpha. Thus, for the above-discussed reason, construct validity and reliability of the instrument used in this study was assessed by calculating the Cronbachs alpha coefficients.

DeVellis (2003), point out that the value of Cronbach alpha coefficient of a scale should ideally be more than .7. Nevertheless, Cronbach alpha values are usually quite susceptible given the number of items in the scale. Scales with fewer than ten items, it is common to find quite low Cronbach values (e.g. .5).

TABLE 5.1: Scales Reliability Analysis

Factor	No. of Items	Cronbachs Alpha
Organisational Decision-making	3	.75
Perceived Value	7	.81
Perceived Ease of Use	3	.73
Quality of Information	5	.82
Behavioural Intention to Use	8	.90
Attitudes Towards Use	4	.68

The reliability of the scales was established by making use of the Cronbachs alpha to test for consistency between items (Table 5.1). In the context of this research, Cronbachs alpha varied from 0.68 to 0.90 , which is considered acceptable for this type of studies.

## 5.3 Demographic characteristics of respondents

### 5.3.1 Gender of respondents

The following are descriptive statistics relating to the gender of managers who participated in the study. Table 5.2 presents a summary of the gender distribution of managers.

TABLE 5.2: Gender Description

Gender	Frequency	Percent	Valid%	Cumulative %
Male	237	63.0	63.0	63.0
Female	139	37.0	37.0	100.0
Total	376	100.0	100.0	

In terms of gender, as illustrated in Table 5.2, there were a total of 376 responses to the questionnaire. The majority of managers were male who represent 63.0 percent (n=237) of the sample, while females represent only 37.0 percent (n=139).

### 5.3.2 Age of respondents

Table 5.3 provides an illustration of the age distribution amongst managers who participated in the study.

TABLE 5.3: Age Description

Age	Frequency	Percent	Valid%	Cumulative %
20-29	75	19.9	19.9	19.9
30-39	120	31.9	31.9	51.9
40-49	117	31.1	31.1	83
50-59	64	17.0	17.0	100.0
Total	376	100.0	100.0	

As illustrated in Table 5.3, the highest percentage (31.9%) of managers who participated in this study were between the age of 30–39 and the lowest were between the age of 20–29 (19.9%).

It is clear that younger managers have already started playing important roles in decision-making and decision-making related tasks in their respective companies.

Nevertheless, it is still evident that age is an important factor when it comes to managerial responsibilities and decision-making activities because the majority of managers range between 30 and 49 as illustrated in Table 5.3.

### 5.3.3 Qualification of respondents

The findings of demographic statistics denote important information, in that a large majority of managers in this sample possess a Bachelor's degree as indicated in Table 5.4. It was anticipated that the average percentage of managers in companies would normally have higher academic qualification, yet it was revealed that the majority of managers (46.8%) only have a Bachelor's degree. The shortage of masters and doctoral degrees in organisations operating in the Western Cape was clear. As indicated in Table 5.4 only 20.2% have a masters degree.

TABLE 5.4: Qualification Description

Qualification	Frequency	Percent	Valid%	Cumulative %
Certificate	5	1.3	1.3	1.3
Diploma	90	23.9	23.9	25.3
Batchelor's Degree	176	46.8	46.8	72.1
Masters	76	20.2	20.2	92.3
Other	29	7.7	7.7	100.0
Total	376	100.0	100.0	

As illustrated in Table 5.4, the description of the managers highest qualification reveals that 1.3 % of managers have certificates (n=5), while 23.9% of managers possess a diploma (n=90), and 46.8% of managers have a Bachelors degree (n=176). Only 20.2% of respondents have a Masters degree (n=76), while 7.7% of the respondents possess some other form qualification (n=29).

### 5.3.4 Managerial experience of respondents

As illustrated in Table 5.5, the description of managerial experience reveals that the majority of respondents, 31.9 % have between 6-10 years managerial experience (n=120), while 26.1% of respondents have between 1 to 5 years managerial experience, and the third highest are managers with 16 to 20 years experience who account for 24.2% (n=91). Meanwhile, respondents with managerial experience of 21 years or more (n=21) account only for 5.6%.

TABLE 5.5: Managerial Experience Description

Experience	Frequency	Percent	Valid%	Cumulative %
1-5	98	26.1	26.1	26.1
6-10	120	31.9	31.9	58.0
11-15	46	12.2	12.2	70.2
16-20	91	24.2	24.2	94.1
21-More	21	5.6	5.6	100.0
Total	376	100.0	100.0	

### 5.3.5 Business Intelligence experience

TABLE 5.6: Business Intelligence Experience Description

BI Experience	Frequency	Percent	Valid%	Cumulative %
Less than 1 year	75	26.1	26.1	26.1
1-3	77	19.9	19.9	19.9
4-6	73	20.5	20.5	40.4
7-10	112	29.8	29.8	59.8
11-More	39	10.4	10.4	100.0
Total	376	100.0	100.0	

As illustrated in Table 5.6, the description of BI experience reveals that the majority of respondents, 29.8 % have between 7 to 10 years BI experience (n=112), while 20.5% of respondents have between 4 to 6 years managerial experience, and the third highest are managers with 11 or more years BI experience who account for 10.4% (n=39).

### 5.3.6 Which devices used

Table 5.7 provides a description of the devices used by managers who participated in the study in order to access Mobile BI.

TABLE 5.7: Mobile BI Description

Mobile BI Access	Frequency	Percent	Valid%	Cumulative %
Mobile Phone	173	46.0	46.0	46.0
Tablet	26	6.9	6.9	52.9
Both	177	47.1	47.1	100.0
Total	376	100.0	100.0	

As illustrated in Table 5.7, the highest percentage (46.0%) of managers who participated in this study were between access Mobile BI only on their mobile phones while 6.6% of managers (n=26) access Mobile BI exclusively on their tablets. However, a large percentage (47.1%) of managers (n=177) access Mobile BI on both their mobile phones and tablets.

The section to follow will present discussions on analysis of measurement properties that was used in the study.

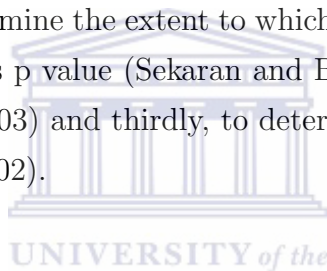


## 5.4 Correlation analysis

### 5.4.1 The need for correlation analysis

Correlation coefficient (also known as Pearson's  $r$ ) is a statistical method used to determine the degree to which two or more variables are related between a single group of people. Correlation is also used to measure the strength as well as the weakness between two variables (Privitera, 2011). Moreover, correlation coefficient helps to provide an indication of the direction of the found relationship (Privitera, 2011).

Pearson's correlation was used in study as the statistical method to establish the relationships between the different variables used. This was done for three reasons. Firstly, to establish if there exist any relationship between the variable used in this study. Secondly, to determine the extent to which the constructs are correlated by assessing the coefficient's  $p$  value (Sekaran and Bougie 2010; Field 2005; de Vaus 2007; Saunders et al., 2003) and thirdly, to determine the direction of correlation (Johnson & Wichern, 2002).



### 5.4.2 Correlation between variables

An initial representation of the nature of the relationships between factors can be deduced from the results of the bivariate correlation analysis as shown in Table 5.8.

TABLE 5.8: Correlation matrix

Constructs	1	2	3	4	5	6
(1) Perceived Value	-					
(2) Perceived Ease of Use	.542**	-				
(3) Attitudes towards Use	.571**	.266**	-			
(4) Behavioural Intention To Use	.729**	.457**	.639**	-		
(5) Quality of Information	-.101*	-.033	-.090	-.110*	-	
(6) Organisational decision-making	.582**	.462**	.552**	.675**	-.151*	-

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

The results in Table 5.8 indicate that there is a positive moderate correlation between the Perceived Value of Mobile BI and the Perceived Ease of Use ( $r=0.542$ ,  $p=0.00$ ). The relationship is statistically significant at level 0.01.

The results in Table 5.8 indicate that there is also a positive and moderate correlation between the Perceived Value of mobile BI and the Attitudes towards use of Mobile BI ( $r=0.571$ ,  $p=0.00$ ). Since the p-value is less than 0.005, this means that the relationship is also statistically significant at level 0.01.

The results in Table 5.8 indicate that there is also a negative moderate correlation between the Perceived Value of Mobile BI and the Quality of Information ( $r=-0.101$ ,  $p>0.05$ ). The relationship is also statistically significant at level 0.05.

There is a positive ( $r=0.266$ ,  $p=0.00$ ) correlation between Attitudes towards Use and Perceived Ease of Use as indicated in Table 5.8. The relationship is also statistically significant at level 0.01.

While results in Table 5.8 indicates a negative correlation between the Quality of Information and Perceived Ease of Use ( $r=-0.33$ ,  $p>0.05$ ). However, the relationship was found to be insignificant.

Moreover, there is a negative ( $r=-0.090$ ,  $p>0.00$ ), but insignificant correlation between the Quality of information and Attitudes towards Use. However, there was a negative relationship between Behavioural intention to use and Quality of information ( $r=-0.110$ ,  $p>0.00$ ).

The results in Table 5.8 indicate that there is also a positive moderate correlation between the Attitudes towards Use and Organisational decision-making ( $r=0.552$ ,  $p=0.00$ ). The relationship is also statistically significant at level 0.01.

The results in Table 5.8 indicate that there is also a positive moderate correlation between the Behavioural intention to Use Mobile BI and Organisational decision-making ( $r=0.675$ ,  $p=0.00$ ). The relationship is also statistically significant at level 0.01.

## 5.5 Regression analysis

### 5.5.1 The need for regression analysis

The rationale behind the regression analysis performed on the results in this study was to assess the direction and degree of impact of each of the independent variables on the dependent variable. Moreover, Pallant, (2005) states that one of the objectives of the regression tests is to establish the magnitude of change in the dependent variable that can be explained by the independent variables.

Various types of regression are often used, these include 'enter', 'stepwise'... Stepwise multiple regression is the statistical technique which was used in this study. Stepwise multiple regression is a method of selecting predictors of a specific dependent variable based on given statistical measures. The focus is on discovering which independent variable is the best predictor at every step using statistical procedures. The difference with other multiple regression tests is that, in the stepwise regression, the independent variables are recorded with respect to their statistical contribution in explaining the variation in the dependent variable. This was the reasoning behind selecting Stepwise as a statistical test to perform regression analysis.

### 5.5.2 Sample Size test

Stepwise multiple regression oblige that the lowest possible ratio of convincing subjects to independent variables should be at least 5 to 1. In this study, the valid ratio of subjects (376) in relation to the number of independent variables (5) was 75.2 to 1. This, in other words, means that the ratio in this study was far greater than the minimum ratio of 50 subjects per independent variable. Thus, the requirement, which necessitates for a minimum ratio of cases to independent variables, was met.

After having meet both prerequisites of sample size and the degree of measurement, the step which follows next is testing the three important assumptions of multiple regression, namely: linearity and homoscedasticity as well as normality.



One of the first phase in interpreting regression models is to make sure that the model is statistically significant. This process entails conducting some measurement tests to assess the assumptions of multiple regression analysis. To accomplish the measurement tests, this study assumed a normal distribution of variables. This is referred to as normality.

Normality is the distribution of the dependent variables in error terms (residuals). Normality tests are generally performed to determine how likely variables are normally distributed. As previously mentioned, this study assumed a normal distribution of factors and then Multicollinearity diagnostic tests were performed. The discussion to follow will explain in detail how the diagnostic tests were performed.

### 5.5.3 Assumption of independence of errors

Stepwise multiple regression makes a fundamental assumption that errors are generally independent and that there is absence of any serial correlation. Essentially, errors are the residuals among the actual value for a case and the value projected by the regression equation. This further means that there is no serial correlation which suggests that the magnitude of the residual for one case has any influence on the magnitude of the residual for the other case. To assess the existence of any serial correlation between the residuals, the Durbin-Watson statistic was applied.

The Durbin-Watson statistic value varies between 0 and 4. This study's Durbin-Watson statistic value was 2.012, and thus meets the requirement of the universal rule of acceptable range between 1.50 - 2.50. This further means that the study meets the assumption of independence of errors.

### 5.5.4 Multicollinearity test

Variation Inflation Factor (VIF) and Tolerance were used to analyze Multicollinearity amongst the constructs. The VIF, evaluates the extent to which the variance of the anticipated regression coefficients are inflated as a consequence of being correlated to the other independent variables, while Tolerance indicates the extent of variability of the identified independent variable, which is not explained by the other independent variables in the model.

TABLE 5.9: Collinearity Statistics

Model	Collinearity	
	Tolerance	VIF
Perceived Value	0.468	2.137
Perceived Ease of Use	0.791	1.265
Quality of Information	0.591	1.619
Organisational decision-making	.246	.086
Behavioural intention to use	.216	.053

Results in Table 5.9 indicate that the Tolerance for all independent variables fluctuate between (.374 and .964), which are greater than the threshold of (0.10). This means that, if the values obtained were less than .10, it would mean that the multiple correlation with other variables would be high, implying the possibility of multicollinearity. However, this was not the case.

According to Field (2000), the existence of Multicollinearity put at risk the internal validity of multiple regression and increases the chances of type II errors in hypothesis testing.

The VIF of all independent variables vary between (1.921 and 2.674), which are less than the restricted valued (10). This suggests that there was no high (Multicollinearity)among the independent variables.

### 5.5.5 Overall relationship between dependent variable and independent variables

The foremost result to validate relates to the general relationship between the five independent variables and dependent variable. Stepwise multiple regression was applied to discover the best predictors of the dependent variable "Organisational decision-making" between the independent variables, namely : *Quality of Information, Perceived Ease of Use, Attitudes towards Use, Perceived Value, Behavioural Intention to Use.*

### 5.5.6 Validity of the model

To test the validity of the regression model, the following hypotheses are proposed:

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \dots = \beta_k = 0 \quad (5.1)$$

$$H_1 : \text{At least one } \beta_i \neq 0$$

If the null hypothesis is found to be true, this would mean that none of the independent variables will be linearly related to the dependent variables, (Organisational decision-making), and therefore the model would be deemed invalid. This is done to assess the statistical significance of the result. This tests the null hypothesis that multiple R in the population equals 0.

TABLE 5.10: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1096.699	5	219.340	79.873	.000
Residual	1016.065	370	2.746		
Total	1289.122	375			

- a. Dependent Variable: Organisational decision-making
- b. Predictors: (Constant), Quality of Information, Perceived Ease of Use, Attitudes towards Use, Perceived Value, Behavioural Intention to Use

In view of the fact that the probability of the F statistic ( $p < 0.001$ ) was less than or equal to the level of significance (0.05), the null hypothesis that the Multiple R for all independent variables was equal to 0 was not supported. This means that there exist a relationship between the dependent and independent variables as supported by the findings in Table 5.10 ( $F = 79.83$ ,  $p < 0.001$ ). Following the assessment of the existence of any relationship, the section to follow will discuss deal with results pertaining to the list of independent variables that are statistically significant.

### 5.5.7 Model analysis

By assuming that Quality of Information, Perceived Value, Perceived Ease Of Use and Attitudes towards use are potentially related to the dependent variable “Organisational decision-making” , thus the model of this research is represented by the following equation:

$$Org.DecisionMaking = \alpha + \beta_1, BIU + \beta_2, QoI + \beta_3, PV + \beta_4, PEOU + \beta_5, ATT \quad (5.2)$$

Where,

**BIU** = Behavioural Intention To Use

**QoI** = Quality of Information

**PV** = Perceived Value

**PEOU** = Perceived Ease of Use

**ATT** = Attitudes Towards Use

### 5.5.8 Research model testing

The research model proposed in this study was tested using multiple regression analysis. Multiple regression analysis gives the amount of variance ( $R^2$ ) accounted for the dependent variable from a set of independent variables. To test the research model all the developed constructs were taken as the independent variables

TABLE 5.11: Coefficients

Model	Coefficients				
	UnStd. Coeff.		Std. Coeff.		Sig
	B	Std. Error	B	t	
(Constant)	2.15	0.31		0.939	0.348
Perceived Value	0.41	0.38	0.62	1.076	0.283
Perceived Ease of Use	0.286	0.067	0.186	4.276	.000
Attitudes Towards Use	0.178	0.043	0.200	4.124	.000
Behavioural Intention To Use	0.215	0.31	0.408	7.029	.000
Quality of Information	-0.201	0.096	-0.076	-2.091	.037

Dependent Variable: Organisational decision-making

and were regressed against Organisational decision-making which is the dependent variable. Table 5.11, presents the results of the multiple regression analysis.

According to the results depicted in table 5.11, the best predictors of values for the dependent variable (Organisational decision-making) were (1) Behavioural Intention To Use ( $\beta = 0.408$ ,  $p < 0,05$ ), (2) Perceived Ease of Use ( $\beta = 0.186$ ,  $p < 0,05$ ); (3) Attitudes Towards Use ( $\beta = 0.200$ ,  $p < 0,05$ ) and (4) Quality of Information ( $\beta = -0.076$ ,  $p < 0,05$ ) The variable " Perceived Value was not included in the list of predictors because its p value is greater than 0.005.

Thus, as illustrated in Table 5.11 that the four independent variables from the initial five independent variables produce the highest degree of statistical significance in line with explaining the dependent variable (Organisational decision-making).

### 5.5.9 Best predictors of the dependent variable

TABLE 5.12: Best Predictors of Dependent variable

Independent Variable	Best Predictors			
	Model 1 $\beta$	Model 2 $\beta$	Model 3 $\beta$	Model 4 $\beta$
Behavioural Intention to Use	0.355***	0.308***	0.235***	0.231***
Perceived Ease of Use		0.298**	0.309***	0.311***
Attitudes Towards Use			0.191**	0.188***
Quality of Information				-0.205**
Constant	0.332	-1.528	-2.142	2.445

\*\*\*Statistically significant at 1%

\*\*Statistically significant at 5%

$\beta$  : Unstandardised Beta Coefficient

Based on results in Table 5.12, the main predictor of **Organisational decision-making** is Behavioural intention to Use. The second most important predictor is Perceived Ease of Use, the third most predictor is Attitudes towards Use and the fourth most important predictor is Quality of Information. Thus, by substituting values into equation 4.2, the model is represented the following equation:

$$\text{Organisational decision-making} = 2.564 + 0.62(\text{PV}) + 0.186(\text{PEOU}) + 0.200(\text{ATT}) + 0.408(\text{BIU}) - 0.076$$

In the stepwise regression the focus is placed on the entry order of the independent variables and the interpretation of individual relationships of independent variables on the dependent variable. This will be discussed next starting with the first independent variable.

#### 5.5.10 Relationship between the first independent variable (Behavioural Intention to Use) and the dependent variable (Organisational decision-making)

The beta coefficient for the relationship between the dependent variable “Organisational decision-making” and the independent variable Behavioural intention to use was  $\beta = 0.355$ . This means that there exists a direct relationship between the Behavioural intention to use and Organisational decision-making due to a positive

sign of the coefficient. For the independent variable “Organisational decision-making, the probability of the t statistic (17.671) for the b coefficient is  $<0.001$  which is less than or equal to the level of significance of 0.01. This means that, the null hypothesis reject that the slope associated with Organisational decision-making is equal to zero ( $b = 0$ ) and conclude that there is a statistically significant relationship between Organisational decision-making and total behavioural intention to use.

### **5.5.11 Relationship between the second independent variable (Perceived Ease of Use) and the dependent variable (Organisational decision-making)**

The beta coefficient associated with Perceived Ease of Use is positive ( $\beta = 0.298^{**}$ ), indicating a direct relationship in which higher numeric values for Organisational decision-making are associated with higher numeric values for Perceived Ease of Use. Therefore, the positive value of  $\beta$  implies that survey respondents (managers) who made use of Mobile BI for decision-making had higher influence on organizational decision making in their respective organisations.

### **5.5.12 Relationship between the Third independent variable (Attitudes towards Use) and the dependent variable (Organisational decision-making)**

For the independent variable Attitudes towards Use, the probability of the t statistic (4.532) for the  $\beta$  coefficient is  $<0.001$  which is less than or equal to the level of significance of 0.01. This also means that the null hypothesis which states that the slope associated with Attitudes towards Use is equal to zero ( $b = 0$ ) is also rejected. To conclude, there is a statistically significant relationship between Attitudes towards Use and Organisational decision-making.

### **5.5.13 Relationship between the fourth independent variable (Quality of Information) and the dependent variable (Organisational decision-making)**

The  $\beta$  coefficient associated with Quality of Information is negative ( $\beta = -0.205$ ) as indicated in Table 5.12. This indication means that a negative relationship in which higher numeric values for Quality of Information is associated with a negative numeric values for Organisational decision-making.

### **5.5.14 Relationship between the fifth independent variable (Perceived Value) and the dependent variable (Organisational decision-making)**

The relationship between Perceived Value and “Organisational decision-making” was not found to be statistically significant and therefore was excluded from the list of predictors. This is because Perceived Value was found to have a p value of 0.283 which is far greater than the standard of 0.005.



## 5.6 Research hypothesis testing

In order to achieve the objectives set by this study in Chapter 2, the proposed hypotheses should be proved by the results generated from the data collection. To test the research hypotheses of the study, independent regression analyses were performed. The findings were then used to confirm or reject the research hypotheses. These findings are discussed next.

### Hypothesis 1:

Perceived Ease of Use positively influences Perceived Value of Mobile BI

In testing the first Hypothesis (H1), a regression analysis was conducted. Perceived ease of use was used as the independent variable and Perceived Value used as the dependent variable. Table 3 presents the regression results used to test H1.

TABLE 5.13: Regression outcome for Hypothesis 1

Model	Coefficients		t	Sig
	UnStd. Coeff.	Std. Coeff.		
Perceived Ease of Use	1.262	.542	12.486	.000

Dependent Variable: Perceived Value

As depicted in Table 5.13, perceived ease of use indeed was found to have a significant influence on perceived usefulness ( $\beta = .542$ ;  $p < 0.001$ ). This finding therefore confirms and supports Hypothesis 1 (H1).

### Hypothesis 2:

Perceived Ease of Use positively influences managers Attitudes towards Use of Mobile BI

### Hypothesis 3:

Perceived Value positively influences Attitudes Towards Mobile BI use

Hypothesis 2 and 3 were confirmed by regressing both Perceived ease of use and perceived value against Attitude Towards Using Mobile BI for managerial decision making. Table 5.14 illustrates results from the regression analysis for hypothesis 2

TABLE 5.14: Regression outcome for Hypothesis 2

<b>Coefficients</b>					
Model	UnStd. Coeff.		Std. Coeff.		Sig
	B	Std. Error	B	t	
Perceived Ease of Use	.438	.086	.262	5.3626	.000
Perceived Value	4.21	.031	.571	13.447	.000

Dependent variable: Attitude Towards Use

and 3. As indicated in Table 5.14, perceived ease of use as well as perceived value both have significant influence on Attitude towards using Mobile BI. This finding thus confirms and supports both hypotheses 2 and 3.

#### **Hypothesis 4:**

Perceived Value is positively related to the Quality of Information.

Similarly with the above three tested hypotheses, Hypothesis 4 (H4) was also tested by regressing Perceived Value against Quality of information. Table 5.15 depicts results from the regression analysis for hypothesis 4.

TABLE 5.15: Regression outcome for Hypothesis 4

<b>Coefficients</b>						Dependent
Model	UnStd. Coeff.		Std. Coeff.		Sig	
	B	Std. Error	B	t		
Perceived Value	-.025	.013	-.101	-1.970	.050	

Variable: Quality of Information

Findings demonstrate that, although a relationship between the two constructs was confirmed, however, it was the type of the relationship was not confirmed. As illustrated in Table 5.15 there exist a negative relationship between the Perceived Value and Quality of Information. This implies that the hypothesised positive relationship between the two constructs is thus rejected.

**Hypothesis 5:**

Quality of Information positively influences Attitudes towards (Mobile BI) Use.

TABLE 5.16: Regression outcome for Hypothesis 5

Model	Coefficients				
	UnStd. Coeff.		Std. Coeff.		Sig
	B	Std. Error	B	t	
Quality of Information	-.262	.153	-.090	-1.738	.083

Dependent Variable: Attitudes towards Use

According to the results in Table 5.16, the analysis indicate that since the p value is greater than 0.05, as indicated in Table 5.16( $p = 0.80, > 0.05$ ), this implies that, although a relationship exists between Quality of Information and the Attitudes towards use, this relationship is insignificant. This further implies that the hypothesis 5 was not supported. Moreover, this finding can further be interpreted as, the Quality of Information has no bearing on the attitude of the decision-making manager. In otherwords, if a manager has a negative attitude towards the use of Mobile BI, the quality of information at his or her disposal does not make a difference in the decision they will make.

**Hypothesis 6:**

Quality of Information positively influences Behaviourial Intention To Use.

In testing the hypthesis 6, Quality of Information was used a the independent variable and Behaviourial Intention to Use used as the dependent variable. Table 5.17 presents the regression results used to test H6.

TABLE 5.17: Regression outcome for Hypothesis 6

Model	Coefficients				
	UnStd. Coeff.		Std. Coeff.		Sig
	B	Std. Error	B	t	
Quality of Information	-.554	.259	-.110	-2.13	.043

Dependent Variable: Behaviourial Intention to Use

As depicted in Table 5.17, Quality of Information indeed was found to have a relationship with Behaviourial Intention to Use ( $\beta = -0.110; p < 0.33$ ). However, this

finding does not support Hypothesis 6 due to the nature of the relationship. Therefore Hypothesis 6 is rejected.

### Hypothesis 7:

Attitudes towards Use positively influences the Behavioural Intention to Use (Mobile BI).

TABLE 5.18: Regression outcome for Hypothesis 7

Model	Coefficients				
	UnStd. Coeff.		Std. Coeff.		Sig
	B	Std. Error	B	t	
Attitudes towards Use	1.084	.067	.639	16.079	.000

Dependent Variable: Behavioural Intention to Use

Results from Table 5.18 show a strong relationship between the Attitudes towards Use and the Behavioural intention to Use.

### Hypothesis 8:

Behavioural Intention to Use positively influences Organisational decision-making.

TABLE 5.19: Regression outcome for Hypothesis 8

Model	Coefficients				
	UnStd. Coeff.		Std. Coeff.		Sig
	B	Std. Error	B	t	
Behavioural Intention to Use	.355	.020	.694	17.617	.000

Dependent Variable: Organisational decision-making

Results from the data analysis found that the Organisational decision-making is strongly and positively influenced by the behavioural intention to Use of mobile BI.

## Summary of hypothesis testing

The results of the hypotheses testing illustrated in table 3, were assessed by computing the regression and correlations amongst constructs.

TABLE 5.20: Summary of hypotheses testing

Hypothesis	Impact	Outcome
H1	PEOU $\rightarrow$ PV	Supported
H2	PEOU $\rightarrow$ ATT	Supported
H3	PV $\rightarrow$ ATT	Supported
H4	PV $\rightarrow$ QoI	Rejected
H5	QOI $\rightarrow$ ATT	Rejected
H6	QOI $\rightarrow$ BIU	Rejected
H7	ATT $\rightarrow$ BIU	Supported
H8	BIU $\rightarrow$ ORG.DECISION-MAKING	Supported

## 5.7 Fitness of the model

The regression analysis of the original model reveals that the R-square of the model is 0.512 as depicted in Table 5.21. This means that the model explains a 51.2% of the variance in the dependent variable as shown in Table 5.21.

TABLE 5.21: Model summary

Model	R	$R^2$	Adjusted $R^2$	Std. Error
1	.694 <sup>a</sup>	.455	.454	1.755
2	.695 <sup>b</sup>	.485	.482	1.708
3	.715 <sup>c</sup>	.512	.508	1.665
4	.718 <sup>d</sup>	.518	.512	1.657

- Predictors: (Constant), Behavioural Intention to Use
- Predictors: (Constant), Behavioural Intention to Use, Perceived Ease of Use
- Predictors: (Constant), Behavioural Intention to Use, Perceived Ease of Use, Attitudes towards Use
- Predictors: (Constant), Behavioural Intention to Use, Perceived Ease of Use, Attitudes towards Use, Quality of Information
- Dependent Variable: Organisational decision-making

Moreover, this can be further explained that the model is statistically significant, because the p-value of the model is 0.000. This P-value is relatively less than the limit for statistical significance limit (See Appendix A), which is 0.10 for weak significance and 0.05 for significance. Therefore, this level is good enough; meaning that the fitness of the model in explaining the usage of Mobile BI for decision making in the context of this study is high.

## 5.8 Final research model

The final research model illustrates the effect of Mobile BI on Managerial decision making.

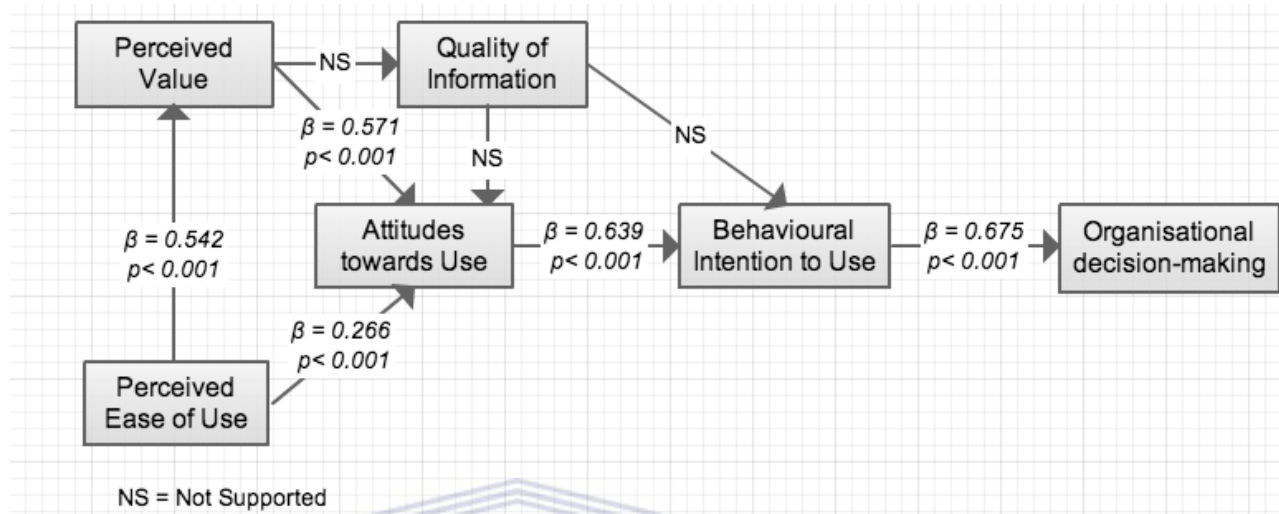


FIGURE 5.1: Final Research Model

The hypothesized general model in chapter 2 was tested using the result from correlation, regression and research hypotheses testing. As a result, a final generated model of this study was produced. This model has the capability to explain the Effect of Mobile BI on managerial decision-making in organisations. The regression weights indicated on the path of model demonstrates unstandardised  $\beta$  estimates as well as their significance. The NS, indicates that the hypothesis was not supported.

## 5.9 Chapter summary

In this chapter, the data collected was analysed, the hypotheses were tested from the data and the final research model for this study was also presented. The research model described five main user acceptance constructs that influence the usage of Mobile BI for managerial decision-making, which in turn influence the Organisational decision-making.

In summary, some of the predictors (not all) were able to significantly explain managerial decision making in organisations using Mobile BI. The most important determinants for managerial decision making in organisation were Behavioural Intention to Use, Attitudes Towards Use and Perceived Ease of Use with stronger regression weights being statistically significant.

According to the Correlation and Regression analyses that were performed on the data, the results were found to support five of the initial eight proposed hypotheses while it only rejected three. More importantly, it was found that Behavioural Intention to use mobile BI for decision making has a significant influence on Managerial decision making in organisations. In the Chapter to follow, a practical interpretation of these patterns and other findings will be discussed. This will in turn help address the research question as well as the research objectives.

# Chapter 6

## Discussion of findings

### 6.1 Introduction

In Chapter 5, the final model analysis and hypotheses testing were found to support a number of hypotheses while it rejected others. Some of the core variables such as Perceived Ease of Use (PEOU) and Attitudes Toward Use as well as Perceived Value (PV) (which replaced perceived usefulness in TAMMS) and Behavioural Intention to Use (BIU), when combined together, they bring forward discussions that help to explain the effect mobile BI has on managerial decision-making in organisations.

Moreover, it was also found that the greatest predictor of Organisational decision-making by managers was Behavioural intention to Use. The second most important predictor was Perceived Ease of Use while the third and fourth most important predictors were Attitudes towards Use and Quality of Information respectively. From the point of view of the overall research objectives of understanding the effect of Mobile BI on managerial decision-making in organisations, the model has been, to a large extent, successful.

In certain cases, some patterns in the relationships discovered between the individual constructs seemed to digress from the expected outcomes. Firstly, while the Quality of Information was highly expected to have some influence on Managerial decision-making indirectly through its effect on Behavioural Intention to Use, the results from the analysis in Chapter 5 proved otherwise. Therefore, in the context



of this study, the Quality of information was found not to play significant role in predicting managerial decision making.

Secondly, the assumed positive relationship between the Quality of Information and the BIU was found to be negative ( $\beta = -0.110$ ,  $p < 0.001$ ). Prompting the rejection of the hypothesised relationship.

## 6.2 Explaining Perceived Value

Findings from the correlation analysis in Chapter 5 suggest that PV was moderately correlated with Organisational decision-making. The results in Table 4.8 indicate that there was a positive moderate correlation between the PV of Mobile BI and the Organisational decision-making ( $r = 0.582$ ,  $p < 0.05$ ). The relationship was also found to be statistically significant at level 0.01. This highlights the importance of the Perceived Value construct inline with the its influence on managerial decision-making.

PV describes the important characteristics of the services that are valued by the users and other stakeholders (Kaasinen, 2005). In the context of this study, PV can be described as one of the main reasons why managers are interested in Mobile BI in order to make decisions. PV is also linked to the costs of using the service.

With respect to PV's influence on Attitudes Towards Use, results from individual regression analysis between the two constructs indicated that PV had a significant influence on Attitudes. This further implies that managers who consider Mobile BI valuable to their decision-making needs would have a positive attitude towards using Mobile BI in making decisions in an organisation. In addition, PV was also found to exert a significant influence on the Behavioural intention to use construct indirectly through the Attitudes construct.

As previously explained in Chapter 2, in the context of this study, Organisational decision-making is an umbrella term for managerial decision-making which influences the goals, objectives, policies ... and are subject to variation with different organisations. Organisational decision-making also does include managers' personal goals and objectives (Presbitero & Langford, 2013). Given that PV was found to be highly influenced by PEOU with correlation coefficient of 0.582 ( $r =$

0.582,  $p < 0.01$ ) with a statistical significance relationship at level 0.01 as illustrated in Table 5.8 – therefore, such personal goal activation may be effective in the current context.

This means that organisational decision makers would be expected to have a good understanding of the need to and importance of maximising their work performance. Managers who perceive Mobile BI to be valuable to their job performance may cognitively process the opportunity to use Mobile BI as an important tool that may lead them towards achieving their personal goals and objectives for which they would expect to be rewarded. This finding is consistent with the findings of previous other studies such as (Kaasinen, 2005; Lam & Schaubroeck, 2011) and (Turel, Serenko, & Bontis, 2007).

This finding is further corroborated by Vlahos, Ferratt and Knoepfle (2000) who found Perceived Value of a system highly influential in supporting managerial decision-making. Vlahos et al., after studying a sample of German managers to examine the Perceived Value and satisfaction of a decision support system, found PV influential in order to make successful and effective decisions in an organisation.

### **6.3 Explaining Perceived Ease of Use**

Previously, there existed numerous challenges and limitations with mobile devices that had a significant influence on the Perceived Ease of Use of Mobile BI (Airinei & Homocianu, 2010). Some of these include:

1. The challenge of small screens,
2. Limited processing power,
3. Limited functionality of pointing devices
4. Limited storage and random access memory
5. Limited battery power as well as
6. Very sluggish mobile network connections

The rapid technological developments in the mobile industry have seen new and powerful mobile devices with larger screens (such as the ipad) as well faster mobile

networks (3G and 4G LTE) being introduced to the market. The limitations that once had an influence on the PEOU have all but diminished (Brockmann, Stieglitz, Kmiecik, & Diederich, 2012).

Referring back to the definition of Perceived Ease of Use (PEOU) as defined by Davis (1989) as “ The degree to which a person believes that using a particular system would be free from effort”, PEOU in this context may be regarded as part of the advantage of using Mobile BI from the manager’s perspective. This point of view accounts for why PEOU exerts an important influence on PV as illustrated in the result from the data analysis.

With respect to the influence PEOU of Mobile BI has on Organisational managerial decision-making, the importance of PEOU construct inline with the its influence on managerial decision-making is highlighted by two important findings.

- (a) Correlation results in Table 5.8 point to a positive moderate correlation between the PEOU of Mobile BI and the Organisational decision-making ( $r=0.462^{**}$ ,  $p<0.01$ ). Also, a relationship statistically significant at level 0.01 was also found.
- (b) The regression results in Table 5.12 which depicts the best predictors of the dependent variable, lists PEOU as the second most important predictor of managerial decision-making using Mobile BI with  $\beta = 0.298$ .

In the context of this study, PEOU can be regarded as a very important determinant in relation to managerial decision-making using Mobile BI in organisations. This is further supported by a number of findings which found PEOU as an equally important factor in predicting the use of Business Intelligence technologies for managerial decision-making. (Safeer & Zafar, 2011; Ben-Zvi, 2012; Bharati & Chaudhury, 2004; Goslar, Green, & Hughes, 1986)

## 6.4 Explaining Attitudes Towards Use

Results from the regression analysis suggest that Attitude is jointly predicted by Perceived Value and Perceived Ease of Use .This implies that without Attitudes, the Perceived Value, Perceived Ease of Use and Quality of Information would provide an incomplete description of the Mobile BI usage for managerial decision

making, which in turn affects the Organisational decision-making (Arts, Gijssels, & Boshuizen, 2006). Attitude towards use was expected to have a significant direct influence on the dependent variable (Organisational decision-making) as suggested by numerous other studies in the same domain (Graham, Harvey, & Puri, 2013; Higgins & Finn, 1976).

Therefore, according to the final model, Attitudes Towards Use was found to be instrumental, in influencing Organisational decision-making. From this perspective, a manager's influence towards using Mobile BI would be highly expected to be determined by Attitude Towards Use Mobile BI. This finding is consistent with that of Yan and Davison (2011; 2013; 2003).

## 6.5 Explaining Behavioural Intention to Use

Results showed that there exist a significant positive relationship between Behavioural Intention to use and Organisational decision-making. This implies that if managers Behavioural Intention to Use vary positively then their usage of Mobile BI for decision making is likely to have an influence on the entire organisation's decision-making, which in turn affects performance. When managers make use of Mobile BI to make decisions using information that is provided to them through a complex connection process to company BI systems, they need to rely and depend up on the information provided to them to make decision (Kuo & Yen, 2009).

As previously illustrated in the data analysis, Behavioural Intention to Use is predicted by Attitudes Towards Use ( $\beta = 0.39$ ,  $p < 0.005$ ) as illustrated in Table 4.18. In addition, the correlation analysis indicate a positive correlation between BIU and Organisational decision-making ( $r = 0.675$ ,  $p < 0.05$ ). Moreover, this relationship was found to be statistically significant at level 0.01.

This point of view perhaps explains a high influence Behavioural Intention to Use has on Organisational decision-making. BIU was found to be the most important predictor of Organisational decision-making as was illustrated in table of best predictors of the dependent variable (Table 5.12).

## 6.6 Explaining Quality of Information

Quality of Information's lack of a significant effect on the Organisational decision-making may have been a result of its rejected hypothesis (H5) and a negative correlation with the Attitude towards use. This is perhaps surprising because, while Mobile BI cannot exist without information, the quality of information should have some sort of bearing on how the system is used (Citroen, 2011).

There are other studies that have found otherwise. Petter et al., (2008) point out that there are a small number of studies that have investigated the correlation between information quality and use at both the individual and organisational levels. The authors further explain that one of the reasons for this is because, instead of evaluating Information Quality as a separate factor, information quality tends to be assessed as a constituent of user satisfaction measurements.

In the context of this study, the absence of a significant relationship between the Quality of information and Organisational decision-making can be explained as, because Attitudes Towards Use has a direct influence on how the system is used, and since there is no correlation between the quality of information and the attitudes, the decision makers attitude still play a significant role in how the system is used regardless of whether there is quality information or not.

The relationship between the Quality of Information and Organisational decision-making is only significant when Organisational decision-making construct is measured by system dependence; otherwise no relationship is revealed between the two constructs Rai et al., (2002). Furthermore, McGill et al., (2003) and Livari (2005) also found no significant relationship between information quality and intention to use, of which in the TAM model, intention to use leads to system usage (Venkatesh, Morris, Davis, & Davis, 2003; Citroen, 2011).

## 6.7 Explaining Organisational managerial decision-making

The Organisational decision-making construct presented in the research model forms an important part in finding answers to the research question and meeting the research objectives of this study. In most organisational settings, the organisations strategy, goals, objectives and policies are important factors in driving and reinforcing how its employees, particularly decision makers, use or adopt certain technologies in their job tasks. This is further linked to work performance (Mithas, Ramasubbu, & Sambamurthy, 2011).

Findings from the data analysis in Table 5.12, the main predictors of Organisational decision-making were Behavioural intention to Use, Perceived Ease of Use, Attitudes towards Use and the fourth predictor was Quality of Information.

The underlying purpose of using Mobile BI by managers for decision-making is to enhance and improve managerial decision-making abilities. This is because improving decision-making has been one of the greatest concerns of business managers in organisations. Several studies have shown that the performance of decision makers is significantly influenced by the information and system quality (Speier & Morris, 2003).

This is further corroborated by numerous other studies which found and empirically demonstrated different relationships between organisational managerial decision-making, which is also highly linked to organisation performance (Kunc & Morecroft, 2010; Jansen, Curseu, Vermeulen, Geurts, & Gibcus, 2011; Walter, Kellermanns, & Lechner, 2012; Dean & Sharfman, 1996; Elbanna & Child, 2007; Mayer, 2013; Elbashir, Collier, & Davern, 2008)

## 6.8 Chapter summary

In this chapter, discussions of findings were presented. The important predictors of Mobile BI usage for managerial decision-making in organisations were discussed. New patterns that emerged from the data analysis were identified and discussed. In Chapter seven, conclusions will be drawn and suggestions for future research will be discussed.



# Chapter 7

## Conclusion

### 7.1 Introduction

This chapter concludes the thesis by revisiting the aim and objectives outlined by this study in chapter one. Based on the results obtained in the data analysis, this chapter provides answers to the research questions set out by the study. Furthermore, this chapter concludes by presenting discussions and recommendations in relation to the direction of the future research.

### 7.2 Back to the research questions

The purpose of this research was to understand the impact Mobile BI has on managerial decision-making and how these decisions influence the overall organisational decision-making. This undertaking was approached by using a hybrid model deduced from the TAM and TAMMS models in a manner that jointly predicted the managerial usage of Mobile BI for decision making. Thus, the main research question of this study was:

**What is the effect of Mobile BI on managerial decision-making in organisations?**

To help find the answers to the main research question, this research question was further broken down into three sub-questions:



**Q:1** What are the factors influencing the usage of Mobile BI for managerial decision-making ?

**Q:2** What impact does Mobile BI have on a manager's behaviour in relation to decision-making in an organisation ?

**Q:3** What kind of effect does the decisions taken using Mobile BI have on the organisation's performance ?

The following section will briefly discuss how each of the research questions were addressed and where it was address in the thesis.

**Q:1** What are the factors influencing the usage of Mobile BI for managerial decision-making ?

In an attempt to find answers to the research questions raised in this thesis, a quantitative empirical study was conducted. On the basis of findings from the data analysis and the final research model, factors influencing the usage of Mobile BI for managerial decision-making found to be a result of a number of constructs as (deduced from regression analysis). These are the following:

- (a) Perceived Ease of Use Of Mobile BI,
- (b) Perceived Value of Mobile BI,
- (c) Attitudes Towards Use of Mobile BI and
- (d) Behavioural Intention To Use of Mobile BI.

Chapter six provided a comprehensive discussion of these factors based on data analysis in Chapter four. The findings were also corroborated by numerous other studies as discussed in Chapter six.

**Q:2** What impact does Mobile BI have on a manager's behaviour in relation to decision-making in an organisation?

Discussion of findings in Chapter six found a relationship between Behavioural Intention To Use and Organisational managerial decision-making. Since in the context of this study, Mobile BI is a technology that only focused on decision-makers

(i.e. managers) in organisations, it was discovered that Behavioural Intention To Use plays an important role in predicting the usage of Mobile BI to make decisions. This pattern has also been observed across a range of studies (P. Harrison & Monique, 1997; Porter & Donthu, 2006; Yang & Yoo, 2004).

**Q:3** What kind of effect does the decisions taken using Mobile BI have on the organisation's performance?

Organisational managerial decision-making, was found to be greatly predicted and influenced by Attitudes towards Use and Behavioural intention to Use in the way that managers use the Mobile BI to assist them in decision-making. On the basis of findings in the data analysis in chapter five, a plausible argument can be built maintaining that organisations that tend to encourage their decision-makers (managers) to use such decision support technologies, would actually benefit immensely from improved performance of its workers. This is further supported by previous studies by Kohli and Devaraj (2004), which provided evidence that the usage of decision support systems leads to improvements in the overall organisational performance.

Davis and Venkatesh (1996) also argued emphasizing that if users in an organisation are not willing to accept a new technology; the technology will not provide its intended benefits to the organisation. This is also inline with the findings of (Hill & Remus, 1994) and (Radford, 1974) who also confirm this in their studies.

### 7.3 Back to the research objectives

This research study so far has been trying to meet the four main objectives set at the beginning of the study. These are the following:

1. To investigate the extent to which using Mobile BI helps to improve managerial decision-making.
2. To review previous literature relating to Mobile BI and Business Intelligence technologies as well as the adoption and usage within context of managerial decision-making at both the individual and organisational level.
3. To formulate a model of technology acceptance of Mobile BI for managerial decision making using previous Technology acceptance models in literature.

The following section takes a reflective point of view on how these objectives have been achieved. An important contribution of this research was the study and analysis of empirical data on how managers use Mobile BI to make decisions and how those decisions (made with the use of Mobile BI) impact the overall organisation.

Objectives 1 and 3 of this research were met through the collection and analysis of empirical data obtained from the data gathered for this research. More importantly, a focus of the empirical data was collected on managers views on the use of Mobile BI for decision-making which helped to address the research questions and sub questions as well as to test the hypotheses of this study.

Objective 2 was validated in Chapter 2 (Literature Review) which identified a gap in the existing research that justified ample evidence on the need for academic research confirming the importance of Mobile BI. Therefore, in contrasting theory with practice, in other words, by comparing the literature review findings with the actual real world practice, this study presented valuable insight and useful knowledge in relation to Mobile BI for managerial decision-making. Table 7.1 presents a summary of research objectives, as well as where and how they were addressed in the thesis.

TABLE 7.1: Summary of Research Objectives: where and how they were addressed

Objective	Where Addressed	How Addressed
1	Chapters 5 and 6	In Chapter 5, the analysis of the data helped explain the factors that influence managerial decision-making and how these influence the Organisational decision-making. In Chapter 6, these factors were discussed and explained in detail.
2	Chapter 2 and 3	Chapter 2 presented important discourse on literature relating to the background of Mobile BI and Decision-making theories. In particular, section 2.2 through to section 2.5 dealt with the review of the technology (BI and Mobile BI), Decision-making theories and models (at both the individual and organisational level) as well as discussion about the technology acceptance frameworks were presented in Chapter 3.
3	Chapters 3 and 5	The literature review in Chapter 2 helped to provide a foundation for the formulation of the conceptual research model which was based on previously proven technology acceptance models. In Chapter 5, The research model was tested using regression and correlation techniques. In particular, section 5.7 demonstrated that the model explained a 51.2% of the variance in the dependent variable. Section 5.8 in chapter 5 depicted the final research model.

## 7.4 Overall Contribution

The main contribution made by this study was a model/framework based on a new empirical research setting founded on well-known acceptance theories in IS research. This model is a management technology acceptance model (see Figure 5.1), which fulfilled all requirements with a very good level of fit to the data. This model could help explain the acceptance of Mobile BI by managers for decision-making in organisations.

## 7.5 Limitations of the research

Much like any other research, there are several limitations to the broader implications of this study. Firstly, the perceived benefits of Mobile BI technologies are likely to mature over time with more innovation expected in both (a) The mobile and (b) Business Intelligence and related technologies. This also means that their diffusion and inventive use by different organisations will like progress and evolve over time.

Secondly, the managers population of the organisations sampled mainly consisted of managers who consume BI both on their mobile phones and tablets devices. Purvis, Sambamurthy and Zmud (2001) argue that this consistency increases considerably the internal validity of a study and its measure. However, the external validity may be undermined when considering managers who consume Mobile BI exclusively on either their mobile phones or exclusively on their tablets. This is given the fact that mobile phones and tablets would normally have different specifications, specializations or capabilities, and that would mean different kinds of usage.

Thirdly, since Mobile BI is a contemporary subject area, the perceived benefits of Mobile BI systems are likely to undergo changes and develop into more specialised as technology vendors bring to the market a variety of systems or components designed for particular purposes. Therefore, this research provides an overview of the effect of Mobile BI for managerial decision-making at only a specific stage-in-time. This research mainly relies on subjective perception-oriented measures at the design and method, organisation as well as individual level, which can sometimes result in general method bias.

The use of managers' perceptions was regarded suitable simply because the information needed to measure the effect of Mobile BI are qualitative in nature and would be complicated to gather objectively, if not unachievable. Since this kind of information is primarily objective in nature, particularly at the organisational level, some organisations often perceive and value their data as of strategic importance. In fact, most organisations treat any of their data as a strategic asset. Some organisations consider such information extremely confidential and thus do not openly share it with anyone.

One other limitation is that, during the data analysis, this study assumed a normal distribution of factors. This allowed for the usage of pearson's correlation instead of spearman's correlation.

Nevertheless, in spite of these limitations, this research study makes an important contribution to theory and practice because there is lack of studies conducted to address the issue of Mobile BI with respect to managerial-decision making.

This research was conducted in an attempt to understand the effect of Mobile BI on managerial decision-making. Essentially, there is still opportunity for further investigation into the use of Mobile BI for managerial and executive decision-making. The section to follow will discuss possible direction for future research.



## 7.6 Direction for future research

The purpose of this section is to briefly delineate a series of topics for future research on the theoretical and applied aspects of the adoption and use of Mobile BI for managerial decision-making. The Quality of Information construct was found to show an insignificant correlation with the dependent variable (Organisational managerial decision-making), which could suggest that it had very little or no influence on the managers use of Mobile BI for decision making. Further research with respect to the Quality of information would be worthy of examination. Kennerley and Mason (2007) results showed evidence of correlations between the Quality of information and decision-making.

However, in the context of mobile technologies in line with to decision-making, the results discussed in this study indicate that a new kind of research is needed to investigate this phenomenon in detail. Future research might consider tackling the research by using a different methodology or research design.

The chosen research frameworks upon which the foundation of this research was based, were highly instrumental in identifying contextual factors that helped explain the use of Mobile BI for decision making. As previously discussed, Mobile BI is relatively a young subject area, and further research is needed to explore other factors, perhaps using different frameworks, to explain issues such as the impact of mobile on managers performance, managerial resistance or rejection of such technologies for decision making.

### **Towards an integrated model**

Given that TAM was originally established to predict and explain people's technology acceptance in various work environment, however, this research's point of view stemmed from seeking an understanding of the impact of a contemporary technology such as Mobile BI would have on managerial decision-making. It would be interesting to integrate the model produced by this research study with one the many decision-making models described in chapter two for future research.

## 7.7 Conclusion

The aim of this study was to investigate the effect of Mobile BI on managerial decision-making in organisations. The theory along side the results from the data analysis demonstrated that there are a wide variety of factors that will influence the use of Mobile BI for managerial decision-making.

Some of these factors include: Organisation variables, Attitudes and behavioural intention to use. In addition, variables such as perceived value and ease of use were also found to play an important influencing role. Overall Mobile BI does offer considerable advantages to managers and executives in the context of decision-making alike.

A number of statistical tests were performed in an attempt to lower or prevent any serious threats to the quality of the information from either method variance or inadequately defined measures. Correlation and Regression analyses were performed on the survey data, and the overall results were found to support the hybrid research model coalesced between original TAM model and TAMMS. The proposed hypotheses were also tested.

There were a number of limitations to the study. One main limitation of this research was the fact that Mobile BI is still an emerging subject area, of which many important factors are expected to evolve over time. Another limitation was that this study mainly relied on perception-based measures, of which the managers population were used as the sample. This meant that the generalizability of results drawn from their responses were mostly subjective, and can sometimes cause bias. However despite a few limitations, this research study was able to make a number of important contributions to theory and practice in this domain.



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# Appendix A

## Information sheet

The University of the Western Cape requires researchers to apply for ethical clearance before venturing for data collection. The participants involved in the research were given comprehensive details about the research and were given the freedom to withdraw from the research if ever they felt uncomfortable about the questions asked. Finally, the data collected did not in any way entail sensitive participants information such as personal email addresses or personal phone numbers.

Managers were able to provide information on their consent and this information was kept confidential and was only used for the purpose of this research. Below is the information sheet that were given to managers explaining to them what the research was about.



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Tel. 021 959 3680

### **Information Sheet: Questionnaire**

My name is Yasser Buchana. I am doing a Masters degree at the University of the Western Cape in Information Systems. For this degree I must conduct a study that is entitled 'The Effect of Mobile BI on Managerial Decision-making'.

My contact number is 0837276654 email [ybuchana@gmail.com](mailto:ybuchana@gmail.com) . My supervisor is Dr Visvanathan Naicker in the School of Business and Finance, University of the Western Cape. He can be contacted at : +27 21 959 3226 or [vnaicker@uwc.ac.za](mailto:vnaicker@uwc.ac.za)

To get the information I need for this study I hereby request permission to interview some of the managers in your organisation or various people in your organisation who have experience in running, working with Business Intelligence or related technologies about their experiences. The project has a strong focus in understanding how managers use and consume Business intelligence on their mobile devices (Mobile Phone or Tablets) to help them make decisions, and how those decisions impact the business or the entire organisation.

To reach this understanding I would like to conduct a brief interview with some of the managers in your organisation. The interview will take maximum 20 minutes or less to complete. This information sheet is for you to keep so that you can be aware of the purpose of the interview. With your signature below you show you understand the purpose of the interview.

Yours faithfully  
Yasser Buchana

Signature of Participant: \_\_\_\_\_

Date: \_\_\_\_\_



# Appendix B

## Consent form

The University of the Western Cape requires researchers to apply for ethical clearance before venturing for data collection. The participants involved in the research were given comprehensive details about the research and were given the freedom to withdraw from the research if ever they felt uncomfortable about the questions asked.

Finally, the data collected did not in any way entail sensitive participants information such as personal email addresses or personal phone numbers.

Managers were able to provide information on their consent and this information was kept confidential and was only used for the purpose of this research. Below is a consent form that was given to managers who participated in this study.



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I \_\_\_\_\_ hereby confirm that I understand that the interview is for a research project and that the information I give will be used towards a Master's degree and other academic publications.

I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

I also understand that my identity will be kept secret unless I give my express consent in writing. I also understand that all potentially harmful information I give will be kept confidential unless I consent expressly to it being used in public. I understand that the findings of the research will be available to me upon request.

Signature of Participant: \_\_\_\_\_

Date: \_\_\_\_\_

# Appendix C — Questionnaire





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## Managers Questionnaire



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The purpose of this survey is to examine the effect of Mobile BI on Managerial Decision Making

This questionnaire is derived from well-validated portions of several surveys that have been used in other studies the past. Your responses will help to understand what kind of effect Mobile Business Intelligence have on decisions managers make. Please complete all items even if you feel that some are redundant. This should require at most 15 minutes of your time.

a Mobile BI system provides a solution that allows for flexibility, device independence, and cross platform integration to consume and make the most of business intelligence capabilities on a mobile device, (smartphone or tablet) in order to make decision.

Usually it is best to respond with your first impression, without giving a question much thought. Your answers will remain confidential and anonymous.

### 1. Personal information (Please mark an "X")

What is your gender?	Male	Female
----------------------	------	--------

What is your age?	20-29	30-39	40-49	50-59	60 years or older
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What is your highest qualification?	Certificate	Diploma	Bachelor's degree	Masters degree	Doctorate	Other
-------------------------------------	-------------	---------	-------------------	----------------	-----------	-------

How many years Managerial experience do you have?	1-5	6-10	11-15	16-20	21 years or more
---	-----	------	-------	-------	------------------

**2. Please mark an “X” next to the decision type. I use Mobile BI to make ... (choose only one)**

1.		Strategic decisions Making
2.		Operational decisions Making
3.		Financial decisions Making
4.		Group decision Making
5.		Independent decision Making
6.		Structured decision Making
7.		UnStructured decision Making

How do you access Mobile BI?	Mobile Phone	Tablet	Both
------------------------------	--------------	--------	------

Whose device do you use to access Mobile BI?	Personal	Companie's	Both
--	----------	------------	------

**3. How would you describe yourself in respect to the various levels of BI or Mobile BI usage? Mark an “X” next to the level that best describes you.**

1.	Unfamiliar	I have no experience with Business Intelligence technologies.
2.	Newcomer	I have attempted to use Business Intelligence technologies, but I still require help on a regular basis.
3.	Beginner	I am able to perform basic functions in a limited number of Business Intelligence applications.
4.	Average	I demonstrate a general competency in a number of Business Intelligence applications.
5.	Advanced	I have acquired the ability to competently use a broad spectrum of Business Intelligence technologies.
6.	Expert	I am extremely proficient in using a wide variety of Business Intelligence technologies.

3. The following questions will evaluate how Factors such as Organisation Strategy, Goals and Objectives influence decision-making in your organisation. Indicate by selecting one level of agreement or disagreement.

**SD = Strongly Disagree** <sup>(1)</sup> | **D = Disagree** <sup>(2)</sup> | **U = Undecided** <sup>(3)</sup> | **A = Agree** <sup>(4)</sup> | **SA = Strongly Agree** <sup>(5)</sup>

	<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>
1. Organisation strategy influences decision making using Mobile BI	①	②	③	④	⑤
2. The senior management has been helpful in the use of the mobile BI for decision making.	①	②	③	④	⑤
3. In general, the organisation has supported or encouraged the use of the mobile BI for decision making.	①	②	③	④	⑤

4. The following questions will evaluate the Perceived Value of Mobile BI by selecting only one appropriate answer for each statement.

**SD = Strongly Disagree** <sup>(1)</sup> | **D = Disagree** <sup>(2)</sup> | **U = Undecided** <sup>(3)</sup> | **A = Agree** <sup>(4)</sup> | **SA = Strongly Agree** <sup>(5)</sup>

	<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>
1. Using Mobile BI increases my abilities to make better decisions	①	②	③	④	⑤
2. Using Mobile BI enhance my Job Performance.	①	②	③	④	⑤
3. Mobile BI Would ease the pressure on me as a Manager	①	②	③	④	⑤
4. Mobile BI is useful for decision making	①	②	③	④	⑤
5. Using the mobile BI would enable me to complete job tasks more quickly	①	②	③	④	⑤
6. Using mobile BI would enhance my effectiveness at work	①	②	③	④	⑤
7. Using Mobile BI, I can make decisions from anywhere anytime.	①	②	③	④	⑤

6. The following questions will evaluate the Perceived Ease of Use of Mobile BI by selecting only one appropriate answer for each statement.

**SD = Strongly Disagree** <sub>(1)</sub>   **D = Disagree** <sub>(2)</sub>   **U = Undecided** <sub>(3)</sub>   **A = Agree** <sub>(4)</sub>   **SA = Strongly Agree** <sub>(5)</sub>

	SD	D	U	A	SA
1. Mobile BI is clear and understandable to use.	①	②	③	④	⑤
2. It is easy for me to remember how to perform tasks using Mobile BI	①	②	③	④	⑤
3. I find a mobile BI procedures to be flexible to interact with	①	②	③	④	⑤

7. The following items will evaluate Managers attitudes towards the use of Mobile BI. Please select only one level of agreement or disagreement for each statement.

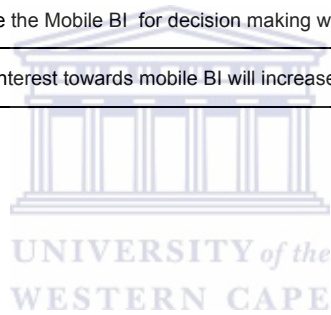
**SD = Strongly Disagree** <sub>(1)</sub>   **D = Disagree** <sub>(2)</sub>   **U = Undecided** <sub>(3)</sub>   **A = Agree** <sub>(4)</sub>   **SA = Strongly Agree** <sub>(5)</sub>

	SD	D	U	A	SA
1. I enjoy using Mobile BI	①	②	③	④	⑤
2. Mobile BI Enhances my professional Development	①	②	③	④	⑤
3. Using Mobile BI has changed the way in which I approach decision making.	①	②	③	④	⑤
4. Mobile BI helps me to make more accurate decisions	①	②	③	④	⑤

8. The following questions will evaluate your behavioural intention of Use of Mobile BI by selecting only one appropriate answer for each statement.

**SD = Strongly Disagree** <sub>(1)</sub>   **D = Disagree** <sub>(2)</sub>   **U = Undecided** <sub>(3)</sub>   **A = Agree** <sub>(4)</sub>   **SA = Strongly Agree** <sub>(5)</sub>

	<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>
1. I intend to use (or continue to use) Mobile BI in my job	①	②	③	④	⑤
2. I intend to make decisions quickly when using Mobile BI	①	②	③	④	⑤
3. I intend to prefer to use Mobile BI over traditional BI in my daily job.	①	②	③	④	⑤
4. I am excited about using Mobile BI in my work as a Manager.	①	②	③	④	⑤
5. Using the mobile BI will enable me to accomplish certain tasks more quickly.	①	②	③	④	⑤
6. I intend to use Mobile BI for routine decision making tasks	①	②	③	④	⑤
7. I intend to use the Mobile BI for decision making whenever possible	①	②	③	④	⑤
8. I believe my interest towards mobile BI will increase during the next three months	①	②	③	④	⑤





9. The following questions will evaluate the Quality of Information with respect to Mobile BI by selecting only one appropriate answer for each statement.

**SD = Strongly Disagree** <sub>(1)</sub>   **D = Disagree** <sub>(2)</sub>   **U = Undecided** <sub>(3)</sub>   **A = Agree** <sub>(4)</sub>   **SA = Strongly Agree** <sub>(5)</sub>

	SD	D	U	A	SA
1. Access to Real-Time information is less important when I need to make decision using mobile BI	①	②	③	④	⑤
2. The quality of information is critical for my abilities to make any decision using Mobile BI	①	②	③	④	⑤
3. Information relevance is critical for me to make any decisions using Mobile BI.	①	②	③	④	⑤
4. Accuracy of information is necessary for me to make decisions using Mobile BI	①	②	③	④	⑤
5. Up-to-date information is a necessity for me to make decisions using Mobile BI	①	②	③	④	⑤

If you have any additional comments you wish to make, please feel free to add them here.  
*Mobile bi has become so important I will probably use it to assist in every managerial decision I make in the near future. The majority of my current decisions use mobile BI as part of the decision making process.*

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 Thank you for your time and cooperation.  
 If you have any questions regarding this survey, please contact the researcher,  
 Mr. Yasser Buchana through any of the following.  
 ybuchana@gmail.com – 0837276654

or my supervisor Dr. V.Naicker through any of the following.  
[vnaicker@uwc.ac.za](mailto:vnaicker@uwc.ac.za) – 0835576805 – (021) 5510994 – (021) 9593226