



FACTORS AFFECTING THE ADOPTION OF BUSINESS INTELLIGENCE SOLUTIONS IN A PUBLIC SECTOR ORGANISATION

A thesis presented to the Department of Information
Systems – University of Witwatersrand

In partial fulfillment of the requirements for the Master of Commerce in Information
Systems

By Modiketse Tshehla

2135251

Table of Contents

Abstract.....	vi
Keywords.....	vii
Declaration.....	viii
Acknowledgements.....	ix
CHAPTER 1 : INTRODUCTION	1
1.1 Background	1
1.2 Research problem	2
1.3 Purpose of the study	3
1.4 Contributions of the study	5
1.5 Delimitation of the study	5
1.6 Conclusion to Chapter 1.....	5
1.7 The layout of the research study	6
CHAPTER 2 : LITERATURE REVIEW	7
2.1 Business Intelligence Solutions	7
2.1.1 History of Business Intelligence	7
2.1.2 Description of Business Intelligence	7
2.1.3 Business intelligence software components.....	8
2.1.4 Business Intelligence Tools	9
2.2 Benefits of BIS	10
2.3 Adoption of BIS	11
2.3.1 Technological context factors	11
2.3.2 Organisational context factors.....	13
2.3.3 Environmental context factors.....	15
2.4 Conceptual Framework	16
2.4.1 The diffusion of innovation.....	17
2.4.2 The Iacovou et al. (1995) model	17
2.4.3 The Technology Organisation Environment framework.....	18
2.5 Chapter Summary.	21
CHAPTER 3 : RESEARCH METHODOLOGY	23
3.1 Philosophical Approach.....	23
3.1.1 Positivism	23
3.1.2 Interpretivism.....	23

3.2	Research Design	25
3.2.1	Research designs not selected for this study.....	26
3.2.1.1	Descriptive research design	26
3.2.1.2	Relational research design	26
3.2.1.3	Experimental research design.....	27
3.3	Research Strategy	27
3.4	Data Collection Methods	29
3.4.1	The interview approach	29
3.4.2	The interview protocol.....	30
3.4.3	Other data collection methods considered	32
3.5	Sampling Method.....	32
3.5.1	Sampling technique.....	33
3.6	Data Analysis.....	34
3.6.1	Phase 1: Familiarising with data	34
3.6.2	Phase 2: Generating initial codes.....	34
3.6.3	Phase 3: Searching for themes.....	36
3.6.4	Phase 4: Reviewing themes	36
3.6.5	Phase 5: Defining and naming themes	37
3.7	Rigour of Research – Evaluation of methods.....	37
3.8	Ethical Considerations.....	38
3.8.1	Informed consent.....	38
3.8.2	Harm and risk.....	38
3.8.3	Privacy, confidentiality, and anonymity.....	38
3.8.4	Voluntary participation	39
3.9	Chapter Summary	39
	CHAPTER 4 : FINDINGS.....	40
4.1	Introduction	40
4.2	Profile of the Participants.	40
4.3	Presentation of the Data and Results of the Analysis.....	41
4.3.1	Research question 1: Technology factors that influence BIS adoption	42
4.3.1.1	Expected benefits of the technology	43
4.3.1.2	Compatibility.....	44
4.3.1.3	Summary of findings for Research Question 1	45
4.3.2	Research Question 2: Organisational factors that affect adoption	46

4.3.2.1	Organisational culture.....	46
4.3.2.2	Stakeholder engagement.....	49
4.3.2.3	Organisation size.....	50
4.3.2.4	Available financial resources.....	51
4.3.2.5	Summary of findings for Research Question 2	52
4.3.3	Research Question 3: Environmental factors affecting BIS adoption.....	53
4.3.3.1	Government regulation.....	54
4.3.3.2	Service provider support.....	54
4.3.3.3	Summary of findings for Research Question 3	55
4.3.4	Reasons why the identified factors influence the adoption of BIS.....	56
4.3.4.1	Stimulation of employee interest.	56
4.3.4.2	Importance of data quality.	58
4.3.4.3	Summary of reasons	58
4.4	Chapter Summary	59
CHAPTER 5 : DISCUSSION OF FINDINGS.....		61
5.1	Introduction	61
5.2	Research Question 1: What aspects of the visualisation and data exploration BIS are perceived to influence the adoption of the BIS in the public sector organisation?	62
5.2.1	Data integration	62
5.2.2	Performance monitoring and reporting.....	63
5.2.3	Ease of use	64
5.3	Research Question 2: What organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation?	65
5.3.1	Organisational size and available financial resources.....	66
5.3.2	Organisational culture.....	69
5.3.3	Stakeholder engagement.....	71
5.4	Research Question 3: What external environmental factors are perceived to influence the adoption of the visualisation and exploration of BIS in the public sector organisation?	75
5.4.1	Government regulations	75
5.4.2	Service Provider Support	76
5.5	Reason why these identified factors influence the adoption of BIS?	77
5.5.1	Stimulation of employee interest	77
5.5.2	Importance of data quality	78
5.6	Reflection on the TOE framework.....	79
5.7	Chapter Summary	80

CHAPTER 6 : CONCLUSION	82
6.1 Overall Summary of the Study	82
6.2 Re-visiting the Research Question	82
6.3 Contribution to Theory	84
6.4 Contribution to Practice.....	85
6.5 Limitations of the Research	85
6.6 Recommendations for the Future.....	85
6.7 Concluding Remarks.....	86
REFERENCES	87
ANNEXURE A – Interview Protocol	a
ANNEXURE B – Participant Information Letter	c
ANNEXURE C – Participant Consent Form	d
ANNEXURE D – Organisation Permission Letter	e
ANNEXURE E – Ethics Clearance Certificate.....	f
ANNEXURE F – Codebook	g

LIST OF TABLES AND FIGURES

TABLES

Table 3.4-1 BIS adoption determinants	32
Table 3.6-1 Description of themes	37
Table 4.2-1 Profile of participants	40
Table 4.2-2 Profile of documents	41
Table 4.3-1 Overview of themes and subthemes on technology factors.....	42
Table 4.3-2 Overview of themes and subthemes on organisation factors	46
Table 4.3-3 Overview of themes and subthemes on environmental factors.....	53
Table 4.3-4 Overview of reason themes and sub-themes influencing adoption of BIS.	56
Table 5.7-1 Summary table of findings.....	80

FIGURES

Figure 1.7-1 Study layout.....	6
Figure 2.4-1 Standard factors from the TOE theoretical framework by Tomatzky and Fleischer (1990)	19
Figure 2.4-2: Conceptual research model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990	20
Figure 3.6-1 Conceptual research model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990	35
Figure 3.6-2 Sample of the coding process.....	36
Figure 3.6-3 Sample of the mind map	36
Figure 4.3-1 Modified conceptual research model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990.....	41
Figure 5.1-1 Final conceptual model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990	61
Figure 5.2-1 Contextual diagram of aspects contributing to technological factors that affect BIS adoption.....	62
Figure 5.3-1 Contextual diagram of aspects contributing to organisational factors that affect BIS adoption.....	66
Figure 5.4-1 Contextual diagram of the aspect contributing to the environmental factor that affects BIS adoption.....	75
Figure 6.2-1 Final modified conceptual model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990.....	84

ABSTRACT

Business Intelligence Solutions (BIS) continue to play a significant role in organisations and businesses in today's information age. The adoption of BIS enables an organisation to gain a competitive advantage, generate accurate and faster data reporting, improve customer service, and increase revenue. The benefits of BIS have been realised in private sector organisations. However, the South African public sector is yet to release the benefits of adopting business intelligence solutions. The factors that affect the adoption of business intelligence solutions in a South African public sector organisation have not been fully investigated.

This study explores factors that division managers perceive to be salient in influencing the adoption of a visualisation and data exploration BIS available in a public sector organisation in South Africa. The study was underpinned by Tomatzky and Fleischer's Technology Organisation Environment (TOE) framework which was applied previously in the adoption of information system (IS) at the organisation level. The framework provided the lens from which adoption was studied by considering influences from the technological context, the organisational context and the environmental context.

The following main research question guiding the study was addressed: What aspects of the visualisation and data exploration BIS are perceived to influence the adoption of the BIS in the public sector organisation. The organisation in the study provides training and development to public sector employees of the South African government.

The study interviewed 10 senior managers with at least three years' experience in the organisation. It was found that expected benefits from the technology and its compatibility are important for the adoption of BIS. Within the public sector organisation studied, stakeholder engagement; organisational culture; and available financial resources were also found to be important and supported by the literature. While service provider support was found to be crucial in the BIS adoption from the environmental context, the size of the organisation and the government regulations were found not to be influential in the adoption of BIS in a public sector organisation. The stimulation of employee interest and the importance of data quality were discovered to be the most important reasons the BIS was adopted.

This research contributed to the improvement of theory by extending IS literature on BIS adoption and by testing the TOE theoretical framework in the South African public sector context. This study adds to the body of knowledge by extending the use of the TOE framework as a suitable tool for the study of BIS adoption. Furthermore, the study contributed by uncovering factors that influence the adoption of BIS in the South African public sector context.

The results may help the South African and other countries' public sector organisations to become more aware of the factors that influence the adoption of BIS. Practitioners and managers could be better prepared and minimise the BIS adoption risks by considering these factors.

KEYWORDS

Business Intelligence adoption, public sector, stakeholder engagement, government regulations, organisational culture, South Africa, TOE framework

DECLARATION

I, Modiketse Tshehla, declare that this research document is my own work, except as indicated in the references and acknowledgement. It is submitted in partial fulfilment of the requirements for the degree of Master of Commerce Information Systems, University of Witwatersrand. It has not been submitted before for any degree or examination at this or any other university.

A handwritten signature in black ink, appearing to be 'Modiketse Tshehla', written over a faint circular stamp that contains the text 'Research Report'.

Modiketse Tshehla

2022 June 30

ACKNOWLEDGEMENTS

Firstly, all praise to the Almighty and Graceful God for the generous gift of life, health and the strength to walk this fulfilling study journey.

Thereafter, I acknowledge and appreciate the unwavering support and encouragement of my supervisor, Lyrice Cohen. I would like to thank her for her guidance and patience in making this project a success.

I wish to extend my sincere gratitude to everyone who inspired, encouraged, proofread, and cheered me on at different stages of this journey, with a special mention to the following people: Riaan de Coning, Brenda Ngesi, Gugu Tshehla, Jimmy Weir-Smith, Vincent Sibande and Dikeledi Malahlela.

I acknowledge my parents, Geoffrey & Christina Tshehla and Betty Ngoma (late), despite not having any formal education, they provided deep-rooted inspiration, support and encouragement for education.

Most importantly, I dedicate this work to my 'twin' Zanele and the three T'angels, Tiro-thomo, Tswelopele and Tshiamo. Thank you, guys, for your evergreen love, for enduring many, many days and nights of my partial presence, time spent in front of a computer. You are the wind beneath my wings.

CHAPTER 1 : INTRODUCTION

1.1 BACKGROUND

This research study explores the adoption of Business Intelligence Solutions (BIS) in a South African public sector organisation. In particular, the research focuses on the factors that affect the adoption of BIS at an organisational level in the public sector. The BIS under consideration includes two high level components; (1.) visualisation which is the graphical representation of information and (2) data exploration which is the analysis of data with the purpose of identifying and/or uncovering new insights.

Organisations and businesses make use of information systems to conduct their daily activities. The usage of these systems generates a large amount of data for the organisation. Nowadays, organisations invest a great deal of resources in information systems and the management of data generated thereof (Silahtaroglu and Alayoglu, 2016), such as supply chain management (SCM), customer relationship management (CRM), and enterprise resource planning (ERP) (Woodside, 2011). Ain, Vaia, DeLone and Waheed (2019) and Guenduez, Mettler and Schedler (2020), state that such data are rich with information and knowledge, that could enable top management to make informed decisions about the trajectory of an organisation.

Commercial business enterprises rely heavily on BIS to analyse this data and remain competitive in the volatile business environment (Puklavec, Oliveira and Popovič, 2018; Chege, Wang and Suntu, 2020). Public sector organisations, on the other hand, are known to make operational and service delivery decisions based on approved legislative policies. It has been found though that some public sector organisations, much like commercial organisations, strive for competitiveness where relevant information and knowledge are required to make strategic and tactical decisions (Sewdass, 2009; Silahtaroglu and Alayoglu, 2016). According to Woodside (2011), public sector organisations also have to continually adapt to the evolving business environment to be successful.

In recent research Fakier (2021) asserted that public sector organisations without the BIS face the difficulty of efficiently managing their resources without easy access to comprehensive information about the costs of delivering services to citizens. When control systems and information systems are not in place or are weak, public sector organisations may struggle to maintain the delivery of services and prevent the diversion of services (Andrews, Ferry, Skelcher and Węgorowski, 2020).

The lack of information makes it impossible for public sector organisations to monitor their actual service deliverables and to draw patterns. Hartley and Seymour (2011), assert that workers in the public sector may abuse their powers without any detection when information and patterns of their responsibility areas are lacking. The performance of service delivery operations can only be monitored and controlled when key information is at the disposal of senior management in the public sector.

Using analytics in strategic decision-making contributes to public sector organisations and managers to be efficient in service delivery and monitoring (Mansell and Ruhode, 2019). This can be achieved when key information is at hand, allowing organisations to align their activities with citizen expectations for services. Technological solutions are available to organisations to help improve their performance and managerial practices (Elbashir, Collier, Sutton, *et al.*, 2013; Chege, Wang and Suntu, 2020). One such tool is the data visualisation and exploration BIS available at the public sector

organisation being studied. Data exploration is open ended as it attempts to discover what should be done to resolve a high level concern (Alspaugh, Zokaei, Liu, Jin and Hearst, 2018). The available BIS tool enables a data exploration process that can reveal a broad picture of important patterns, trends and insights that may clarify what the response to a concern should be or may lead to establishing a goal for more specific and detailed data analysis. The visualisation and drill-down capabilities of the BIS tool facilitate data exploration.

The new currency in organisations in this information age is data, information, knowledge, and intellectual capacity (Wixom, Watson and Werner, 2011). The new driver for business success is regarded as BIS; an information communication technology (ICT) artefact that makes it possible to leverage the usage of data, aggregate, and summarise information; which helps organisations to be adaptive in the changing business environments and also in making informed business decisions (Olszak, 2016). Many organisations in the different sectors are interested in adopting and implementing BIS to improve their decision-making capabilities (Ranjan and Foropon, 2021).

1.2 RESEARCH PROBLEM

The BIS technological artefact has benefits such as providing real-time information for improved decision-making at various levels of the organisation (Woodside, 2011). The decision process of the organisation can be enhanced and effective management action enabled with BIS (Popovič, Hackney, Simões Coelho and Jaklič, 2012).

According to Grubljesic and Jaklic (2015), the many expected benefits of BIS can only be realised when the technological innovation has been accepted and adopted at organisation and individual levels. Studies have found that BIS implementations fail as many organisations do not fully accept and adopt the tool for their business decision making (Olszak, 2016). Therefore, it is important for organisations to fully understand the information system (IS)/ information technology (IT) adoption process and the factors affecting adoption of BIS (Ali, Murray, Muhammed, Dwivedi and Rashiti, 2022).

The adoption of IS/IT has been researched widely at the organisation level (Puklavec, Oliveira and Popovic, 2014; Grubljesic and Jaklic, 2015). The focus of most previous studies was on adoption factors of various applications and technologies, however, research focusing specifically on the adoption of BIS is limited (Puklavec, Oliveira and Popovic, 2014; Rouhani, Ashrafi, Zare Ravasan and Afshari, 2018). There is also a gap in the research of BIS adoption in public sector organisations.

This study focused on exploring factors that are perceived to influence BIS adoption in a South African public sector organisation. The organisation is a national institution that provides services to other public sector organisations across all spheres of government. The organisation studied, despite being a government entity, is in competition with other non-governmental institutions that offer a similar service to public servants.

The public sector organisation studied utilises source systems – non-BIS systems that generate the data that will later be analysed using BIS systems - that have a relational database system at the backend. For example, the financial system used in the organisation is a transversal Basic Accounting System that is also used by all government departments (national and provincial) (Mamoojee, 2001). Other business units in the organisation studied are using non-BIS specialist applications for their

operational functions, such as the Persal system used by the Human Resource unit, and the Logistics System used by the Supply Chain Management unit.

BIS encompasses a whole range of technologies concerned with gathering, integrating, analysing and presenting data, including data warehousing, data mining, advanced analytics, visualisation and data exploration. This study focused on the adoption of visualisation and data exploration BIS.

The South African public sector organisation studied currently uses a commercial BIS platform which is a visualisation and data exploration tool. The platform is mainly used as an analytical tool for financial forecasting, compiling weekly and monthly financial reports as well as reconciliations. The organisation does not have a data warehouse, however, the BIS platform is used to integrate data from multiple data sources before performing data analytics. The data standardisation and warehousing policy is the basis used for the integration of data from various sources. The organisation collaborates with outsourced service partners to deliver its services to customers. The statistics generated from the source system are integrated with the financial data for reporting.

Two business units in the organisation have adopted and are using the BIS platform for statistical reporting, financial forecasting, and reporting purposes. The lack of adoption of the BIS platform by the entire organisation could be a hindrance to exploiting the wealth of information at its disposal, which could make the organisation gain a competitive advantage in the market (Woodside, 2011). A BIS platform enables any organisation to compile information from which they can anticipate present and future activities as well as behaviour of its “competitors, suppliers, customers, technologies, acquisition, markets, products and services and the general business environment” (Ain *et al.*, 2019; Chen and Siau, 2020).

The study contributes to IS literature by testing the TOE theoretical framework in the South African public sector context as suitable in BIS adoption research. Furthermore, the study sought to gain an understanding of the factors that influence the adoption of BIS in a public sector organisation studied which may aid the efforts towards the adoption and thus lead to the realisation of greater benefits offered by the BIS platform. The public sector organisation studied has been able to realise some of the benefits of the implemented BIS platform, but far more would be achieved if there was a higher level of adoption.

1.3 PURPOSE OF THE STUDY

The purpose of the study was to understand the phenomenon of the adoption of BIS in a public sector organisation. The research followed a case study approach and collected data through interviews with participants.

The objective of the study was to explore factors that division managers perceive to be salient in influencing the adoption of BIS available in the public sector organisation in South Africa, and to discover why these factors influence adoption.

The focus was on division managers because the platform is accessible to them, and they are considered to be knowledgeable about BIS factors affecting BIS adoption in the organisation.

The study described the identified factors to be perceived as 'salient' by divisional managers. The term 'salient' is defined as the most noticeable or most important. This term is used in this study to describe the most noticeable or important factors.

The main research question for this study was: What do division managers perceive as salient factors that affect the adoption of the visualisation and data exploration BIS in the public sector organisation?

More specifically the objective of the research was to answer the following questions:

Research Question (RQ)1: What aspects of the visualisation and data exploration BIS are perceived to influence the adoption of the BIS in the public sector organisation?

RQ2: What organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation?

RQ3: What external environmental factors are perceived to influence the adoption of the visualisation and exploration BIS in the public sector organisation?

The election of these research questions was informed by the Technology, Organisation, and Environment framework (TOE), which explains innovation adoption and comprises contexts that influence technology adoption (Tomatzky and Fleischer, 1990). The TOE framework was used to provide an initial set of factors that the managers may perceive to be valid and important, but the objective included exploring what other factors were perceived to be important in terms of the adoption so that the most salient factors overall can be found.

It has been found in the literature that the expected benefits of BIS have a positive influence on its adoption by an organisation (Hočevár and Jaklič, 2010). Furthermore, the literature reveals that the technological compatibility of BIS with the organisation also has a positive influence on its adoption (Grubljesić and Jaklič, 2015). Based on these findings, Research Question 1 (RQ1) sought to determine the characteristics of the BIS technology that may impact an organisation's decision to adopt the innovation.

The size of the organisation and available financial resources have been found in the literature to have a positive effect on the adoption of BIS (Puklavec, Oliveira and Popović, 2014). Research Question 2 (RQ2) examined aspects of the public sector organisation that affect the adoption of the BIS.

Previous studies on BIS adoption show that the external environment influenced the adoption of BIS. Competitors and the support of service providers have been found to have a positive influence on adoption (Puklavec, Oliveira and Popović, 2014; Grubljesić and Jaklič, 2015). The Research Question (RQ3) investigated environmental influences that affect or lead a public sector organisation to adopt a BIS.

Research questions 1 to 3 explored the perceived factors that influence adoption in the technology, organisational, and environment categories. In many cases, perceived reasons for the influence of each factor were given, some of which reasons spanned the different categories. An overall look at the most important of these reasons driving the influence of the various factors was deemed necessary.

1.4 CONTRIBUTIONS OF THE STUDY

The phenomenon of BIS adoption in the public sector is not widely studied, as such, not many publications have been found in the most popular journals on information systems. Most research studies focus on individual-level adoption and usage of technological innovations (Rouhani *et al.*, 2018b). There are currently very few research publications in South Africa that focus on BIS adoption, particularly in the public sector.

The study contributes to the current knowledge of the adoption of BIS. In particular, the study adds to existing research knowledge by identifying factors that affect BIS adoption in a South African public sector context. It was expected that the South African research context would be different as it was locally focused whilst engaging with international perspectives on the phenomenon. South Africa is a developing economy with a rich and diverse cultural and political history which is regarded as unique and different to international contexts that have matured economies. According to Premkumar and Roberts (1999), the TOE framework has been used previously in adoption research in private sector organisations. The study also enhances the evidence on the appropriateness to use the TOE framework in the adoption of BIS in the public sector context.

The organisation where the case study was conducted will benefit by learning about the adoption factors in their organisation. Even though this is a case study, and as a result, it is not generalisable; other organisations, practitioners, and managers that are concerned about BIS adoption in public sector organisations or other sector organisations may use the study to draw on the new knowledge to anticipate possible issues that may arise in their environment.

1.5 DELIMITATION OF THE STUDY

The scope of the study was limited to one public sector organisation in the Republic of South Africa. The organisation is a government department with a legislative and constitutional mandate to provide education, training and development in the public sector. Private sector organisations and others were not included.

- The study focused only on factors perceived to affect the adoption of BIS. Other phenomena and technology were not considered.
- The participants interviewed were only senior managers of business units within the organisation because the platform is accessible to them. Senior managers are considered to be knowledgeable about factors affecting BIS adoption in the organisation. Six senior managers were from business units that have already adopted the BIS artefact while the other four were from business units that have not yet adopted the technology.

1.6 CONCLUSION TO CHAPTER 1

This chapter presented the background to the study and the research problem. The objective of the study was to understand the phenomena of BIS adoption in the public sector by exploring influencing factors perceived to be salient in the organisation. The main research question guiding the study was presented. The next Chapter is the literature review that includes definitions and benefits of BIS, and an introduction to the conceptual framework.

1.7 THE LAYOUT OF THE RESEARCH STUDY

The research study is organised into six chapters:

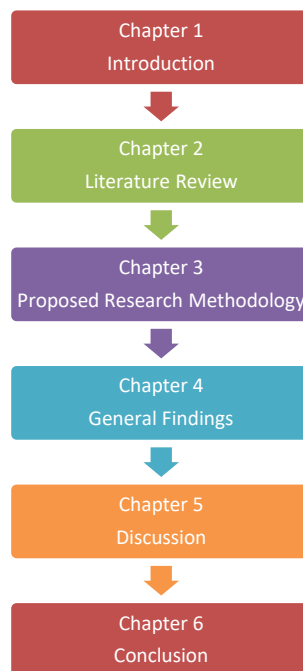


Figure 1.7-1 Study layout

Chapter 1 introduces the research by providing the overall background of the study and the research problem. The objectives of the study were outlined and the research questions were discussed.

Chapter 2 presents the literature review conducted to understand the history and definitions of BIS as well as its benefits. The Technology-Organisation-Environment framework is explored to unpack the factors from the different contexts of the framework. Six factors from the framework were selected for inclusion in this study as identified in the literature on BIS adoption and regarded as relevant for the organisation.

Chapter 3 outlines the methodology of the research philosophy. The discussion covers the research design, the procedures for data collection and analysis, research rigour and limitations, as well as ethical issues.

Chapter 4 presents the findings and the emerging themes from the primary research conducted via interviews. The structure of the research questions is centred around the themes from the research framework discussed in chapter 2.

Chapter 5 is a detailed discussion of the research findings and it explores the linkages with the literature reviewed.

Chapter 6 presents a summary and concludes the research. Implications for management, research limitations and opportunities for future research are outlined.

CHAPTER 2 : LITERATURE REVIEW

2.1 BUSINESS INTELLIGENCE SOLUTIONS

2.1.1 History of Business Intelligence

The term intelligence has been used by researchers since the 1950s (Bhatiasevi and Naglis, 2020). It has been referred to as a branch of knowledge or a faculty of understanding (Merriam-Webster, no date). Hans Peter Luhn, a researcher from IBM, first used the term Business Intelligence in an article in 1958 to define “the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal” (Elena, 2011, p. 01).

According to Bhatiasevi and Naglis (2020), companies have been using support systems that has evolved since the 1960s to support their decision-making processes. These decision-making support systems evolved from computer-aided models that were created for planning and decision-making, to Business Intelligence as we understand it today (Elena, 2011). Consequently, new tools were developed to supplement business intelligence (BI) ; including data warehouses, online analytical processing (OLAP), Executive Information Systems, and predictive analytics (Bhatiasevi and Naglis, 2020).

Although the concept business intelligence, as it is understood today, received more focus in the late 1980s (Elena, 2011), according to Watson and Wixom (2007), the term Business Intelligence was coined by Howard Dresner (a Gartner Group analyst) in the 1990s. Foley and Guillemettex (2010) pointed out that despite the introduction of “business intelligence” many years ago, many organisations are actively exploring the concept only recently. BI is now popular in business and IT communities (Bhatiasevi and Naglis, 2020) and it is used widely (Elena, 2011) with varied definitions.

2.1.2 Description of Business Intelligence

The concept of Business Intelligence (BI) has been defined and described in many ways by researchers in the Information Systems field. Foley and Guillemette (2010) have expressed that it is observable that each definition is oriented to suit a particular research study. The changes and the increase in technologies and the tools used in BI distort the general and practical understanding of the term. According to Wieder and Ossimitz (2015), BI is an information system for supporting decision making processes by providing users with capabilities to create new knowledge through aggregation, integration, and management of large structured and unstructured data.

A second definition by Negash (2004) is “BI systems combine data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision-makers” (p. 178.). On the other hand, Popovič et al. (2012) refer to BI as “quality information in well-designed data stores, coupled with software tools that provide users timely access, effective analysis, and intuitive presentation of the right information, enabling them to take the right actions or make the right decision” (p.2.).

There are similarities in these three definitions, however, the concepts are not the same. The definitions by Negash (2004) and Wieder and Ossimitz (2015) include managerial aspects and the process of BI. The definition by Negash (2004) includes competitive intelligence and knowledge

management, thereby, providing a broad view of the scope of BI. The definition by Popovič et al. (2012) postulates BI as “information” and is leaning toward the technological parts of BI.

The definitions are synthesised to understand BI as an analytical process that gathers disjointed data from across the organisation and externally; and transforms it into knowledge for planners and decision-makers. Furthermore, it is understood from the definitions that the business intelligence architectural stack is composed of software, tools, and related technologies.

For the purpose of this study, it is, therefore, important to unpack the meaning of BI and its related components. However, this study focused only on the visualisation and data exploration aspect of BI.

2.1.3 Business intelligence software components

Firstly, the BI software components in the stack are designed to support the analytical process, and according to Wieder, Ossimitz and Chamoni (2012), these include data warehouse software, data mining software, and dashboard software.

The first layer is a data warehouse, described by Hajmoosaei, Kashfi and Kailasam (2011) as an environment that is a repository of enterprise-wide information. Nkuna (2011) explains that BIS is usually not distinguished from data warehousing and the definitions of each are sometimes used interchangeably. Even without the use of data warehousing, BIS has elements that are similar to those of data warehousing as it includes the gathering of data, data storage, and analytical capabilities to generate information for decision making (Negash, 2004).

Dayal, Castellanos, Simitsis and Wilkinson (2009) clarify that data warehouses are managed separately from the operational databases in the organisation; they unify data storage from multiple sources in the organisation to provide current and historical decision-support information. Elena (2011) argues that “not all data warehouses are used for business intelligence, nor do all business intelligence applications require a data warehouse”. Notwithstanding the above, the discussion on data warehouse architecture for data management would be beyond the scope of this study.

In the second layer, the concept of data mining is viewed as an important “step in the process of knowledge discovery in databases” (Seng and Chen, 2010). Gorunescu (2011) explains that data mining is rooted in three woven scientific disciplines: i). Statistics - the numeric study of data relationships; ii). Artificial Intelligence – human-like computer machine intelligence; and iii). Machine Learning – algorithms that make predictions based on what they learn from the data.

Data mining software provides the capability to automatically search huge databases, such as data warehouses, to discover meaningful patterns, previously unknown, and potentially useful information (Gorunescu, 2011). As an example, a study by (Groenhof, Koers, Blasse, *et al.*, 2020) used data mining on historical patient health records stored in a data warehouse to discover previously unknown patterns in cardiovascular disease.

The third layer in the software component is dashboard software. Dashboard software provides data visualisation capabilities and allows for data exploration. Key performance indicators of an organisation’s business processes can be presented visually to management. For example, a report on the status of business processes of the sales department can be viewed at a glance with a constant

real-time feed of updates. There are typically three types of dashboards; namely; strategic, analytic, and operational dashboards (TechAdvisory, 2015). Examples of available tools for dashboard implementation include Microsoft Power BI, Qlikview, and Tableau, to mention a few.

Top management monitors the forecasts and performance of the business presented on strategic dashboards. Strategic dashboards can provide a global visualisation of an organisation's status based on quarterly, monthly, or weekly data. Ying, Lijun and Wei (2009) indicate that analytical dashboards enable the user to explore the data by interacting with high-level data reports by drilling down to the details that make the report. Operational dashboards enable managers to view and monitor operational activities that may require immediate attention. For example, a manager at a service delivery point, may view a queue management dashboard and allocate additional resources to a specific service point as and when there is a build-up of a queue by clients (TechAdvisory, 2015).

2.1.4 Business Intelligence Tools

Secondly, BI tools, as outlined by Wieder et al. (2012), are software products that have been installed in an organisation and are used for a particular purpose in the business intelligence processes. For example, an organisation may have a data integration tool installed and configured, set to perform extract-transfer-load (ETL) transactions on large volumes of data from multiple sources and at high speed, to the data warehouse. BI related technology includes underlying IT infrastructures such as servers, operating systems, networks, analytical tools, and so on.

According to Chen, Chiang and Storey (2012), BI has evolved into four levels since it was launched. In version 1.0 the focus was on databases, data warehousing, and data mining. Version 2.0 focused on web analytics and intelligence and social network analysis; while version 3.0 introduced analysis which is location-based, person-centred and sensor-based content. Lastly, version 4.0 uses advanced analysis methods for complex and big data.

Wieder and Ossimitz (2015) point out that BI is more than software and systems, it is about the whole process of managing data to support decision making by management. Ain, Vaia, DeLone and Waheed (2019) and Woodside (2011) concur and regard the primary purpose of BI as being able to allow large disparate data into a central repository and convert it into actionable information to improve managerial decision making.

Some of the analytical tasks performed by BI include the following, as enumerated by Negash (2004: p180) and Rouhani *et al.*, (2018):

- a) "Creating forecasts based on historical data, past and current performance, and estimates of the direction in which the future will go".
- b) "What-if" scenario analysis based on environmental changes.
- c) Monitoring of business activity and traditional decision support.
- d) Providing strategic insight on dashboards for decision-making.
- e) On-demand access to data to answer non-routine specific questions.

BIS are, therefore understood to be a collection of BI softwares, tools, and technologies including the IT infrastructure, and processes that support BI (Wieder, Ossimitz and Chamoni, 2012).

2.2 BENEFITS OF BIS

The evolution of Information Technology (IT) has caused a rise in investments by many organisations that expect productivity improvements as returns from their investments (Karahanna, Straub and Chervany, 1999). In the recent past, BIS has been used by organisations for a myriad of purposes including monitoring the efficiency of business processes and primary data input systems by gathering and analysing statistics in real-time (Nkuna, 2011).

Popovič et al. (2012) state that BIS are important tools for an organisation to use to attain their goals. Decision-makers and executives of organisations have paid attention to BIS because of its capability to provide complex and competitive information inputs in the decision process (Ain *et al.*, 2019). BIS have the capability to enhance the decision-making processes of an organisation by assisting with prediction, planning, and problem-solving (Popovič *et al.*, 2012).

The benefits of using BIS include enabling an organisation to gain a competitive advantage; receive, retrieve accurate and faster data reporting; improve customer service; and increase revenue (Bhatiasevi and Naglis, 2020). According to Wang (2014), BIS can assist managers to understand and exploit capabilities within the organisation, interpret market and industry trends, as well as predict actions that competitors may take and the effects of such actions. The organisation can monitor trends in the market along with its competitors, view the profitability of sales, and analyse its customers through the BIS (Hočevár and Jaklic, 2010; Olszak, 2016).

Performance trends and patterns can be monitored and analysed for strategic decision making by the organisation (Watson and Wixom, 2007; Phan and Vogel, 2010). Managers and employees at different levels in the organisation have access to relevant and timely information from the BIS, this results in improved decision making in the entire organisation (Hannula and Pirttimäki, 2003, as cited in Bhatiasevi and Naglis, 2020).

According to Hartley and Seymour (2011), public sector organisations can use BIS for multi-dimensional analyses of relevant data to derive plans and make strategic decisions that can positively impact the lives of citizens, without using sophisticated tools. Previous studies on the benefits of BIS have found that access to real-time information that top management can use to make quick decisions has a positive impact on efficiency (Gangadharan and Swami, 2004; Lönnqvist and Pirttimäki, 2006).

The performance of an organisation and the service it renders to its clients is significantly improved based on the business intelligence derived from the BIS (Gangadharan and Swami, 2004; Olszak, 2016). Reports on organisational activities that took many hours to generate are accessible within moments through BIS, therefore saving the organisation time (Gangadharan and Swami, 2004; Watson and Wixom, 2007; Popovic, Turk and Jaklic, 2010). BIS enables organisations to make strategic decisions driven by data integrated and disaggregated from the entire organisation to gain a competitive advantage (Gangadharan and Swami, 2004; Lönnqvist and Pirttimäki, 2006).

Watson and Wixom (2007) postulate that organisations host duplicated data through silo systems, thereby requiring huge infrastructure. BIS reduce the cost (Puklavec, Oliveira and Popovic, 2014) of infrastructure by de-duplicating data in an organisation. There are other benefits of BIS which are regarded as un-measurable and are not immediately noticeable on adoption and implementation,

however, they help the organisation to achieve its strategic goals. (Hočevár and Jaklič, 2010; Puklavec, Oliveira and Popović, 2014).

The informational needs of an organisation and the benefits that could be derived from the BIS may trigger an organisation to consider investing in technological innovation (Hočevár and Jaklič, 2010). The adoption of BIS in organisations is driven by factors that stimulate the decision and enable its adoption (Olszak, 2016).

2.3 ADOPTION OF BIS

Practitioners and academic researchers have focused on studying BIS extensively in the past few years (Bhatiasavi and Naglis, 2020). According to Ain et al. (2019), it has been found in the literature that organisations are trying to gain returns on investment from systems they have implemented and have failed to capture the full benefits of BIS. As a result, there is still a huge debate on the appropriate tactical and strategic approaches to the successful adoption of BIS (Ain *et al.*, 2019).

Grubljesic and Jaklič (2015) suggest that organisations considering adopting BIS should concentrate on managing the factors that have shown to be the most influential and important in the adoption of BIS. According to Bhatiasavi and Naglis (2020), the TOE framework, a three-dimensional theoretical framework, comprises of contexts to explain factors that influence the adoption of technology innovation at the organisation level.

The TOE framework was used in this study to provide an initial set of factors perceived to be valid and important in terms of adoption of BIS. These factors, established from the literature, provided a starting point for the discovery of all of the factors that are perceived to be most salient in terms of influencing the adoption of the data visualisation and exploration BIS in the organisation. The initial set of factors found in the literature are presented in the three categories of the framework, namely; the “technological context factors, organisational context factors, and environmental context factors” (Tomatzky and Fleischer, 1990).

2.3.1 Technological context factors

The technological context represents characteristics of current and new technological innovations that are in use by the organisation, including those not in use but available in the market, that are relevant to the organisation such as expected benefits, compatibility, and cost-effectiveness (Tomatzky and Fleischer, 1990; Baker, 2012; Venkatesh and Bala, 2012). Organisations may make their innovation decisions based on the technological innovations that are available but not employed by the organisation.

According to Baker (2012), available innovations may demonstrate to organisations ways in which technology can be used to adapt and evolve. The adoption of new technological innovations may bring about organisational changes with a small impact or a dramatic impact on the industry in which the organisation competes (Baker, 2012). Therefore, organisations should consider, with care, when adopting innovations.

Expected benefits have been noted as an important factor that may influence an organisation to adopt new technological innovations (Premkumar and Roberts, 1999; Puklavec, Oliveira and Popović, 2018;

Rouhani *et al.*, 2018b). Expected benefits are what the organisation expects to derive from the adoption of technological innovation (Zhu, Kraemer and Xu, 2006). The perceived characteristics such as cost reduction, increased revenue, operational efficiency, real-time data, and knowledge creation have been cited in the literature as expected benefits from the innovation (Venkatesh and Bala, 2012). These characteristics are also referred to as 'relative advantage' in classical innovation literature (Ramamurthy, Premkumar and Crum, 1999). These expected benefits can be categorised into two, namely; tangible and intangible. The tangible benefits are directly linked to the organisation's financial gains, time-saving, new revenues and, shareholder value (Rouhani *et al.*, 2018b). On the other hand, the intangible benefits are difficult to quantify; and include improved tactics and decisions, efficient processes, improved customer service, and better strategic plans.

It has been found that both *tangible* and *intangible benefits* have a significant influence on the adoption of BIS (Rouhani *et al.*, 2018b). In agreement with Rouhani *et al.* (2018), expected benefits were found to be the drivers of adoption, however, to a lesser extent (Gibbs and Kraemer, 2004; Kotze and Mudzana, 2015). Even though perceived benefits are comprised of different constructs in different studies, they have been found to significantly influence the adoption of technology (Iacovou, Benbasat and Dexter, 1995; Ramamurthy, Premkumar and Crum, 1999). Relative advantage, on the other hand, has been characterised as a perceived benefit from innovation adoption, it has been found to be a factor that affects the adoption of technology (Puklavec, Oliveira and Popovič, 2018).

In the TOE framework, the expected benefits characterise the technology but are not inherent in the technology itself; they are regarded as organisational characteristics (Gibbs and Kraemer, 2004). Expected benefits are regarded as an important factor in the organisation being studied and it has been included in the initial set of factors to be explored.

Compatibility is described as "the extent to which an innovation is believed to be close fitting and consistent with existing norms and values, previous experiences and current needs" (Rogers, 2003 p.52). The lack of compatibility may impose barriers to the adoption of technology. Organisations institutionalise successful business routines and these become part of institutional norms and values (Venkatesh and Bala, 2012). When considering adopting innovations, Rogers (2003) notes that an organisation would try to find the compatibility of innovations with its institutional norms and values.

Potential adopters may choose to reject an innovation perceived not to be compatible with its existing internal processes and business logic (Venkatesh and Bala, 2012). For example, an organisation with large operations that needs to be able to make decisions based on real-time operational information may evaluate a technological innovation, such as BIS, to establish if it will address its needs for real-time data processing and reporting.

It has been found that compatibility has a positive relationship with the adoption of technology (Premkumar and Roberts, 1999; Bhatiasavi and Naglis, 2020). However, one study found that compatibility was not significant in the decisions to adopt new technology (Gibbs and Kraemer, 2004). Organisational barriers were cited as having an impact on the initial adoption of technology. In the public sector organisation studied, the chosen BIS is considered to fit in well with the current business processes and information systems without requiring major adjustments or changes in workflows (Bhatiasavi and Naglis, 2020). Compatibility has been included in this study to explore whether this perception is valid.

The *expected benefits* and *compatibility* were included as technological factors that influence the adoption of BIS in an organisation.

2.3.2 Organisational context factors

The organisational context is considered next, based on the TOE framework. The adoption of technology in this context is influenced by characteristics of an organisation such as the size of the organisation, available resources, absorptive capacity, and organisational age and organisational culture (Tomatzky and Fleischer, 1990; Boonsiritomachai, McGrath and Burgess, 2014; Chen, Huang and Zhang, 2022).

The *size of the organisation* has been investigated in several previous studies and was found to be an important factor that influenced the decision to adopt BIS (Ramamurthy, Sen and Sinha, 2008; Boonsiritomachai, McGrath and Burgess, 2014; Rouhani *et al.*, 2018a). The findings though have been inconsistent (Ramamurthy, Sen and Sinha, 2008). The size of the organisation is often measured by the number of employees (Rogers, 2003) and the financial revenue it has (Liang, Saraf, Hu and Xue, 2007). Organisations that are larger tend to rely heavily on BIS for their business processes (Rouhani *et al.*, 2018a). Large organisations are also seen to be more inclined to adopt digital technology than smaller firms (Kannabiran and Dharmalingam, 2012).

Contrary to the findings above, one study found that smaller and larger organisations equally adopt BIS; therefore, suggesting that the size of an organisation is not as important in deciding whether to adopt BIS or not (Kotze and Mudzana, 2015). On another end, it has been argued that smaller organisations may generate and adopt technological innovations more efficiently than larger organisations (Yeaple, 1992). Nowadays, BIS vendors provide technological support to organisations that may not have internal skilled resources to adopt and implement innovations (Puklavec, Oliveira and Popovic, 2014).

The public sector organisation studied is regarded as small when compared to other organisations in the public sector. It has few human resources and limited skilled resources. Because of the contrasting findings from the different studies, this factor was considered to be important for this study.

In the past, to adopt and implement an innovation such as BIS, an organisation would have been required to have skilled workers and large financial resources due to the complex nature of BIS and its cost (Sahay and Ranjan, 2008). To support this argument, it has been suggested that larger organisations have more human, financial and technological resources required to foster technological innovation and absorb the related risks relative to smaller organisations that would focus on maximising the available limited human capital (Liang *et al.*, 2007; Rouhani *et al.*, 2018a).

Available resources refer to equipment, skilled workers, financial resources, and organisational time (Grubljesic and Jaklic, 2015). This factor was identified in previous studies as influential in the adoption of innovation (Oliveira and Martins, 2011; Boonsiritomachai, McGrath and Burgess, 2014; Puklavec, Oliveira and Popovic, 2014). The decision to adopt and implement technological innovations is affected by the organisation's capabilities in this domain and the resources at hand (Boonsiritomachai, McGrath and Burgess, 2014). Since the implementation of a BIS requires specialist skilled personnel given the complexity of the system, management may support the adoption of this innovation when these resources are available within the organisation (Grubljesic and Jaklic, 2015).

Financial resource availability was found to have a greater effect on BIS adoption (Masha, Adeyelu and Jokonya, 2019). Information systems are resource-intensive and the availability of financial resources has also been found in another study to affect the adoption of technology (Ramamurthy, Premkumar and Crum, 1999); they are the main drivers in the organisational context (Iacovou, Benbasat and Dexter, 1995). According to Gibbs and Kraemer (2004), financial resources enable an organisation to invest in critical hardware, software and technical skills required. In the public sector financial resources are allocated to organisations each fiscal year based on the priorities of the state in that particular year. This is an important factor for the organisation to consider as operations depend on its availability.

Organisational age describes the period over which the organisation has been operational. Previous studies highlighted that decisions to adopt technology and innovation are influenced by the age of the organisation, wherein younger organisations are more likely to adopt innovation to complement existing goals and systems (Flanagin, 2000). Older organisations that have well-established methods and processes have been found to be less likely to adapt and embrace change stimulated by technological innovation (Daniel and Myers, 2000). Older organisations are well established while newer ones are using new technologies as part of their strategy to establish themselves. In addition to the above findings, younger organisations are established in an era where information and communication technologies are advanced and widely available, they thus use technology heavily to build competitive advantage (Rogers, 2003). Organisational age was not regarded as an important factor for this study because the organisation being studied is relatively young and has newer technologies in use, and it may adapt more easily than more mature organisations.

Organisational culture has been found to be a critical intangible resource in an organisation and has been highlighted as playing a significant role in the failure or success of technology adoption (Seng, Jackson and Philip, 2010; Abousaber and Papazafeiropoulou, 2011; Al-Dmour, Nweiran and Al-Dmour, 2017). Organisational culture is perceived as shared values, beliefs and experiences of a certain group that incorporates environmental factors and interpersonal factors (Schneider, Schneider and Barsoux, 2003).

Organisational culture is measured by six dimensions which are based on whether the organisation is process-oriented or result oriented, employee-oriented or job oriented, parochial or professional, if it is an open system or closed system, with loose control or tight control, normative or pragmatic (Hofstede, 2011). These dimensions have been shown to influence the manner in which people in the organisation receive innovation. An introduction of new technology, leadership changes and, redefined roles are some of the factors that trigger an organisational culture change, which in turn may affect the adoption of innovation (Jackson, 2011).

Studies have shown that the hierarchical culture in public sector organisations has a positive effect on innovation adoption (Cameron and Quinn, 2011). In another study, adhocracy culture was found to positively affect innovation adoption in an organisation (Senarathna *et al.*, 2014). Organisational culture is difficult to isolate and measure when compared with other factors that affect IT/IS adoption (Hasan and Ditsa, 1999). Although organisational culture was an important consideration in IS adoption, it was excluded from the initial set of factors. It was regarded as too complex for the scope of this study, requiring a dedicated research study of organisational culture and BIS adoption.

The *size of the organisation* and *available financial resources* were included as organisational factors that influence the adoption of BIS in an organisation.

2.3.3 Environmental context factors

The environmental context encompasses the environment in which the organisation operates based on the TOE framework. In this context, innovation adoption is influenced by the following factors the structure of the industry, technology service providers and government regulation (Tomatzky and Fleischer, 1990). Before adopting technology, it would be necessary to analyse environmental factors and the influence they have on the successful adoption of innovation (Boonsiritomachai, McGrath and Burgess, 2014).

According to Puklavec et al. (2014), the industry within which the organisation operates would include competitors, customers, linked organisations, and partners. Numerous studies have identified competitive pressure as important in IT adoption (Ramamurthy, Premkumar and Crum, 1999; Zhu, Kraemer and Dedrick, 2004), therefore this study will focus specifically on the *competitors* aspect of the industry as a possible factor influencing adoption.

Competitors represent the pressure point from which an organisation is forced to be innovative and develop new means for efficiency and increased productivity (Themistocleous, Irani, Kuljis and Love, 2004). Furthermore, Themistocleous et al. (2004) states that when competition in the market increases, other organisations may feel the need to adopt technologies to gain a competitive advantage. It is suggested in previous studies that organisations are likely to turn to IT when confronted by a highly competitive environment (Rouhani et al., 2018a). A study by Junior, Oliveira and Yanaze (2019) found that competitive pressure influences the adoption of technology in an organisation.

Kotze and Mudzana (2015) assert that smaller sized organisations are more likely to experience competitive pressure which would, in turn, influence their decision to adopt a BIS. External pressure also exists from trading partners with the growth of inter-organisational systems. Moreover, linked organisations and trading partners exert pressure which influences the adoption of information systems (Premkumar and Roberts, 1999).

An example in the context of this study would be non-governmental organisations (NGOs) that aim to provide services that the public sector fails to deliver to its citizens. Public sector organisations are therefore in competition with these NGOs for the same consumers. Competition was a challenge for the organisation being studied and it was included in the list of factors that influence the adoption of BIS.

Customers are the consumers to which an organisation desires to provide services and products employing the latest technological advances and innovation (Daniel and Grimshaw, 2002). According to Themistocleous et al. (2004), changing customer demands puts pressure on organisations to adopt new technological innovations in order to satisfy the elusive demands. An example of customer pressure is that nowadays customers have access to the internet and may demand to transact with an organisation on online platforms. Therefore, an organisation may seek to remain relevant and adopt an enabling innovation to satisfy its customers. Iacovou et al. (1995) state that coercive and normative pressure from trading partners and customers has been found to strongly influence the adoption of

IS. Even though this factor has been found in research to influence adoption, it was not regarded as an important factor for this study as the primary customers of this organisation are predominantly public sector employees who are subjected to the same regulatory framework as the organisation.

The *technology service providers* refer to technology vendors and the technological support they provide, upon which organisations depend for their technological adoption and implementation. Service providers and technology vendors are a big external influence on the adoption of technology in organisations (Puklavec, Oliveira and Popovic, 2014).

Organisations may not always have the internal capacity to implement and support technological innovations; therefore, there is a reliance on external providers and vendors of technology for support. Based on the availability of support from service providers, they may influence the willingness of an organisation to adopt and implement technological innovation (Premkumar and Roberts, 1999). An organisation may procure new software tools influenced by the available free training and support a service provider offers.

DeLone and McLean (2003) found that smaller organisations depend on external support for applications they adopt. The organisation studied did not have skilled workers to implement BIS. Therefore, the technology service provider support was regarded as relevant to be included in the initial list of factors from the TOE framework as it relies on service provider support.

Regulations by the government of the land also influence organisations to adopt technology innovation in order to be compliant (Grandson and Pearson, 2003). The government exerts *coercive pressure* on organisations by imposing new tax laws, business laws and other regulatory frameworks (DiMaggio and Powell, 1983); which affect and influence technology adoption decisions (Phan and Vogel, 2010). Thus, the adoption of innovation may be affected or influenced by coercive pressure exerted by government regulations (Baker, 2012). Even though the public sector organisation being studied functions within the regulatory framework and prescripts of government, this factor has not been included in the initial set of factors. It is inherent in the nature of the organisation and regarded as not important for this study.

Competitors and *service provider support* were included as environmental factors studied that influence the adoption of BIS.

The next section outlines the theoretical lens on which this research study was based as well as examples of where it was previously applied in research.

2.4 CONCEPTUAL FRAMEWORK

This section introduces the various research frameworks that are available for IS adoption at an organisational level as well as those that have been considered for this study. The TOE framework was selected as the most relevant for this study of the adoption of BIS in a public sector organisation.

Technical Knowledge and Know-How was a framework developed by Attewell (1992) to consider organisational knowledge and know-how to determine the adoption of an innovation. The Organisation Resources theory was developed by Damanpour (1991) focusing on organisational resources and characteristics that determine innovation adoption. Nord and Tucker (1987) proposed

a theory asserting that technological innovations are adopted on the basis of similarities or differences to other technologies that exist in the organisation. These three theories were not looked at for this study on the basis of irrelevant factors described in each.

According to Lautenbach, Johnston and Adeniran-Ogundipe (2017) and Oliveira and Martins (2011) Diffusion of Innovation (DOI), Iacovou et al. (1995) Model, and Technology-Organisation-Environment (TOE) have been used widely to study IS adoption. These theoretical frameworks have been considered for this study.

2.4.1 The diffusion of innovation

The diffusion of innovation (Rogers, 2003) is a theory that examines the extent, the method and the reasons new technologies are distributed; and used at organisation and individual levels (Liang *et al.*, 2007). The theory identifies three facets that have an effect on organisational innovation adoption, as described by Oliveira and Martins (2011).

- a) it is the leader's or manager's approach towards leading change in the organisation (*leader characteristics*).
- b) The formation of the organisational structure. This includes the distribution of power at top management; the skills level of members of the organisation; the extent to which compliance with rules and procedures is expected from members; the dependencies between business units and the numbers of employees in the organisation (*organisational structure characteristics*).
- c) The third facet is the level at which the organisation is susceptible to influence by external factors (*external characteristics*).

2.4.2 The Iacovou et al. (1995) model

The second theory introduced was developed by Iacovou, Benbasat, and Dexter (1995); referred to as the Iacovou et al. (1995) model. The model identifies three factors that influence organisations in the adoption of IT innovations.

- a) The benefits that are perceived to be derived from the implementation of technological innovation.
- b) The readiness of the organisation with regards to available IT resources and funds needed to implement the innovation.
- c) Organisational pressures originating externally from competitors and trading partners. Trading partners may exert pressure on the organisation to conform to certain technological innovations. As an example, an organisation may be expected to implement a system such as SAP, because trading partners are using it, for data interfaces between the firms.

According to Ain et al., (2019), the theories mentioned above have been applied extensively in the innovation adoption literature. The DOI theory, even though its use is supported, has limitations. The *leader characteristics* from the theory are limited to the approach of the individual leader in driving

change. The context did not align with the factors that were considered to be pertinent in the organisation where this research study was based. Therefore, it is on this basis that this theory is not selected.

2.4.3 The Technology Organisation Environment framework

The Iacovou et al. (1995) model consists of the factors that may be tested for BIS adoption. However, the model is limited to only three factors that were relevant to the context of this study. This research considered additional factors that were described in the TOE framework. The framework was a good foundational basis for studying and understanding factors that lead to the adoption of technology at an organisational level (Bhatiasevi and Naglis, 2020).

The TOE is a framework introduced by Tomatzky and Fleischer (1990) wherein they argue that the adoption of technological innovations is influenced by the technological, organisational, and environmental aspects of an organisation. Each of these three aspects of the framework is comprised of secondary constructs.

According to Tomatzky and Fleischer (1990), the technological aspect describes all technologies (equipment and processes) that are in use internally and externally as well as new technologies relevant to the firm; while the organisational aspect comprises the resources and characteristics of an organisation; and the environmental aspect describes the environment in which the organisation operates.

Tomatzky and Fleischer (1990) during their research, explored the relationship between the decision to adopt an innovation and the attributes of innovation. Of the various technology-related attributes, they found that compatibility, relative advantage, and complexity, significantly influence adoption. These attributes construct the technological aspect of the framework, as depicted in **Figure 2.4-1**.

The organisational aspect is constructed from attributes of the organisation that wants to adopt a technological innovation. The following are articulated by Tomatzky and Fleischer (1990) as influential in the adoption of innovation; human resources, managerial structure, linkages among employee structures, the size of the organisation, the level of centralisation and the degree of formalisation. The environmental aspect and the arena in which the organisation conducts its operations is composed of the industry, competitors, technology providers, and regulatory bodies.

The TOE framework has been applied in various studies and was discovered to be useful for the study of IS adoption at an organisational level (Premkumar and Roberts, 1999; Zhu *et al.*, 2006; Baker, 2012). Rouhani et al. (2018) pointed out that the TOE is a unified framework that includes all the required and effective aspects at an organisational level for IS adoption.

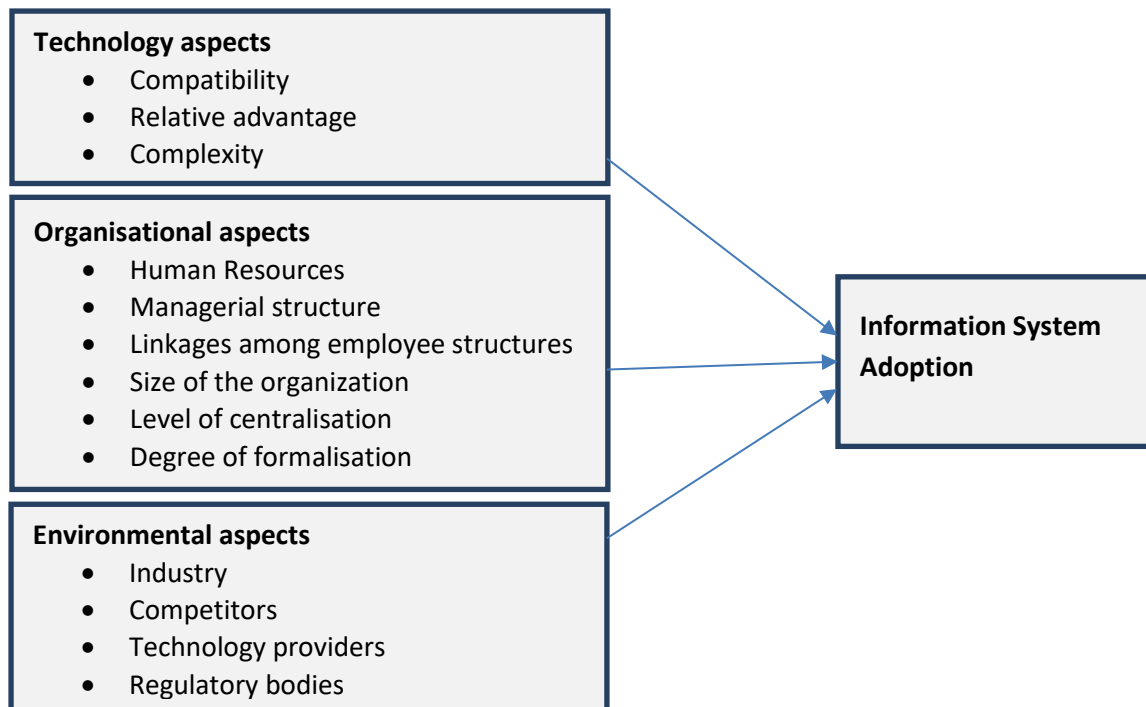


Figure 2.4-1 Standard factors from the TOE theoretical framework by Tomatzky and Fleischer (1990)

This framework has been used in several studies in IS adoption, such as enterprise resource planning (Pan and Jang, 2008); web sites (Oliveira and Martins, 2008); cloud computing (Priyadarshinee, Raut, Jha and Gardas, 2017); knowledge management systems (Sucahyo, Utari, Budi, Hidayanto and Chahyati, 2016); radio-frequency identification systems (Cao, Baker, Wetherbe and Gu, 2012); e-commerce (Gibbs and Kraemer, 2004; Liu, 2008; Martins and Oliveira, 2009); e-procurement (Soares-Aguiar and Palma-dos-Reis, 2008).

Puklavec et al. (2014) applied the TOE framework to study BIS adoption by small and medium enterprises, while Rouhani et al. (2018) used the same framework to study factors affecting BIS adoption in the banking and finance industry. A study by Pool, Jamkhaneh, Tabapeeian, Tavakoli and Shahin (2018) looked at BIS adoption in agile supply chain management, while Malladi (2013) studied BIS adoption factors in general.

In South African studies, the following are examples of research that employed the TOE framework in the BIS adoption domain: a study by Kotze and Mudzana (2015) which used the TOE framework to find BIS adoption determinants from a perspective of a developing country; Masha et al. (2019) studied BIS adoption in a public social sector context; and the study by Walker and Brown (2019) was based in a telecommunications organisation.

This study looked at factors affecting BIS adoption at an organisational level. As mentioned above, the TOE framework has been used in various studies with a number of variations of factors used. The factors selected in the TOE theoretical framework for BIS adoption were derived from the literature reviewed with studies that focused on adoption in the public sector. After reviewing the various frameworks that were discussed, the TOE was found to be the most suitable for this study because it enabled the exploration of a larger number of factors than the other two frameworks considered, while still maintaining clarity by categorising those factors into the three main areas: technological,

organisational and environmental. The extensive use of TOE for other studies also lent weight to this choice.

The following factors were used to draft the conceptual model of this research study (*expected benefits, compatibility, size of the organisation, available financial resources, competitors, external support*) as depicted in **Figure 2.4-2**.

Expected benefits was selected for this study to ascertain if they contribute to the adoption of the BIS in the organisation. The BIS is regarded to be a good fit in the current organisational business processes and *compatibility* was included in the study to explore the validity of this perception. The *size of the organisation* has been included in this study because there are inconclusive findings in the literature reviewed. *Available financial resources* were included in the study as the organisation's operations depend on its availability. *Competitors* were considered to be applicable in this study as they were perceived to exert pressure in the organisation to adopt technology. *Service provider support*, on which the organisation depends for implementing technology, was also included in this study.

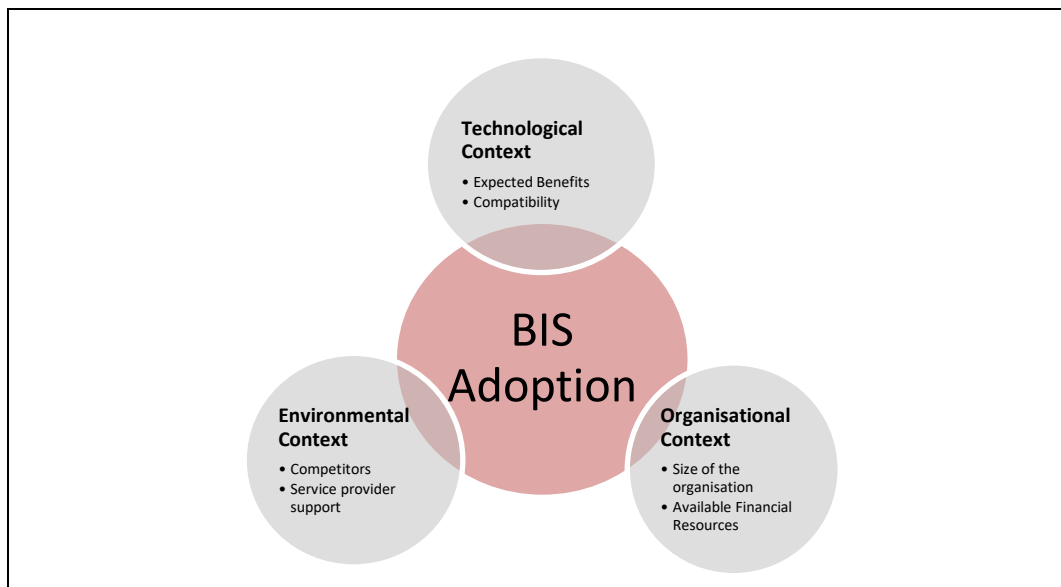


Figure 2.4-2: Conceptual research model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990

The TOE framework has provided the standard factors some of which were not regarded as applicable for this study. The following standard TOE factors were not selected for this study (*relative advantage, complexity, human resources; managerial structure, linkages amongst employee structures, level of control, degree of formality, industry and regulatory bodies*). The main reason for not selecting these factors is that the scope of this research was limited and could not consider all the possible factors that were discovered in literature. Furthermore, some of these factors were not considered to be applicable in this public sector organisation on which this study was based.

2.5 CHAPTER SUMMARY

This chapter discussed the background history of the BIS, its benefits and the factors that should be considered by organisations when adopting the BIS. The theoretical framework guiding the study and conceptual model were also discussed.

The history of BIS dates back to the 1950s when the term *intelligence* was used by researchers, referring to a branch of knowledge. Researchers in Information Systems have defined Business Intelligence in many different ways. It is described as a data gathering, data storage and knowledge management system; for supporting the decision-making processes, presenting complex internal and competitive information; with software tools that provide timely access and analysis to users.

The BIS consists a data warehouse layer that includes the gathering of data, data storage, and analytical capabilities to generate information for decision making. Secondly, the data mining layer provides software with capabilities to automatically search huge databases, such as data warehouses, to discover meaningful patterns, previously unknown, and potentially useful information. Lastly, the dashboard software provides data visualization capabilities and allows for data exploration. This study focusses on the visualisation and data exploration aspects of BIS.

Some of the benefits of using a visualisation and data exploration BIS include enabling an organisation to gain a competitive advantage, receive and retrieve accurate and faster data reporting, improve customer service, and increase revenue. Performance trends and patterns can be monitored and analysed for strategic decision making by the organisation. Public sector organizations can use BIS for multi-dimensional analyses of relevant data to derive plans and make strategic decisions that can positively impact the lives of citizens, without using sophisticated tools.

Organisations considering adopting BIS should concentrate on managing the factors that have been found as most influential and important in the adoption of BIS. The TOE framework, a three-dimensional theoretical framework, comprises of contexts to explain factors that influence the adoption of technology innovation at the organisation level. It has been applied in various studies and was discovered to be useful for the study of IS adoption at an organisational level. This framework was used in this study to provide an initial set of factors perceived to be valid and important in adoption, whereas the other theories showed limitations in their applicability to the organisation in this study. .

The technological context represents characteristics of current and new technological innovations that are in use by the organisation, including those not in use but available in the market, that are relevant to the organisation. The organisational context is influenced by characteristics of an organisation such as the size of the organisation, available resources, absorptive capacity, and organisational age and organisational culture. The environmental context encompasses the environment in which the organisation operates such as the structure of the industry, technology service providers and government regulation.

The following factors were used to draft the conceptual model of this research study (expected benefits, compatibility, size of the organisation, available financial resources, competitors, external support). Expected benefits was selected for this study to ascertain if they contribute to the adoption of the BIS in the organisation. The BIS is regarded to be a good fit in the current organisational business

processes and compatibility was included in the study to explore the validity of this perception. The size of the organisation has been included in this study because there are inconclusive findings in the literature reviewed. Available financial resources were included in the study as the organisation's operations depend on its availability. Competitors were considered to be applicable in this study as they were perceived to exert pressure in the organisation to adopt technology. Service provider support, on which the organisation depends for implementing technology, was also included in this study.

The next chapter presents the methodology that this research study followed.

CHAPTER 3 : RESEARCH METHODOLOGY

This chapter discusses the methodology of the research philosophy. The discussion covers the research design, the procedures for data collection and analysis, research rigour and limitations, as well as ethical issues.

3.1 PHILOSOPHICAL APPROACH

The purpose of this study was to explore factors that affect the adoption of business intelligence solutions in a South African public sector organisation. All research studies were based on an underlying philosophical approach which also provides a guide on the research method that is appropriate for a particular study. The positivism and interpretivism paradigms were reviewed. The study adopted the interpretivism research paradigm.

3.1.1 Positivism

A paradigm is a belief system or a thinking model used to observe and understand the world and that which is around us (Oates, 2006; Bhattacharjee, 2012). According to Bogdan and Biklen (2007), paradigm shapes the research and the thinking about the world through related ideas and assumptions. Scientific research methods for instance, are based on assumptions that the world has ordered and is regular; therefore it can be explored and observed objectively (Oates, 2006).

The positivist paradigm views the world as having many elements and events that interact in regular ways which can be observed (Dudovskiy, 2018). Positivist research creates knowledge by observing and measuring a phenomenon directly (Bhattacharjee, 2012). It is based on a philosophy that knowledge generated from observations is indisputable and can be trusted (Dudovskiy, 2018). Researchers tend to look for correlations between two or more variables (Thompson, 2015). The positivist paradigm is a basis for natural sciences research like biology, chemistry, metallurgy, and physics, referred to as scientific methods (Mukherji and Albon, 2010).

Positivist research is characterised by models, measurements, objectivity, hypothesis testing, universal laws, and quantitative data analysis. Its approach tests concepts and patterns using empirical data, which requires the researcher to be scientific, remain detached from the study and have minimal interaction with research participants. The role of the researcher is thus limited to the facts of the study; that is data collection and interpretation (Dudovskiy, 2018). The detachment is necessary to distinguish between scientific fact and personal experience during a study (Edirisingha, 2012).

Hypotheses are developed and tested through quantitative methods such as surveys and the use of official statistics. Trends and patterns between variables are the main study foci rather than individuals or their experiences (Thompson, 2015). The aim of positivist research studies is that the findings should be reliable and representative of as large a population as possible; thereby making these generalisable. Research findings can be quantified and are observable, making it possible to do statistical analyses (Dudovskiy, 2018).

3.1.2 Interpretivism

Interpretivist research, holds a view that society is shaped by individuals, which is contrary to the objective positivist view (Bhattacharjee, 2012). Interpretivists believe that reality and knowledge are based on the experiences and meanings of society (Dudovskiy, 2018). According to Thompson (2015),

scientific methods should not be used for social studies as these rely mostly on statistics that positivist research is based on.

Individuals are regarded as complex, with varied experiences and understanding of the world; therefore interpretivist research aims to gain an empathetic understanding of the emotions and feelings of participants (Thompson, 2015). This is to understand the reasons they take action in the manner that they do. Interpretivist research methods aim to gain an understanding of the motives and meanings that individuals attach to things (Thompson, 2015). Multiple strategies may be used to mirror different parts of the issue being studied (Dudovskiy, 2018).

During interpretivist research studies, participants are provided with an opportunity to tell their own stories and explain their actions through their viewpoint of the world (Thompson, 2015). There is a high degree of engagement with research participants in this type of study. The data are collected using qualitative methods (Thompson, 2015). These methods include spending considerable amounts of time with participants engaging in interviews, making observations, and analysing documents or artefacts that are personal to participants. The close interaction creates an environment of involvement and develops a rapport between the participant and the researcher (Thompson, 2015).

The purpose of an interpretive research approach is to produce an understanding of the context; and the process wherein context influences information science and vice versa (Walsham, 1993). The findings from interpretive studies are based on individual views and values which introduces an element of unreliability to these findings (Dudovskiy, 2018). Although interpretive research results cannot be generalised, they provide in-depth analysis and rich data about the research; and also have high validity (Dudovskiy, 2018).

There are two main reasoning approaches to interpretive research, namely: inductive and deductive. In an inductive research approach, also called *theory-building*, a researcher collects data, analyses it to discover patterns, and then develops a theory to explain patterns discovered in the data (Bhattacharjee, 2012). The inductive research approach is based on specific instances and experiences and may not be generalised, as it does not represent a wider population. A researcher makes observations from an experience and then makes propositions about those experiences to develop a theory. In other words, it makes broad generalisations from the specific experience or observation.

The deductive research approach, also referred to as *theory-testing research*, aims to use empirical data to test patterns or concepts from a theory (Bhattacharjee, 2012). A researcher studies theories that have been developed by others about a phenomenon and then uses data that has been collected to test the theory and hypotheses from the theory. In other words, a theory is selected and predictions are made about what could be observed if the theory were correct in order to prove a conclusion.

This study followed a deductive reasoning approach and aimed to interact with individuals involved in the BIS adoption in a public sector organisation studied and analysed these interactions to propose factors that may affect BIS adoption. This study, therefore, validated and strengthened the TOE framework.

The study sought to understand the public sector context and influences on BIS adoption through interviews with employees of a public sector organisation. The interpretive approach strengthens the richness of understanding the context from individual experiences and viewpoints, contrary to the

positivist approach which relies on scientific measurements and hypotheses. The interpretive approach was thus chosen for this study.

3.2 RESEARCH DESIGN

The purpose of this study was to explore the factors influencing BIS adoption in a South African public sector organisation. This case study followed an exploratory methodology because it allowed for the exploration of factors affecting BIS adoption.

Exploratory research

Exploratory research is conducted to uncover more about an event or problem where there is little or no knowledge (Salkind, 2010). This method makes it possible to understand a particular problem in great depth. It includes a systematic data collection process, information analysis, and reporting. Participants' varied perspectives can be explored and there is no single specific technique for collecting data. This means multiple techniques to collect data can be used in the same study.

By design, exploratory research is mostly qualitative in nature and flexible; it can be used where a problem is not yet clearly articulated (Dudovskiy, 2018; van Wyk, no date). The method can be used to extend existing theory as it makes it possible to gain new insights into relationships between constructs (Bozic and Dimovski, 2019). This means the researcher may change tactics during the research and adapt as new knowledge is being gathered.

Exploratory studies do not make any conclusions from the evidence but provide new insight into a problem (Bhat, 2018b; Dudovskiy, 2018). This research type can be used as an initial study to gain a better understanding of a problem and to test the feasibility of a full research study before it can be undertaken (Salkind, 2010; Labaree, 2019). It is used to answer research questions such as 'what' (Bhat, 2018b). This study explored the 'what' factors influence the adoption of BIS in a South African public sector organisation and is therefore exploratory in nature.

Explanatory research

On the other hand, explanatory research techniques can be used in case studies, longitudinal studies, correlational studies, causal studies, depth interviews, or focus groups (Yousaf, 2019). Explanatory research can be aimed at identifying causal links or the nature of the cause-and-effect relationship between variables of a research problem and why they are related to one another (Salkind, 2010; Dudovskiy, 2018; van Wyk, no date).

The collection of data is flexible wherein literature reviews, interviews, questionnaires, participants and direct observations can be used as primary data collection methods within the research method (Bhat, 2018b). The population sample used in this type of research is usually too small for the generalisability of the findings (Dudovskiy, 2018). This research method answers the "why" and the "how" types of research questions. For example, such a question would be to explain how high failure rates at a certain school can be changed after there has been evidence corroborating high failures.

This research study did not look at the nature of cause-and-effect relationships and did not attempt to answer any "why" and "how" types of research questions. It is therefore not an explanatory study.

3.2.1 Research designs not selected for this study

The following research designs were considered but were found inappropriate for this study.

3.2.1.1 Descriptive research design

This research design can be defined as a method in which the researcher describes the current state of a subject or phenomenon in its natural form or behaviour without influencing or affecting its present state (Shuttleworth, 2008; Labaree, 2019). This research design attempts to identify and describe what is observed more completely (Fox and Bayat, 2007; Dudovskiy, 2018) and it does not determine causality and effect nor make accurate predictions (Hale, 2011). Descriptive research can be used where a large population sample may not be testable (Shuttleworth, 2008). It aims to answer the 'what' question about a research subject (Bhat, 2018b).

Descriptive research consists of three distinctive methods, namely; observational, case-study and survey methods (Hale, 2011). Observational methods, also known as *field observation*, are used to observe animals and humans and can be categorized into two methods, namely; laboratory and natural observations. A laboratory enables observations to be conducted under controlled conditions while a natural ecological setting, such as a nature reserve for animals, enables observations in their natural habitat.

Case studies are used to study a group of people or an individual in greater depth. They cannot be used to make accurate predictions nor to study the cause and effect (Hale, 2011). The survey method comprises three subtypes:

- a) comparative surveys, which compare two or more subjects by following a pre-set protocol;
- b) evaluative surveys, which evaluate a situation or event by following specific criteria; and
- c) descriptive surveys, which are used to describe an event at a certain point in time (Fox and Bayat, 2007).

The purpose of this study was to uncover and gain insight into the factors influencing BIS adoption in a South African public sector organisation, which are currently not clearly defined. The descriptive research design would have been selected if the purpose of the study was only to describe the characteristics of the adoption phenomenon in the organisation. Therefore, this research design was not fit for the purpose of this study.

3.2.1.2 Relational research design

A relational research design evaluates a relationship between two or more variables and assesses the strength of the relationship (McCombes, 2019). This research design measures if a change in one variable has a corresponding change in the other related variable (Kalla, 2011). A relationship, however, does not imply that there is causality.

Three different types of correlations exist: a negative correlation occurs when a decrease in one variable results in an increase in the related variable; and a positive correlation occurs when an increase in one variable results in an increase in the related variable (Kalla, 2011), and where there is no relationship at all between variables, change in one variable does not affect the next variable.

A relational study can be conducted by using the survey method, direct observations, or studying archived data (McCombes, 2019). The purpose of this study was not to measure relationships, therefore, the relational research design was found inappropriate for this study.

3.2.1.3 Experimental research design

The science fields of study such as physics, medicine, biology, and chemistry usually make use of experimental research design. This research design studies causality in subjects or phenomena. Experimental research is a scientific research approach where one set of variables is constant, whilst another set is manipulated and measured as part of the experiment (Fox and Bayat, 2007; Blakstad, 2008). A dependent variable is a criterion that is used to measure or observe a subject, referred to as an independent variable (Fox and Bayat, 2007). The dependent variable in this instance is the result or effect while the independent variable is the cause.

The objective of an experiment is to make precise predictions about phenomena and to be able to explicate a cause and effect between variables (Fox and Bayat, 2007; Blakstad, 2008; Salkind, 2010). This research approach is used when researchers expect to find a solution in the future (Fox and Bayat, 2007). The results of the research can be generalised and specific (Blakstad, 2008; Bhat, 2018a). Experimental research has high internal validity (Simon and Goes, 2018).

The nature of experiments is predominantly quantitative although there are qualitative research methods (Blakstad, 2008). A research hypothesis must be formulated for testing in the experiment. An experiment consists of a randomly selected control group that will not be manipulated in the same way as the other groups, known as the experimental group (Blakstad, 2008; Salkind, 2010).

Experimental research has three main design types, namely; (a) pre-experimental research, which is undertaken to determine if further research should be conducted on the target subject; (b) true experimental, which is full-scale research used to determine a cause-effect relationship and to disprove a hypothesis, and (c) quasi-experimental research, which resembles true experimental with the difference being in the selection of participants (Bhat, 2018a). The control group is not selected randomly as per the protocol of the research.

A researcher measures how independent variables affect the experiment to have conclusive reasoning about the effect of the variables (Fox and Bayat, 2007; Blakstad, 2008). Once it can be confirmed that a cause has created the effect, the experiment can be considered to be successful (Bhat, 2018a). An experimental research design would not be fit for this research study as it is not concerned with prediction or causality, and rather the testing a hypothesis, it aims to uncover and understand the factors that affect the adoption of a BIS.

3.3 RESEARCH STRATEGY

The purpose of this study was to explore factors that affect the adoption of BIS in a South African public sector organisation. The research followed an instrumental case study approach and collected data through interviews with participants.

According to Salkind (2010), a case study is regarded as versatile, with researchers dubbing it interchangeably as an approach, a research design, and an outcome. Yin (2018) points out that a case

study relies on direct observations of the subject of study and also on interviews with persons involved in the event being studied. A case study should be used when the intention is to learn the past and the present of a phenomenon (Yin, 2018).

A case study research strategy has been used in disciplines such as law, nursing, business, and administration. Salkind (2010) also suggests that a case study can be used as a stand-alone design or part of a bigger study limited to only a few case studies. This means it may be a case study within an umbrella case study. A case study is a bounded system defined by the entity being studied. This means the case study is set up where the subjects are confined by a single setting such as a business or a government. The researcher may also artificially set up an entity by specifying criteria that focuses on only a select few from among a population (Salkind, 2010).

According to Stake (1995), there are three forms of case studies, namely; (a) an *intrinsic* case study, which is an evaluation of a subject or program for the interest of the researcher and without comparing it to another; (b) an *instrumental* case study, which examines a phenomenon deeper with intent to understand its effects beyond the case itself; (c) a *collective* case study which is a study of a phenomenon in more than one set to gain a broader understanding.

Salkind (2010) further suggests that a case study is an appropriate research design when particular questions are being asked to understand processes and rationale. Similar to an exploratory and explanatory research study, the researcher in a case study is able to interact closely with participants within their local context through interviews and observation to study the entire entity within a specific timeframe.

This study was exploratory and explanatory in nature, and its purpose was to uncover the factors influencing BIS adoption through interaction with participants within the context of a South African public sector organisation. The instrumental case study is therefore suited as the appropriate strategy for this study.

Other research strategies include:

Grounded theory is one of the research strategies that were considered for this study. Grounded theory is a qualitative research method used for generating a theory about a research topic by conducting systematic and simultaneous collection and analysis of data (Salkind, 2010). The grounded theory would have been appropriate if the purpose of this study was to develop a theory on BIS adoption. However, the purpose of this research study was to determine factors affecting BIS adoption.

Ethnography is another strategy that was evaluated. Ethnography refers to a fieldwork research study of people in their social or cultural setting. Based on the purpose of this study, ethnography was not a suitable research strategy. Ethnography would be appropriate if the focus of this study was on the people involved in the BIS adoption, rather than on the factors influencing BIS adoption.

Another research strategy that was considered was a **survey**. A survey is a research strategy for collecting data from individuals where they answer specific questions about their beliefs, attitudes, or behaviour (Salkind, 2010). The disadvantage of a survey is that only closed questions are asked and it does not allow for probing of participants during data collection. A survey would have been

appropriate if the study aimed to obtain general information about the beliefs and behaviour of participants where no open-ended questions would be asked.

3.4 DATA COLLECTION METHODS

Data collection may follow one of the two basic research designs, namely; (a) *longitudinal* or (b) *cross-sectional*. In a longitudinal study, data is collected from the same sample at predetermined intervals over a long period (for example, every three months for five years), whereas in a cross-sectional study data is collected from different samples at a single point in time (Johnson, 2010). A longitudinal design would be appropriate for this study if the purpose was to observe BIS adoption trends and maturity in the organisation over a period. However, the purpose of this study was to determine factors perceived to affect the BIS adoption at the present point in time and thus the cross-sectional design was followed.

3.4.1 The interview approach

Interviews are a productive technique to gather information through an oral discussion (Young, Rose, Mumby, Benitez-Capistros *et al.*, 2018). Core guiding questions are pre-planned and the interviewer may pursue interesting issues that emerge in the interview. The advantages of the interview approach include: (a) provides direct access and contact with relevant users, (b) makes it possible to obtain detailed information, and (c) limits the number of participants needed to obtain rich and detailed data (Young *et al.*, 2018).

There are three interview formats used in qualitative research, namely; (a) structured interviews which are made up of standardised pre-determined questions that are answered by participants in the same order, (b) unstructured interviews which are informal, have no prepared questions and no guiding structure; participants talk openly and widely about the topic without any guidance from the researcher, and (c) semi-structured interviews which have a set of pre-determined questions to be answered by all participants with additional questions that can be asked during the interview to expand certain issues or for clarification (Saunders and Lewis, 2012).

The semi-structured interview format was found to be appropriate for this study because, unlike an unstructured interview, it provides a form of structure that guides the enquiry process. Semi-structured interview format also allowed participants to express their views freely and the researcher was able to engage further by probing for additional information on the topic. The study intended to collect data on the personal experiences and perceptions of participants (DeJonckheere and Vaughn, 2019), therefore, semi-structured interviews were selected.

The majority of the interviews were held in the senior managers' offices with strict adherence to the prevalent Covid-19 health protocols and social distancing. These took place between December 2020 and January 2021 when the country was under Alert Level 3 of lockdown. Two interviews were conducted via the Zoom video conferencing facility since one senior manager resides in the Western Cape, while the second one had a busy travelling schedule.

The average length of the interviews was about 36 minutes with the longest interview lasting 55 minutes. The interview sessions were mostly uninterrupted and allowed for a free-flowing conversation.

The interviews were voice recorded, using a digital recorder. The participants were requested to remove their face masks for purposes of obtaining a clear audio recording and only for the duration of the interview. Voice recording of the interviews was used to assist the researcher with transcribing and analysing of the data. Interview voice records provided a verbatim record to assist the process of notetaking, and further enabled the researcher to focus on developing and maintaining a rapport with the participants during the interviews instead of concentrating too much on jotting notes. The online video conferencing platform generated audio recorded files. The audio files were saved on a password-protected Google Drive storage, accessible only to the researcher.

Where the participant required clarity, the researcher was able to clarify the points that were raised. These clarified points enabled the researcher to amend the questions and probes that were asked in subsequent interviews.

3.4.2 The interview protocol

The researcher used a set of pre-planned questions, referred to as an Interview Protocol (see ANNEXURE A), to guide the interview and to be consistent with all the participants. Since the study was interpretive in nature, the additional questions became necessary as guided by the responses. The participants were allowed to provide more information as the interview progressed. The researcher asked follow-up questions where the original question was inadequately answered.

The Interview Protocol consisted of five sections:

- a) demographic information
- b) general
- c) technological factors section
- d) organisational factors section
- e) environmental factors section.

The *Demographic section* contained questions about the participant's job function, daily functions of the division, the division aims, and the number of employees within the division. The *General section* contained questions about BIS adoption in general, BIS adoption in the organisation and the division as well as factors that are perceived to have affected the adoption.

The Technological factors section of the interview protocol addressed Research Question 1 which focused on aspects of the visualisation and data exploration BIS perceived to be influential in the adoption of BIS. The Organisational factors section addressed Research Question 2 that lists questions about organisational factors perceived to influence the adoption of BIS. Research Question 3 was addressed by the Environmental factors section of the interview protocol focusing on prevalent factors in the environment that affect adoption of BIS in the organisation.

Below are the factors identified from the categories of the TOE framework to guide the interview process, suggested by prior research as influencing the adoption of BIS in **Table 3.4-1**. The draft Interview Protocol was pretested in that it was discussed with the research supervisor. The questions alignment suggestion was incorporated in the final version. Feedback from the initial interviews was also used to improve the questioning in subsequent interviews.

Table 3.4-1 BIS adoption determinants

Category	Theme	Literature source
Technology	Expected benefits Compatibility	(Kotze and Mudzana, 2015) and (Puklavec, Oliveira and Popovic, 2014)
Organisation	Size of the organisation, Available financial resources	(Kotze and Mudzana, 2015) and (Puklavec, Oliveira and Popovic, 2014)
Environment	Competitors Service provider support	(Kotze and Mudzana, 2015) and (Rouhani <i>et al.</i> , 2018b)

3.4.3 Other data collection methods considered

The following data collection methods were considered but found inappropriate for this research study:

a). Questionnaires are research instruments with a set number of questions for capturing responses from participants and can be distributed to a large number of participants (Bhattacharjee, 2012). This data collection method would be most suitable when the target audience is widely distributed and large in number. The disadvantage of questionnaires is that the instrument has to be pre-designed and cannot be adapted or customised to individual participants. The depth this research study sought to reach cannot be provided by questionnaires. Questionnaires could have been suitable for this study if standard information about the organisation was required, where no individual perspective was expected and no follow-up questions would be asked.

b). Observational evaluation is more suitable for research concerning behaviour and can be used as a data collection method when observing data about people, cultures, or processes (Salkind, 2010). The participants in a research study have to be observed in their natural setting. For example, the process of putting the stock on the shelves by merchandisers in a store can be observed by a researcher. Observational evaluation was not suitable for this research study, since information about decisions that participants take is required. This type of information is intangible and therefore cannot be observed.

3.5 SAMPLING METHOD

The organisation where the study was conducted is located in and represents only one tier of the three-tier government system. The organisation was selected on the basis of convenience and access because the researcher was an employee and aware of the BIS platform. It has one commercial BIS platform implemented, that has been adopted and is being used by two business units. Other public sector organisations may have adopted and implemented the exact same platform.

Access to the platform is available to all the senior managers in the organisation. However, not all senior managers have adopted the platform. The purposive sampling technique was used to select the sample for this research study. The sample was made up of 10 senior managers from the organisation, out of a total of 49 senior managers employed. The sample of the senior managers was chosen based on their duration of employment period of three or more years in the organisation. Five of the senior managers had already adopted the BIS implemented in the organisation. It was believed

that these senior managers may provide perspective and insight on the factors that influenced the adoption of the BIS in the organisation.

The other five senior managers were chosen based on the fact that they had not yet adopted the BIS in their divisions. It was thought that these senior managers may have knowledge about factors that affected or prevented the adoption of the BIS in their divisions. The internal Information Technology (IT) department assisted in identifying the specific participants based on the set criteria for selection and provided the list and details of the participants. Demographics such as gender or age are insignificant for this study and therefore were not considered. Out of the 10 senior managers sampled, one declined to participate in the study, and another one was not available for the interview despite numerous attempts to secure their availability. The organisation then provided the researcher with details of additional substitute participants that were interviewed.

According to McCracken (1988); Leedy and Ormrod (2001), recommend that between five and 25 individuals are sufficient for qualitative research when conducting in-depth interviews. A total of 10 interviews were conducted with the selected senior managers. However, it became apparent during the interviews that the additional substitute participants had adopted BIS. Therefore, the interviews were with seven senior managers that had adopted BIS, and three senior managers that had not adopted BIS. The researcher was satisfied with the sample as per the recommendation by Leedy and Ormrod (2001).

3.5.1 Sampling technique

This study employed a non-probability purposive sampling technique to select relevant participants. Purposive sampling is a non-random technique where participants are chosen based on their expertise in the phenomenon being studied (Bhattacharjee, 2012).

There are two categories of sampling, namely; probability and non-probability. In probability sampling, each member of the population has an opportunity of being selected in the sample (Salkind, 2010). Probability sampling uses simple random and systematic random techniques. Simple random technique provides an equal selection opportunity for inclusion in the sample (Bhattacharjee, 2012). It involves selecting participants randomly from a sampling frame. Systematic random sampling on the other involves randomly selecting a sample from members of the population at a fixed interval by dividing the size of the population by the desired sample size (Bhattacharjee, 2012). The probability sampling techniques were found not suitable for this qualitative research study because a specific category of participants for the organisation was targeted.

The other category is non-probability sampling, the techniques in this category select samples based on specified criteria and some members of the population may not be selected (Salkind, 2010). Some of the techniques include *convenience sampling* which selects a sample from the population based on its availability or convenience to the researcher; *snowball sampling* where a few participants that fit the inclusion criteria that are difficult to find, and the participants are asked to recommend others that meet the criteria (Bhattacharjee, 2012). These non-probability sampling techniques were considered but were found not suitable for this research study. Therefore, purposive sampling was chosen as it enabled the researcher to select five participants that adopted and five that did not adopt BIS to gain all angles of adoption reasons.

This research study used interviews and document reviews as data collection techniques. Document reviews are a systematic process for evaluating printed and electronic documents of an organisation (Bhattacharjee, 2012). For this study, annual reports and other organisational documents were made available for review and analysis to gain an in-depth understanding and meaning of the organisation's BIS initiatives, adoption, organisation size and resources. The profile of documents consulted is listed in **Table 4.2-2**. However, no information on BIS initiatives or adoption factors were discovered in the documents.

3.6 DATA ANALYSIS

Interpretive researchers analyse data by searching for meaning, interpret what they have observed and what was experienced and reported by the subjects. Qualitative data analysis aims to discover concepts, themes, meanings, and patterns. According to Bogdan and Biklen (2007, p. 159), qualitative data analysis is "working with the data, organising them, breaking them into manageable units, coding them, synthesising them, and searching for patterns".

A data analysis process starts with categorising and organising data to discover themes, patterns, and meanings as they emerge from the data. This is known as thematic analysis. Thematic analysis is a technique of analysing qualitative data to find themes that are contributing to describing a phenomenon and is one of the most commonly used (Bryman, 2012). The data collection and analysis cycle continues while the synthesised information is checked and revised. This analysis method is referred to as inductive, which means the researcher does not impose upon the themes that emerge from the data (Dawson, 2002).

A subsequent process is a comparative analysis that assists the researcher in contrasting and comparing patterns to make sense of them until all issues are discovered (Dawson, 2002). The entire dataset must be explored, dissected, and reconstructed to identify causal links (Yin, 2009). For the purpose of this study, the researcher moved iteratively between transcripts, memos, and the research literature to identify and generate conceptual categories by coding these into groups. The conceptual categories are a preliminary framework for further analysis.

3.6.1 Phase 1: Familiarising with data

Each completed interview audio recording was backed up on the password-protected Google Drive folder. The audio files were uploaded to the Otter Artificial Intelligence tool for the initial transcription of the recordings. The tool achieved an average of 90% accuracy on the transcripts.

The researcher replayed each recording and reviewed the transcript. A few corrections were made in each transcript which included mostly enunciations, abbreviations, sector-specific terms, names and at times African languages expressions and exclamations. The researcher was able to complete the missing transcription words on review. The accuracy and quality of the transcription were satisfactory to the researcher.

3.6.2 Phase 2: Generating initial codes

The transcripts were exported from the Otter Artificial Intelligence tool to Microsoft OneNote. Each interview transcript was renamed and allocated a unique code to relate it to the original interview transcript. The iterative process of coding followed a hybrid approach which is both inductive and

deductive as suggested by Fereday and Muir-Cochrane (2006). The data were organised into meaning groups after identifying interesting aspects in the data items.

The deductive method followed the conceptual model of this study, adapted from the TOE framework and as discussed in the literature review, to extract the following components that were regarded as a priori themes, **Figure 3.6-1**.

In the technology category it was (1) *expected benefits* and, (2) *compatibility*; in the organisation category it was (3) *organisation size* and (4) *available financial resources*; and in the environment category it was (5) *competitors* and, (6) *service provider support*. The data were analysed to determine whether the a priori themes were relevant and to discover any additional influences on the adoption of BIS.

The inductive method allowed for new themes to emerge from the data. The following additional themes emerged (1) *change management*, (2) *organisational culture*, (3) *stakeholder engagement*; the environmental category (4) *government regulation*, (5) *stimulation of employee interest*, and (6) *importance of data quality*.

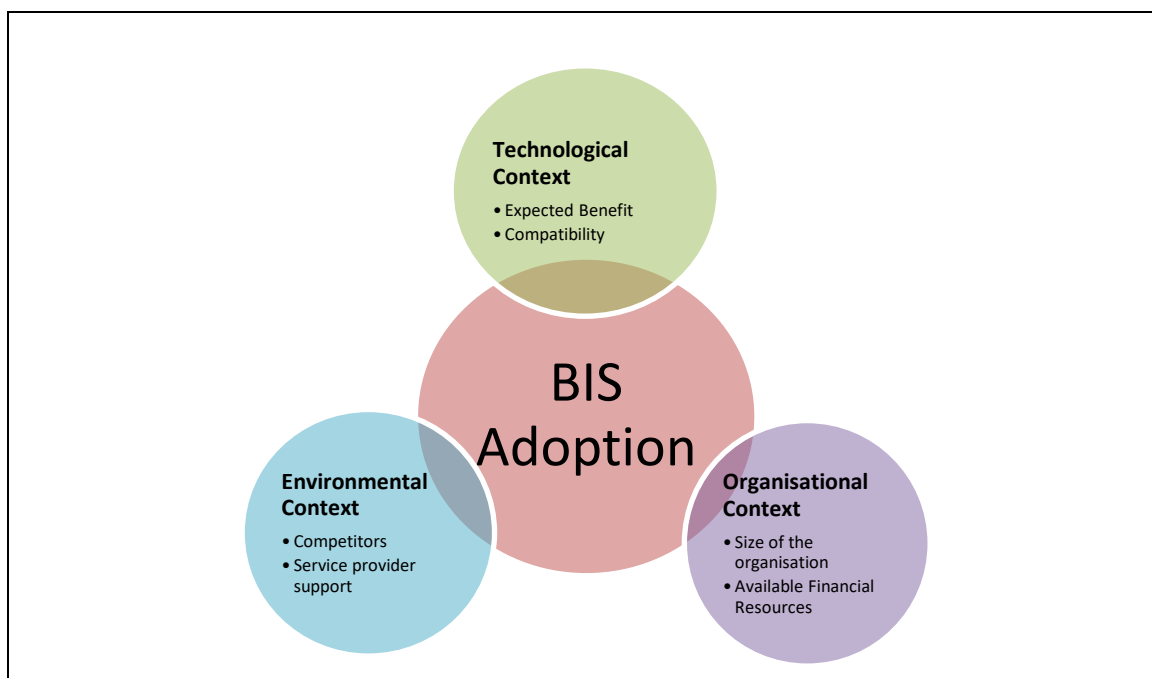


Figure 3.6-1 Conceptual research model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990

Codes were developed from passages of text that related to the general phenomenon to describe the data and answer the research questions as suggested by Saunders and Lewis (2012). Following the approach by Spiggle (1994), certain passages attracted more than one category yet those with no meaningful information attracted no category. A sample of the coding process is depicted in **Figure 3.6-2** below.

Interview extract	Codes
Interviewee 13:55 Human error is one of the key factors that could impact on BIS, because the data comes from a specific source. And there are no controls in place or inadequate controls, it's a risk. The tool itself might be sufficient, but where there is garbage in-garbage out, there is no control on the quality of information coming in. The last point was about training. So in the early days, we were just told click on this page, go to that page, and then you'll see a graph and you'll see red or green. And I think after first year, we then had a dedicated training session to show you what the different modules look like how you connect We didn't have in the start of BIS an in depth training. There was a team of people who used the BIS that were trained. And they were the people like core support and finance people who would use it almost on a daily basis. But those like myself as a manager of programs, I came later for training and being exposed to the modules at a much later stage. So, the benefits of the BIS came later for me.	- Human error - Inadequate controls - Data accuracy - Lack of training - Selective training, - Training sessions

Figure 3.6-2 Sample of the coding process.

3.6.3 Phase 3: Searching for themes

The identified codes were iteratively reviewed to identify relationships and patterns in the data set. The initial codes from each of the interview transcripts were collated to create a long list of codes. The different codes were analysed and combined to form potential overarching themes. Some of the initial codes formed sub-sub-themes and sub-themes. These were congregated into second-level groups and first-level groups. The combinations were organised using a mind map as depicted in Figure 3.6-3.

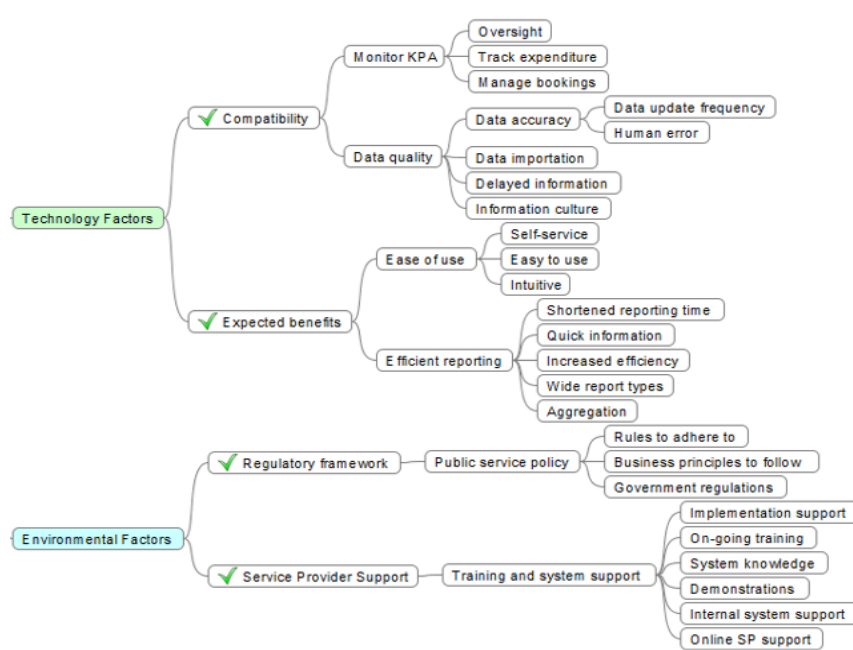


Figure 3.6-3 Sample of the mind map

3.6.4 Phase 4: Reviewing themes

This phase involved setting candidate themes and iteratively refining them to final themes. The collated data extract for each theme was read to confirm the coherence of patterns. Some of the problematic themes were reworked to find a home for extracts that could not fit. The next part was to read the entire data set to establish if it accurately reflects the data. The final codebook, showing the relationship between TOE categories, themes, sub-themes, and codes (see ANNEXURE F) was developed based on the framework in **Figure 3.6-1** above.

3.6.5 Phase 5: Defining and naming themes

This phase involved a further refinement of the themes for data analysis. A detailed analysis was written about each theme. The analysis is presented in the findings chapter of this study. **Table 3.6-1** below lists the main themes and a short description of each.

Table 3.6-1 Description of themes

	Theme	TOE category	Description of the theme	Discovery
1.	Expected benefits	Technology	The benefits that the organisation expects to derive from technological innovation (Zhu <i>et al.</i> , 2006).	a priori
2.	Compatibility	Technology	The extent to which an innovation is believed to be close fitting and consistent with existing norms and values, previous experience and current needs (Rogers, 2003).	a priori
3.	Change management	Organisation	The method of managing change in an organisation.	emerging
4.	Organisational culture	Organisation	The intangible pervasive culture that exists in the organisation, shapes the ways in which employees behave and get things done (Armstrong and Armstrong, 2009).	emerging
5.	Stakeholder engagement	Organisation	The interaction within the organisation between invested divisions that implement an innovation and the users.	emerging
6.	Organisational size	Organisation	The measure of an organisation by the number of employees employed at any point in time (Kotze and Mudzana, 2015).	a priori
7.	Available financial resources	Organisation	The available and uncommitted financial resources are at the disposal of the organisation (Puklavec, Oliveira and Popovic, 2014).	a priori
8.	Regulatory framework	Environment	The prescripts and laws that the government imposes to regulate the industry (Phan and Vogel, 2010).	a priori
9.	Service provider support	Environment	Support provided by technology service providers during the adoption, implementation and maintenance of an innovation (Rouhani <i>et al.</i> , 2018).	a priori
10	Stimulating of employee interest	N/A	The interest that employee develop in the solution being implemented.	emerging
11	Importance of data quality	N/A	The importance of the quality of data and its impact on the BIS	emerging

3.7 RIGOUR OF RESEARCH – EVALUATION OF METHODS

Every effort was made to ensure validity of this research study. The validity of a study relates to the representation of findings and the extent to which they accurately reflect the phenomena (Anderson, 2010). The research data, on which findings are based, must be genuine and honest. There are various techniques to ensure the validity of a study, namely; triangulation and participant validation.

a). **Triangulation** refers to employing more than one study method on the same phenomena. The researcher intended to consult sources of information other than data collected during interviews, such as company records, to gain different perspectives to arrive at comprehensive findings. For this study, annual reports, annual performance plans, and strategic planning documents were used to triangulate with interviews. Even though these documents do not discuss adoption factors or BIS initiatives, they did contain insightful information related to the size of the organisation, financial resources, policy and procedural information related to the organisation.

b). **Participant validation** “provides researchers with a method of checking for inconsistencies, challenges the researchers' assumptions, and provides them with an opportunity to re-analyse their data” (Anderson, 2010, p. 2). Accordingly, the participants in this study were provided with an opportunity to make comments on the researcher’s interpretation of their responses and the research findings. These provided corroboration of research findings.

3.8 ETHICAL CONSIDERATIONS

A qualitative study requires the researcher to interact very closely with the participants. This means the researcher is exposed to the personal spaces of participants. Certain ethical issues must be addressed as the research is underway, and afterwards. The researcher must respect and honour the values, rights, and needs of the participants (Creswell, 2014). As such, the researcher endeavoured to ensure that participants had full knowledge of what was involved in the study, including upholding their privacy, anonymity, confidentiality, rights, and dignity. Below is a description of how ethical issues were addressed in this study:

3.8.1 Informed consent

The researcher applied for ethics clearance before commencing with the research study, which was granted (see ANNEXURE E). In the public sector, there are protocols to be adhered to when researching within an organisation. The head of an organisation must first grant permission for a study to be conducted in the organisation. In the application for permission, the researcher outlined the purpose, nature, data collection methods, extent, and expected benefits of the research study. Permission was granted to the researcher to conduct the study. (see ANNEXURE D). Identifying information is redacted for confidentiality.

In addition, the participants had to grant their consent to take part in the study and were treated as “granting agents”, similar to the employing organisations they represent (Rosenthal, 1994). Each participant was given time to read the information sheet (see ANNEXURE B) and the participant consent form (see ANNEXURE C) before it was signed. Their consent to participate in the study was voluntary.

3.8.2 Harm and risk

Participants in this study were not be exposed to any physical or psychological risk. Bhattacharjee (2012) points out that participants should not experience harm for their participation, even where there is no mortal threat to their person. The researcher undertook to ensure that none of the participants were put in a situation where they might experience physical or psychological harm through their participation by conducting the interviews in the comfort of their offices.

3.8.3 Privacy, confidentiality, and anonymity

The researcher endeavoured to ensure the anonymity of the participants. The study is regarded as anonymous when the responses from participants cannot be linked back to them in the final research report (Bhattacharjee, 2012). The confidentiality of participants was enhanced by removing identifying characteristics in this study report.

Each interview transcript was renamed and allocated a unique code to relate it to the original interview transcript. This was done to further enhance the anonymity of the participants. The participants that had already adopted BIS were allocated an 'A' code and a numeric 'X' to denote the count of the participant, for example, 'A1'. Participants that have not yet adopted the BIS were allocated the 'N' code, for example, 'N1'.

The final results are password protected and saved on a secured storage platform that only the researcher has access to. The information that may reveal the identity of the participants is not included to ensure their privacy. This study report will not be published without permission.

3.8.4 Voluntary participation

Participation in this research study was purely voluntary. Each participant could withdraw their participation consent at any time. This research study was for academic purposes and there was no financial incentive or reward for taking part in the study. Each participant was provided with an information sheet regarding this research project and they were requested to sign a consent form (attached as Annexure C) agreeing to participate in the research, and granting consent for the recording of the interview.

3.9 CHAPTER SUMMARY

This chapter discussed the research methodology followed in this study. Based on the purpose of the study, the methodology followed encompassed an interpretivist paradigm where an instrumental case study approach was used. The purpose of an interpretive research approach is to produce an understanding of the context and the process wherein context influences information science and vice versa. The findings from interpretive studies are based on individual views and values.

The research followed an exploratory case study methodology. Exploratory studies do not make any conclusions from the evidence but provide new insight into a problem (Bhat, 2018b; Dudovskiy, 2018). The study had 10 participants who were all senior managers in the South African public sector organisation studied, with three years' experience and more. The participants were selected using a non-probability purposive sampling technique.

The research interviews were recorded and transcribed into written format. The collected data were analysed using the thematic analysis method. An iterative process of coding the data was followed to discover emerging patterns and themes from the data. These were congregated into second-level groups and then first-level groups using a mind-map. A codebook depicting a priori themes and themes emerging from the data was developed.

Every effort was made to ensure rigour and validity of this research study by applying triangulation and participant validation. In addition, ethical issues were addressed by paying attention to the requirements of informed consent, harm and risk, the privacy aspects of ethics and voluntary participation.

The next chapter presents the findings of this study.

CHAPTER 4 : FINDINGS

4.1 INTRODUCTION

This chapter discusses the outcomes of the interviews which have provided an outlook on the adoption of BIS by senior management in a public sector organisation. The emerging themes and subthemes from the interviews are discussed in detail. Findings from the interviews are explained in line with each research question posed for this study.

The purpose of the study was to understand the phenomenon of the adoption of the visualisation and data exploration BIS in a public sector organisation. More specifically, the objective of the research was to answer the following questions:

- RQ1: What aspects of the visualisation and data exploration BIS are perceived to influence the adoption of the BIS in the public sector organisation?
- RQ2: What organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation?
- RQ3: What external environmental factors are perceived to influence the adoption of the visualisation and exploration BIS in the public sector organisation?

4.2 PROFILE OF THE PARTICIPANTS.

For ethical reasons, the participants are referred to by their code names.

Table 4.2-1 shows the profile of the participants in this study. All the participants were senior managers with more than 6 years of experience in the organisation. The participants were selected by following the non-probability purposive sampling method. Gender and race were not considered in the selection process.

Table 4.2-1 Profile of participants

#	Participant code	Role	Experience in the organisation	BIS Adoption status
1	A1	Director	11 years	Adopted
2	A2	Director	12 years	Adopted
3	A3	Director	11 years	Adopted
4	A4	Director	9 years	Adopted
5	A5	Director	14 years	Adopted
6	A6	Chief Director	14 years	Adopted
7	N1	Chief Director	12 years	Not adopted
8	N2	Director	16 years	Adopted
9	N3	Director	9 years	Not adopted
10	N4	Director	6 years	Not adopted

The following documents listed in **Table 4.2-2** were made available by the organisation for assessment. Upon the review of the documents, there was no information specific to BIS initiatives or the adoption of BIS. However, the strategic plan documents do reveal that budget allocations for ICT initiatives are limited and thinly stretched to cover the bare necessities of the organisation. This evidence was

reported by participants during the interviews. The ICT function has been outsourced to a third-party provider

Table 4.2-2 Profile of documents

#	Document name	Description	Source
1	Strategic Plan 2020-2025	Official organisational strategic planning document for the year 2020 through 2025.	Supplied
2	Strategic Plan 2015-2020	Official organisational strategic planning document for the year 2015 through 2020.	Supplied
3	Annual Performance Plan 2020-2021	Performance planning document for the financial year 2020-2021	Supplied

4.3 PRESENTATION OF THE DATA AND RESULTS OF THE ANALYSIS

The Technology-Organisation-Environment (TOE) framework, as introduced by Tomatzky and Fleischer (1990), was used in this study to provide an initial set of influences perceived to be valid and important in the adoption of BIS. These influences, found in the literature, were regarded as a priori themes and have been presented in the three categories of the framework, namely; the “technological context factors, organisational context factors, and environmental context factors” (Tomatzky and Fleischer, 1990). They were used to develop the conceptual model for this study as discussed in section 2.4. Findings from the interviews shed new light on this model, which has now been modified to include two new themes in the organisational context (*organisational culture* and *stakeholder engagement*) and one new theme in the environmental context (*government regulation*) as these were identified from evidence during data analysis below. The theme *competition* that was initially included under the environmental factors was identified in the interviews as not being of relevance, and was thus removed. **Figure 4.3-1** illustrates the modified model.

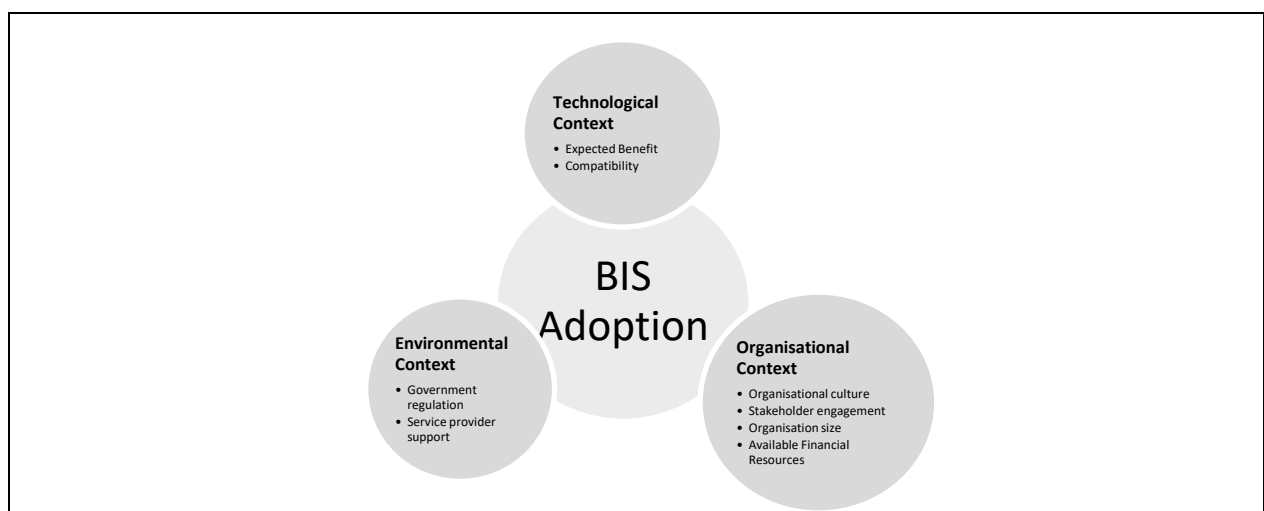


Figure 4.3-1 Modified conceptual research model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990

Each of the three aspects of the framework is comprised of various contributing components, each one representing a possible influence on the adoption of BIS. Several of these components have been

identified in the literature as discussed in the data analysis section (3.6) above. These have been allocated as a priori themes.

The literature thus provided the researcher with a guiding framework for presenting the findings. Themes and sub-themes that emerged from the data analysis were classified according to the TOE categories. These themes and sub-themes were found to embrace the main issues that the literature review revealed to be important. They revealed that all the identified a priori themes which correspond with the factors that were found in the literature are also applicable in the context of the study. However, a priori factor *competitors* was initially selected for this study. During the interviews, it came to light that *competitors* were not relevant in this context but *government regulation* was. The *regulatory framework* is an a priori factor that was identified in the literature.

In addition, several themes and sub-themes revealed influences on adoption – all in the organisational context - that had not previously been encountered in the literature. **Figure 4.3-1** depicts the modified framework with a priori theme as well as emerging themes. The following are themes that emerged from the data in the organisational context: (g) organisational culture, and (h) stakeholder engagement. In the environmental context, the framework was modified by replacing *competitors* with *government regulation*.

Themes are now discussed in the following section in relation to the research questions that they pertain to.

4.3.1 Research question 1: Technology factors that influence BIS adoption

RQ1: What aspects of the visualisation and data exploration of BIS are perceived to influence the adoption of the BIS in the public sector organisation?

Table 4.3-1 illustrates themes, sub-themes and codes extracted from the data that pertain to the technology factors that influence BIS adoption.

Table 4.3-1 Overview of themes and subthemes on technology factors.

Theme	Sub-theme	Initial codes
Expected benefits	Ease of use	Self-service Easy to use Intuitive
	Relevant and efficient reporting	Efficient reporting Quick information Increased efficiency Wide report types
Compatibility	Monitoring KPAs	Oversight Track expenditure Manage bookings
	Data integration	Data accuracy Integration Data importation

The objective of Research Question 1 was to evaluate senior managers' perspectives of data visualisation and data exploration in BIS and understand what aspects of this are perceived to

influence BIS adoption in the organisation. The themes *Expected benefits* and *Compatibility* identified in the interview data analysis corresponded with a priori technology factors selected for this study.

4.3.1.1 Expected benefits of the technology

From the interview data, it was apparent that the participants recognised that the various benefits of the BIS may have effects on the adoption of BIS. The descriptions of the expected benefits from the BIS by participants that had already adopted the BIS revealed the following subthemes: (a) ease of use and (b) efficient reporting.

Ease of use. The participants gave their overall impressions of the BIS and identified that the tool has self-service elements, was easy to use and also intuitive or user-friendly.

“is very easy to use and has elements of self-service where a user with the appropriate access rights can even generate and share own reports on the platform” (A5).

“...it collapses information for me and it's user-friendly” (A1).

“I am able to draw my own reports with only a few clicks and without depending on any of my colleagues or units” (A6).

The present study finding shows that ease of use and user-friendliness are benefits of the BIS and support the research findings by Hočevár and Jaklič (2010) and Sandema-Sombe (2019). The study by Hočevár and Jaklič (2010) further indicated that users of BIS were very satisfied with the intuitiveness of the user interface and that there was no resistance to using the tool.

Relevant and efficient reporting. Another benefit that the participants identified from the interviews was efficient reporting. The participants indicated that the BIS enabled them to create reports efficiently, where they are able to extract information quickly and have gained overall efficiency from the BIS. Previously, the participants had to use the time-consuming manual collection of information they needed to create reports.

The participants indicated that the BIS has provided relevant reporting that assisted them as managers. The BIS has a dashboard from which participants are able to generate and draw analysis reports and other types of reports that are specific to their operational and managerial functions in the organisation. As substantiated by participants,

“It assists me a lot. I am able to get whatever information I want from it and then it tells me exactly what is happening in operations. The BIS is compatible with the operations of the organisation as it provides business information and quickly.” (A1).

“Compiling reports used to be a tedious task. The staff were very excited about the tool since its launch. It is easier to draw reports from the system” (A2).

“The BIS tool provides age analysis reports. We are able to make managerial decisions by analysing the historical data through the BIS. We are now also able to easily monitor our expenditure against revenue generation” (A6).

“...it has assisted me with quite a few analyses that we've had to do” (A4).

The findings from the interview data show efficient reporting capability as a benefit of the BIS. This finding concurred with research findings by Hočevar and Jaklic (2010) and Rouhani et al., (2016), that reporting capabilities of the tool are a benefit of BIS. Hočevar and Jaklic (2010) described the benefit to be an increased autonomy and flexibility of users to create quick and simple analyses and reports that aggregate and drill into the data. Additionally, Rouhani et al., (2016) expressed that the tool assists in exploiting data and providing reports that are valuable in decision-making processes.

4.3.1.2 Compatibility

The second theme that emerged from the interviews was that the BIS was compatible with the organisation. The compatibility aspect relates to the user's assessment of the BIS and the task-technology fit as it pertains to the needs of the organisation (Jaklič, Grublješič and Popovič, 2018). This theme had two subthemes that described the compatibility of the BIS, namely (a) monitoring key performance areas (KPAAs), and (b) data integration.

Monitoring performance. Monitoring performance is an operational task-centric exercise that the organisation undertakes regularly. The organisation sets an annual performance plan and management have to keep track of performance areas that contribute to the overall performance. The participants indicated that their organisation uses the BIS to monitor performance on the dashboard, which involves comparing actual services delivered against annual targets. These participants described the manner in which the BIS has also assisted in monitoring business operations, managing finances, and large requests for current and future services from the organisation.

"It assists us in terms of monitoring the business uptake, then it informs us to know whether we're making it or we still have to push more, and so on" (A4).

"We couldn't manage large requests for future services before. With the BIS we are able to manage these. It also assists with the management of our finances" (A1).

"The tool not only managed performance but also finances. You can track your expenditure and revenue generation" (A6).

The findings in this study suggest that the solution is compatible with the operational needs of the organisation. Agarwal and Prasad (1997), suggested in their study that an innovation that fits with task and work behaviour is compatible. Similarly, Karahanna, Straub and Chervany, (1999) outlined that BIS was in alignment with what people do in the organisation and this is regarded as operational compatibility. The adoption and use of BIS increase when changing data analytics requirements are addressed, thereby creating a positive perception of compatibility with the tool (Jaklič, Grublješič and Popovič, 2018).

Data integration. Data integration is a process of combining data from various sources into a single location. From the interview data, it is apparent that the participants use the BIS for data integration in the organisation. The participants explained that with the BIS they ingest data from other systems to have a unified view of the data created by the organisation. The BIS enabled the integration of the data from different sources into a single platform for further processing and analysis.

“On the BIS tool, you could pull in Excel spreadsheets with data from other sources and integrate it with the data from primary systems. My managers can verify the information for their areas of responsibility” (A6).

“Previously we had to manually check that data is accurate and that we do not exceed the threshold that is contracted. With the BIS we are able to evaluate data and evaluate whether it is accurate” (A1).

Participant A2 commented on delays that were experienced before data management was done using the BI tool.

“There was a lag time between the reporting system and the reality on the ground. We sometimes had to delay reporting by at least 10 days so that narrative reports are reflective of what is visible on the dashboard.” (A2).

The following comment by one of the managers, who had not yet adopted the BI tool, underlines the important relationship between data integration and compatibility.

“I would regard the BIS tool to be fully compatible when it is integrating all the sub-systems from which data is sought and all the data is current. I believe these capabilities influence the adoption of the BIS tool” (N2).

This study identified from the interview data that the BIS function was used to integrate data that the organisation generates. Cheung and Li (2012) and Delen and Demirkan (2013) have also found that the BIS technologies provide functions to prepare and analyse data from different sources. This study supported the finding by Rouhani et al. (2016) that data integration is a compatible function of BIS in information processing and data visualisation.

4.3.1.3 Summary of findings for Research Question 1

The researcher has gathered from the interview data two themes, (a) *expected benefits* and (b) *compatibility*, that corresponds with a priori technological factors obtained from the framework. No further themes emerged from this category. This study identified ‘ease of use’ and ‘relevant and efficient reporting’ as components of expected benefits. The findings revealed that BIS interfaces are user-friendly and enable users to interact with the tool with minimum education and training. This supported findings by Hočevár and Jaklič (2010) and Rouhani et al. (2016) who identified ‘relevant and efficient reporting’ to be benefitting organisations that adopt BIS.

Rouhani et al. (2016) expressed that the tool assists in exploiting data and providing reports that are valuable in decision-making processes, while Hočevár and Jaklič (2010) described the benefit to be an increased autonomy and flexibility of users to create quick and simple analyses and reports that aggregate and drill into the data. Kannabiran and Dharmalingam (2012) found that expected benefits are one of the key influencing factors for the adoption of technology.

The findings in this study further suggest that the BIS is compatible with the operational needs and with the task and work behaviour within the organisation. Agarwal and Prasad (1997) found that an innovation that fits with task and work behaviour is compatible. This is in agreement with Karahanna et al. (1999), who outlined that BIS was in alignment with what people do in the organisation and this is regarded as operational compatibility. The adoption and use of BIS increase when new data analytics

requirements are addressed, thereby creating a positive perception of compatibility with the tool (Jaklič, Grublješič and Popovič, 2018).

The presentation of findings for research question 1 is thus concluded. The next section presents findings related to research question 2 on organisational factors affecting BIS adoption.

4.3.2 Research Question 2: Organisational factors that affect adoption

RQ2: What organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation?

The objective of Research Question 2 was to explore factors within the organisation that are perceived to have an influence on the adoption of data visualisation and data exploration BIS. The response to this question includes some opinions from participants on organisational matters that they regard as paramount in contributing to or hindering the adoption of BIS. Four themes have been identified from the data regarding organisational factors: (1) *Organisational culture*, (2) *Stakeholder engagement*, (3) *Organisation size*, and (4) *Available financial resources*. *Organisational culture* and *stakeholder engagement* are emergent themes while *organisation size* and *available financial resources* are a priori themes that correspond with organisational factors selected for this study. The themes are depicted in the codebook (see ANNEXURE F) and a priori themes are indicated with a green checkmark. These themes are discussed in detail below.

Table 4.3-2 illustrates some themes and subthemes that have emerged from participants as internal organisational influences on organisation adoption of BIS.

Table 4.3-2 Overview of themes and subthemes on organisation factors

Theme	Sub-theme	Initial codes
Organisational culture	Change management	Technology flexibility Adaptation Communication Uncertainty
	Organisational structure	Constant restructuring Fragmentation Silos Integration
Stakeholder engagement	Requirements gathering	Meeting user requirements Consultations
	Information session	Awareness campaign workshop
Organisation size	Number of employees	Few employees Small organisation Easy to adapt
Available financial resources	Budget issues	Limited licence access Availability of funds ICT project funding

4.3.2.1 Organisational culture

The first theme in the category that emerged from the interview data was the culture of the organisation. Organisational culture is “the pattern of values, norms, beliefs attitudes and

assumptions that may not have been articulated but shape the ways in which people in organisations behave and things get done” (Armstrong and Armstrong, 2009: p384).

Leidner and Kayworth (2006) and Hasan and Ditsa (1999) indicated that it is difficult to measure culture and to define and isolate it in the information system context, however, organisational culture influences the behaviour of staff in the organisation. An organisation may even fail if the existing organisational culture is ignored (Almamari, 2016), and the organisation’s efficiency can be impacted negatively if its importance is overlooked (Martins and Martins, 2002).

This emerging theme covered the contributions of organisational culture as perceived to have an effect on the organisation, in relation to the adoption of BIS. The following subthemes were identified (a) change management and (b) organisational structure.

Change management. The participants identified change management from the interviews as an element that affects employees in the organisation. *Change management* deals with approaches to managing change where people and resources are concerned in an organisation (Al-Ali, Singh, Al-Nahyan and Sohal, 2017). According to Yeoh, Koronios and Gao, (2008), every organisation goes through a transition at a point in its lifecycle. Aladwani (2001) expressed that organisational transitions bring about changes that affect processes, technology and people in the organisation. The officials in the organisation should be involved in the change effort to ensure that things like the BIS are implemented and adopted successfully (Yeoh, Koronios and Gao, 2008).

The participants reported that changes in the organisation such as the introduction of new technologies, leadership changes or new strategies, have required resilience from the staff.

“There have been changes in administration and the organisation is moving into the 4IR space. It is exposed to more ICT interventions than before. That requires a lot of flexibility and adaptability by the staff” (A6).

“The situation we currently find ourselves in, sometimes change is not a bad thing. You are forced to do things merely because of the challenges that your environment creates. . . . The organisation has to build fluidness and flexibility when it comes to systems and ICT tools” (A3).

It was apparent from the participants that the staff had become accustomed to operating in a certain way in the organisation. It was recognised that people are comfortable with the status quo and that this has hindered BIS adoption. For example, A5 mentioned that

“I do not think people have adopted the BIS as widely as they could. Most staff still choose to come to me for assistance with accessing business reports. They know the information is there and where to access it. I believe it is a change management issue”.

“I think there is a lot of uncertainty about where we are going and what we are doing as an organisation. It affects the staff negatively” (A2).

The findings in the present study reveal that change management must be considered by the organisation to enable people to adapt to change in a positive way. These findings support research findings by Al-Ali et al. (2017) that change management is an important process that also impacts organisational culture. Similarly, Metre (2009) suggested that managing change would be impossible

without organisational culture, irrespective of the nature of the change. Change management is a constant feature in any organisation and it presents opportunities for an organisation to increase its productivity and profits (Lucey, 2008). Interestingly, change management has been linked very closely with organisational culture and the role of leadership in the organisation (Baddah, 2016).

Organisational structure. Another aspect of organisational culture that was identified from the interview data was organisational structure. The organisational structure is guided by i) a mechanistic system where task communications go through the chain of command and thus tasks are specialized or ii) an organic system where there is no communication hierarchy and tasks are diversified (McKenna, 2020). The manner in which individuals work together to achieve a common goal is determined by the organisational structure, after establishing the right norms and values (Saghafian, Laumann and Skogstad, 2021). The participants have reported their perspectives on the structure of the organisation, for example,

“Generally, the organisation is so in silos... that if you bring a system, that tries to project information for the entire organization, it's not the entire organization that will buy into it” (A4).

“I think adoption is impacted by the fact that perhaps people have not actually settled into their roles. So, what you are dealing with is an organisation that is very fractured and fragmented” (N3).

The participants expressed their concerns about the fragmented and siloed structure of the organisation. Furthermore, they expressed concerns about the changing structure of the organisation and its impact on staff. For example,

“The organisation is going through another restructuring process and this is causing problems. So, I think there's a lot of uncertainty about where we are going and what we are doing as an organisation. We work in silos. I think that's an important and big challenge. Although it may be said that we work together, we don't work together” (N1).

“The divisions in the organisation are not all directly responsible for the performance of the organisation. The organisation's design has allowed for a situation where BIS tools and related systems are the responsibility of one division and not others. A lot of organizations have integrated [structure] to ensure that all people are responsible for the achievement of targets and the business or core business” (N2).

The finding in this study shows that organisation structure contributes to the manner of working relations and the performance of the organisation. In particular, it has been pointed out that organisational structure has affected the delegation of responsibility for BIS tools. Ultimately, therefore, organisational structure influences the adoption of BIS tools.

In the literature, organisational structure has been categorised into two dimensions: (a) centralization where the decision-making power is centralised to a few people (Andrews, Boyne, Law and Walker, 2009), and (b) formalisation which denotes how roles and procedures are defined in the organisation (Olson, Slater, Tomas and Hult, 2005). The present finding concurs with the discovery by Kang (2006), that a less centralised and formalised organisational structure creates flexible decision-making processes and autonomous working operations. Furthermore, the organisational structure has been

seen to play a role in the culture of an organisation including facilitating communication and interaction amongst workers (Johnson, Donohue, Atkin and Johnson, 1994).

4.3.2.2 Stakeholder engagement

The second emerging theme in the organisational category was stakeholder engagement. Support for this theme was found in the literature.

The implementation of solutions such as BIS usually brings about major business process changes (Kesner, 2008). Stakeholders have conflicting expectations from the implementation of the BIS and a successful adoption depends on their support and involvement (Mostert-Phipps, Pottas and Korpela, 2013). The key stakeholders impacted by the BIS must be involved throughout the cycles of implementation to provide contributions that add value to the technology adoption effort in the organisation (Yeoh, Koronios and Gao, 2008). The following subthemes were identified (a) requirements gathering and, (b) information sharing as pertinent to stakeholder engagement in the organisation.

Requirements gathering. Requirements gathering entails the documenting of functional and technical requirements from the BIS by identifying and engaging with relevant business stakeholders (Astrix, 2018). The organisation should undertake a process that clearly articulates the needs of business units that are addressed by the BIS (Mitre, 2013). Potential system users from business units should then be engaged to gain an understanding of the requirements they may have.

It emerged from the interview data that requirements gathering was perceived by the participants to be significant. The following examples were shared by the participants,

“When you want to implement something new you normally gather user requirements to capture what it is that users want out of new technology. User requirements could have been gathered from senior management, at least, it would have been helpful” (A1).

“The implementors should hold sessions to understand what the requirements are from the units in the organisation” (A2).

“Senior managers only were consulted to gather requirements. I am not aware if the other levels were engaged for this exercise” (A6).

Participant N1, who has not yet adopted the BIS, reported that,

“We drew up so many user requirements, we have many booklets of that and we just cannot get to that point of our requirement being met” (N1).

The finding in this study suggests that requirements gathering should be conducted with the key stakeholders of the BIS. Kesner (2008) found that the requirement gathering process is key to building stakeholder commitment to the BI project. Astrix (2018) states that it is best practice for system requirements to be gathered and documented. During the requirements gathering sessions the employees ought to be involved in the design of the system to cater for their identified needs and business priorities (Almamari, 2016).

Furthermore, Conner (1993) found that the involvement of employees in requirements gathering enables them to influence and be familiar with the direction and decisions to be made in the organisation about the BIS. Kesner (2008) indicated that failure to engage stakeholders for serious and sincere requirements gathering may lead to an expensive and underutilized solution that does not meet the needs of the organisation.

Information sessions. Another subtheme that emerged from the interview data was information sessions that form part of stakeholder engagements. The participants indicated that information sessions were necessary during the introduction of BIS tools to create greater awareness in the organisation.

"I think information sharing sessions need to be held with the staff, to inform them about all these available tools. Because it's not only the BIS. There's a number of other tools, which are not known" (A2).

"The introduction of the BIS was supposed to be communicated via information sessions, internal communication to everybody, then arranging training for staff to attend. We normally do that when there are new things in the organisation. Finance does that when there are new changes, they organize information sessions; HR they organize information sessions" (A1).

"The lack of communication to staff and lack of knowledge about upcoming technologies, coupled with the organisation's perpetual restructuring, has created a lot of uncertainty amongst the staff" (N3).

From a contrasting point of view, Participant A5 reported that

"There is a general awareness about the availability of the BIS in the organisation. Senior managers are aware of the data and the tools available to access the information. The awareness of the BIS has grown significantly since when it was first introduced in the organisation".

The findings reveal that information sessions about the BIS tools were lacking in the organisation. Although there were contrasting views about the level of awareness, it was apparent from the interview data that information sharing sessions were a necessity to engage with the stakeholders. The finding supports a study by Kesner (2008) that found it is necessary to hold information sessions throughout the life cycle of the BIS project. A study by McIntosh, Ascough, Twery, Chew et al. (2011) also expressed the need to embrace stakeholders throughout the design and development process. It was further discovered by Kannabiran and Dharmalingam (2012) that simple awareness about developments in the organisation is not sufficient for the adoption of technology.

4.3.2.3 Organisation size

From the interview data, the third theme that was identified is organisation size, an a priori theme that matches one of the factors identified from the literature. The size of the organisation is often measured by the number of employees (Rogers, 2003). The theme was characterised by one subtheme – 'number of employees'.

Damanpour (1992) asserts that organisation size is an important determining factor in the adoption of information systems in the organisation. The significance of the impact of organisation size on technological adoption varies per differing industries (Ifinedo, 2011).

Number of employees. It was clear from the interview data that the number of employees in the organisation that adopted the BIS was small. The participants regard the organisation as small in size and had the expectation that the BIS would have been adopted by all employees since they were not large in number. The following examples were noted,

“We are a very small department. And this could have been adopted through the department as a whole” (A1).

“I think the size of the users it's too small. So, I wouldn't necessarily only say of the organization, I think of the users too. I don't know officially, how many users are there. But just having seen that it's limited to senior managers” (A4).

In a differing perspective, Participant A3 regards change management as more important than organisation size. For example,

“I do not think size has anything to do with the non-adoption of the BIS. The organisation has to build fluidness and flexibility when it comes to systems and ICT tools” (A3).

Consistent with study findings by Rouhani et al. (2018b) and , this study has found the number of employees to be a measure of organisation size in the adoption of BIS. The present study found that the size of the organisation did not affect the adoption of BIS. This finding was consistent with research by Lee and Xia (2006) and Kotze and Mudzana (2015) which also found that size of the organisation was not influential to the BIS adoption. Contrary to the current findings, Walker and Brown (2019) and K. Zhu et al. (2006) in their study found that organisation size was influential in the adoption process.

4.3.2.4 Available financial resources

A fourth theme ‘available financial resources’ is an a priori theme identified from the interview data. This theme also corresponds with a factor identified in the literature, which showed that available financial resources have potential effects on the adoption of BIS in the organisation. Budget issues were the subtheme that was identified as salient in the organisation.

Budget issues. The adoption and implementation of the BIS requires funding. The participants indicated that budget constraints in their organisation presented a challenge in acquiring licenses to use the solution.

“I think funding has been a big, big issue at the institution, especially for ICT services. So I'm sure it's because of budgetary constraints, maybe on the ICT budget, that only a certain number of people can access (BIS), and not every single person” (A5).

“At some stage, we were told about limited licenses when they started the whole thing. I also spoke about it, I said why can't I have access to the BIS and they said no they bought few licenses” (A1).

"The kind of a system that you want that can be so good for the entire organisation normally depends on a good budget. So, money has been a factor too" (N2).

"The BIS tool would probably be widely adopted if the availability of licenses was not a challenge. Not everybody has access because the licensing issue is a problem" (A3).

"I think there are challenges with the funds available, for the whole ICT tools. Management could have looked at divisions and assessed if the BIS is a requirement in that area while considering the costs and funds available." (N1).

Participant A2 offered a differing perspective on the budget issue for ICT in the organisation.

"As far as I know the organisation owns the license of the BIS to make the tool available and accessible to staff. There was a budget allocated to the procurement and implementation of the BIS solution. Therefore, the diminishing budget should not be a factor in the adoption of BIS" (A2).

The present study findings reveal that the constrained budget has an effect on the adoption of the BIS. A study by Cragg and King (1993) revealed that the lack of available budgets affected the adoption of IT innovations. Budget constraints have also been found to have a direct relationship with the adoption of technological innovation (Premkumar, Ramamurthy and Crum, 1997). Adebambo and Toyin (2011) identified the high cost of technology as a hindrance to adoption, and Kannabiran and Dharmalingam (2012) concurred that constrained financial resources are inhibitors to the adoption and use of technology.

4.3.2.5 Summary of findings for Research Question 2

The researcher has gathered from the interview data four themes, (a) organisational culture, (b) stakeholder engagement, (c) organisation size, and (d) available financial resources. *Organisation size* and *available financial resources* correspond with a priori organisational factors obtained from the framework. The other two themes, *organisational culture* and *stakeholder engagement*, emerged from the interviews and data analysis. No further themes emerged from this category.

The emerging theme *organisational culture* was characterised by change management and organisation structure. The present findings show that 'change management' is an important process that must be considered by the organisation to enable people to adapt to change in a positive way. It supports findings by Al-Ali et al. (2017) that change management is an important process that impacts organisational culture. The organisational structure was found in the current study to contribute to the manner of working relations and the performance of the organisation. The present finding concurred with the discovery by Kang (2006), that a less centralised and formalised organisational structure creates flexible decision-making processes and autonomous working operations.

The emerging theme *stakeholder engagement* was characterised by requirements gathering and information sessions. Requirements gathering was found to be important and should be conducted with key stakeholders. The finding supported a study by Kesner (2008) which discovered that the process contributes to building commitment to the BIS project. Information sessions have been found to be a necessity to embrace stakeholders throughout the BIS design and development process.

Organisation size was a priori theme, described by the number of employees in the organisation. In addition to identifying the number of employees as a measure of *organisation size*, Rouhani et al. (2018b) also considered the number of employees in the IT department with the expertise to apply IT-related changes. Organisation size was found as not influential to the adoption of BIS, consistent with the finding by Lee and Xia (2006).

The a priori theme of *available financial resources* was unveiled by the subtheme budget issues that affected the adoption of the BIS tool. Budget constraints have also been found by others to have a direct relationship with the adoption of technological innovation (Premkumar, Ramamurthy and Crum, 1997).

The presentation of findings for research question 2 is now concluded. The next section presents findings related to research question 3 on environmental factors affecting BIS adoption.

4.3.3 Research Question 3: Environmental factors affecting BIS adoption

RQ3: What external environmental factors are perceived to influence the adoption of the visualisation and exploration BIS in the public sector organisation?

The objective of Research Question 3 was to examine factors in the external environment that affect BIS adoption in the organisation. *Competitors* and *Service Provider support* were the original factors to be inquired into by research question 3. The interview questions were adjusted and the factor *competitors* was replaced by *government regulations*. The adjustment was guided by the responses and evidence from the first few interviews with participants. The participants indicated that the organisation, being an entity of the state, does not have competitors as it is the only organisation mandated to provide its services in the public sector. Therefore, it was anticipated that subsequent interviews exploring competition may not yield any meaningful evidence. In addition, it was discovered that there are certain *government regulations* that may have had an influence on adoption.

Table 4.3-3 lists a priori themes that correspond with factors identified from the literature and subthemes that have emerged from participants as external influences on organisation adoption of BIS.

Table 4.3-3 Overview of themes and subthemes on environmental factors.

Theme	Sub-theme	Initial codes
Government regulation	Public service policy	Rules to adhere to Business principles to follow Government regulation
Service provider support	Training and system support	Implementation support On-going training System knowledge Demonstrations Internal system support Online support

4.3.3.1 Government regulation

The government regulation emerged from the interview data as a theme that corresponds with the a priori factor identified in the literature. The government issues guidelines to regularise industries and organisations that operate in the country.

Public service policy. From the interview data, it is apparent that the organisation operates with strict regulations and prescripts. The participants explained that the organisation follows public service policies. Public service policies include guidelines and principles with which organisations must comply in the course of their operations.

It emerged from the interview data that the participants identify a relationship between regulations to be complied with and the adoption of new technologies in the organisation.

“We have to comply with the auditing authority and their regulatory requirements and so on” (A1).

“Regulations stifle government organisations' ability to adapt to a paperless environment and the adoption of technological tools” (A2). Participant N1, who has not yet adopted the BIS, shared their view that the organisation should be enabled to find its own technology solutions. For example,

“But we know what we need. I think we should take control of that because we know what we need, and we cannot let other people come and bring systems to us. We know where the challenges are, who knows better than us” (N1).

This study reveals that policies that regulate the operating environment of the organisation must be considered when adopting technological innovations. This finding supports the study by Pan and Jang (2008) which discovered that public sector organisations are governed by regulatory prescripts which in turn affect the adoption of technological innovation. The adoption of new technologies can be encouraged or discouraged by the government (Oliveira, Thomas and Espadanal, 2014), when it develops technology frameworks and guiding principles for entities and organisations to follow in their business operations (Xu, Kevin and Gibbs, 2004).

4.3.3.2 Service provider support

The next theme to emerge from the interview data was service provider support. It was apparent that the participants regarded service provider support to have potential effects on the adoption of BIS in the organisation. This theme is characterised by a subtheme training and system support

Training and system support. The participants identified that the provision of training and education on the visualisation and data exploration BIS to employees in the organisation was important. Training support includes demonstrations of the BIS features and functions, in-depth curricula presentations on its use, and ongoing general support.

“At the initial introduction of the tool, only a select number of staff were trained to use the tool. The rest of the organisation simply knew about the tool and was reluctant to jump on board and adopt the tool. After a year there was training provided to a cohort of managers on the BIS tool. Only after the training was their adoption when the benefits of adopting the solution were apparent” (A6).

It was apparent from the interviews that there was an improvement in providing training on BIS to potential users. For example,

"I was never trained and I taught myself. The next person may not be comfortable enough to try out the solution with the fear to mess up the data. So, people would stay away and not adopt the solution" (A2).

"There has been a push from ICT to ensure there is training by the service provider for, mostly administrative staff, and the rest of the staff" (A3).

"The support from the service provider has been more visible lately than at the beginning when the BIS was introduced in the organisation" (A3).

The participants that had not yet adopted the BIS reported that they had not received any training on the solution. For example,

"I did not receive any training on the solution. Training and knowledge on tools implemented in organisations should not be based on rank. All levels in the organisation should be trained" (N2).

"We were never trained in our division on the BIS and therefore did not adopt it. It was, therefore, difficult to adopt the solution without the requisite knowledge and training of the solution" (N4).

The interview data reveal that training on the solution was not provided adequately across the organisation, and this had an effect on the adoption of the solution especially as the non-adopters received no training at all. This finding supports the discovery by Mostert-Phipps, Pottas and Korpela, (2013) that insufficient training on the use of the technology may lead to resistance to adoption and affect the motivation to use the BIS. A study by Grubljesic and Jaklic (2015) also discovered that BIS training assists users to be familiar with the technology. When training is provided, potential adopters gain hands-on exposure to the solution and develop positive attitudes when appreciating its quality attributes and potential benefits (Aladwani, 2001). Woodside (2011) highlighted that training and education are important to enhance the knowledge and appropriate use of a system thereby impacting full adoption. It helps staff to adjust to the change introduced by the system (Aladwani, 2001). Reiter, Meyer and Parrott (2019) also suggested that much greater and enduring success would be possible when there is ongoing communication and training to advance continued awareness of the BIS process, tools, and outputs.

4.3.3.3 Summary of findings for Research Question 3

The researcher gathered from the interview data two themes (a) *government regulation* and (b) *service provider support*. The two themes correspond with a priori environmental factors obtained from the framework. The original a priori theme *competitors* was replaced by *government regulation* as guided by evidence collected during the interviews. No further themes emerged from this category.

This study reveals that the effect of policies that regulate the operating environment of the organisation must be considered when adopting technological innovations. This finding supports the study by Pan and Jang (2008) that discovered that public sector organisations are governed by

regulatory prescripts which in turn affect the adoption of technological innovation. The study also identified ‘training and system support’ as components of service provider support. The present findings show that training plays a key role in the introduction and adoption of BIS in the organisation. It exposes users to the technology and provides hands-on knowledge required to consume features and functions of the BIS, supporting the findings of Grubljesic and Jaklic (2015), Woodside (2011) and Aladwani (2001) on the effects of training.

4.3.4 Reasons why the identified factors influence the adoption of BIS

The reasons *why* the factors were perceived to influence the adoption of BIS were mentioned when answering each of the previous three research questions, while the factors in the three TOE categories were being identified and discussed.

In analysing the data for frequently mentioned reasons senior managers feel the factors influence the adoption of BIS, three themes have been identified from the data as the most important: (1) Stimulation of employee interest, and (2) Importance of data quality. The themes are also depicted in the codebook (see ANNEXURE F). **Table 4.3-4** below lists the themes and sub-themes that were identified from the data as the most important reasons that influence the adoption of BIS.

Table 4.3-4 Overview of reason themes and sub-themes influencing adoption of BIS.

Theme	Sub-theme	Initial codes
Stimulation of employee interest	Information sessions	Expectations from a new work tool End of manual way of doing things Possibility to collaborate with others Interesting new work tool
	Requirement gathering	Opportunity for self-development and learning Addressing challenges Easy management tools
	Change management	Adaptation Communication
	Training	On-going training Demonstrations Online support
Importance of data quality	Data processing and integration	A tool to manage data Faster processing of information Improved information quality

4.3.4.1 Stimulation of employee interest.

The first theme derived from frequently mentioned sub-themes in the interview data was the stimulation of employee interest. Stimulation of interest involves convincing employees to be interested in the solution that the organisation intends to adopt. When adopting a new solution in the organisation it is important to capture the attention of employees who are the potential adopters and ultimate users of the solution (Rouhani *et al.*, 2018b). Employees that are interested in the BIS are more inclined to adopt it. Aladwani (2001) indicated that the interest of employees in a technological solution affects the way they receive it.

The following sub-themes were identified from the interview data as they were frequently mentioned by the participants to be contributing reasons that influenced their adoption of the BIS; (a) information sessions, (b) gathering requirements, (c) change management and (d) training. These sub-themes were categorised as stimulants of employee interest.

These sub-themes have all been discussed before, but their contribution to the theme 'stimulation of employee interest' is shown here.

Information sessions. The participants identified information sessions as one of the contributing elements that stimulate the interest of employees in the BIS. The participants revealed that they were introduced to the BIS during the information sessions.

"I started paying attention to BIS after attending a few knowledge sessions" (A2).

"The awareness of the BIS has grown significantly since when it was first introduced in the organisation" (A5).

Consistent with the study by McIntosh et al. (2011), this study has found that information sessions about new technology have ignited the interest of employees about it and how it can address their challenges. Furthermore, the finding supports a study by Quinn (2010) that information sessions are the reason that employees gain adequate context about the solution to make their adoption decision.

Requirements gathering. Another aspect that stimulates interest in the technology is the gathering of requirements for the BIS. During requirements gathering sessions the employees specify features they wish to see in the solution that will address their problems and challenges in the organisation. Almamari (2016) indicated that the involvement of employees when gathering requirements makes them interested in building the solution.

"Our unit has been waiting to see how the solution caters for our requirements" (N1).

The findings reveal that the requirements gathered from the organisation generate anticipation in employees for what the technology can bring. The anticipation further stimulates interest in the technology solution. Kesner (2008) has also found that when the gathering of requirements is on employees' terms, they are open to possibilities of the BIS on strategic business needs.

Change management. During the interviews, it was revealed that the employees were expected to embrace the change that the organisation was experiencing. This involved adopting new ways of working including new technologies. It is mentioned in the literature that organisations undergo the process of change at one point in its lifetime (Yeoh et al., 2008). The employees are expected to adapt and embrace the new changes in the organisation.

"Everyone in the organisation is shifted to a position where they either adapt or ship out" (A3).

This study has found that employees developed an interest in the BIS because of the changes initiated in the organisation. These findings support the research findings by Lucey (2008) that change management presents opportunities for both the employees and the organisation to develop and be productive.

Training. The participants identified the importance of training as another influential aspect that created interest in the BIS. The training that employees were exposed to elevated their knowledge and confidence in the solution.

“It was, therefore, difficult to adopt the solution without the requisite knowledge and training of the solution” (N4).

The findings in this study show that when employees are trained in the new technology solution they are more interested and develop confidence in the system. This finding is consistent with the study by Aladwani (2001) who discovered that training increases employee hands-on exposure and positive attitudes in the system. The finding is further corroborated by Grubljesic and Jaklic (2015) who also found that BIS training assists employees in being familiar with the technology.

4.3.4.2 Importance of data quality.

As the participants shared their perceptions about the technology, they also revealed that they perceive the importance of data quality as the reason why ‘data integration’ is perceived as important in their adoption of the BIS. This is because the BIS helps them to verify the quality of the integrated data they are working with. The participants consider that their work and reporting depend on the quality of data the organisation possesses.

“With the BIS we are able to evaluate data and evaluate whether it is accurate” (A1).

“My managers can verify the information for their areas of responsibility” (A6).

The findings in this study show that because data quality is important, it is necessary to verify the quality of data, particularly when it is being integrated with other data. This is the reason that data integration is perceived to be influential in the adoption the BIS. Işık, Jones and Sidorova (2013) posit that data quality is of utmost importance in many organisations that employ BIS as it also affects its success. Furthermore, Chae, Yang, Oslon and Sheu (2014) found that the BIS initiative should focus on data quality in order to take advantage of the use of data and analytics.

4.3.4.3 Summary of reasons

The researcher has gathered from the interview data two themes perceived to be important reasons for choosing factors that influence the adoption of BIS in the organisation. This study found the *stimulation of interest* in employees of the organisation in the BIS to be an influential reason. This theme was motivated the perception that *information sessions, requirements gathering, change management* and *training* are important. This finding supported the study by Smith, Mandy and Lu (2004) that interest in technology innovation is elevated through engagement with stakeholders.

Furthermore, this study identified the *importance of data quality* as an important reason for choosing factors that influence the adoption of BIS and it motivated the perception that *data integration* is important. This finding supports the study by Işık et al. (2013) who postulate that data quality is of utmost importance for organisations that employ BIS, also affecting its success.

4.4 CHAPTER SUMMARY

This chapter presented the findings of this research study. This qualitative study aimed to answer the main research question: What do division managers perceive as salient factors that affect the adoption of the visualisation and data exploration BIS in the public sector organisation and what do they perceive to be the reasons for the affecting factors being important? The researcher has captured the perceptions of senior managers in a public sector organisation about the factors that are believed to influence the adoption of BIS in the public sector organisation and has explored what the reasons for this could be.

A thematic analysis of the data from the interviews revealed 10 themes, which were presented within each research question: (1) *expected benefits of the technology*, (2) *compatibility*, (3) *organisational culture*, (4) *stakeholder engagement*, (5) *organisation size*, (6) *available financial resources*, (7) *government regulation*, (8) *service provider support*, (9) *stimulation of employee interest*, and (10) *importance of data quality*.

Research Question 1 was what aspects of the visualisation and data exploration of BIS are perceived to influence the adoption of the BIS in the public sector organisation? The objective of the question was to evaluate senior managers' perspectives of data visualisation and data exploration in BIS and understand what aspects of this are perceived to influence BIS adoption in the organisation. Two themes emerged from the interview data, (a) *expected benefits* and (b) *compatibility*, that corresponded with a priori technological factors obtained from the framework. This study identified ease of use and relevant and efficient reporting as components of the expected benefits of the BIS. The present findings show that BIS interfaces are user-friendly and enable users to interact with the tool with minimum education and training. The findings also supported findings by Hočevár and Jaklič (2010), who noted that users were very satisfied with the intuitiveness of the BIS tool. This study suggested that the solution is compatible with the operational needs of the organisation. The present finding supports research findings by Agarwal and Prasad (1997) that an innovation that fits with task and work behaviour is compatible.

Research question 2 was what organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation? The objective of the question was to examine the factors within the organisation that are perceived to have an influence on the adoption of data visualisation and data exploration BIS. Four themes emerged from the interview data, (a) *organisational culture*, (b) *stakeholder engagement*, (c) *organisation size*, and (d) *financial resources*. *Organisation size* and *financial resources* corresponded with a priori organisational factors obtained from the framework. The theme *organisational culture* was characterised by *change management* and *organisation structure* as elements that the study identified affect the culture in the organisation. The present findings show that *change management* is an important process that enables people to adapt to change in a positive way. These findings support research findings by Al-Ali et al. (2017) that *change management* is an important process that also impacts *organisational culture*.

The theme stakeholder engagement was characterised by *requirements gathering* and *information sessions*. *Requirements gathering* was found to be important and should be conducted with key stakeholders. The finding supported a study by Kesner (2008) which discovered that the process

contributes to building commitment to the BIS project. *Organisation size* was a theme described by the *number of employees* in the organisation. In addition to identifying the *number of employees* as a measure of *organisation size*, Rouhani et al. (2018b) also considered the number of employees in the IT department with the expertise to apply IT-related changes. The theme of *available financial resources* was unveiled by the subtheme budget issues that affected the adoption of IT innovations. Budget constraints have also been found to have a direct relationship with the adoption of technological innovation.

Research question 3 was what external environmental factors are perceived to influence the adoption of the visualisation and exploration BIS in the public sector organisation? The objective of the question was to examine factors in the external environment that affect BIS adoption in the organisation. Two themes emerged from the interview data, (a) *government regulations* and (b) *service provider support*. The two themes correspond with a priori environmental factors obtained from the framework.

This study revealed that policies that regulate the operating environment of the organisation must be considered when adopting technological innovations. This finding supported the study by Pan and Jang (2008) that discovered that public sector organisations are governed by regulatory prescripts which in turn affect the adoption of technological innovation. The study also identified *training and system support* as components of *service provider support*. The present findings showed that training support exposes users to the technology and provides hands-on knowledge required to consume features and functions of the BIS, supporting the findings of Grubljesic and Jaklic (2015), Woodside (2011) and Aladwani (2001) on the effects of training.

When examining the reasons why managers in the organisation perceive the identified factors are influential on the adoption of the available BIS, three themes emerged from the interview data, (a) *stimulation of employee interest*, and (b) *importance of data quality*. These findings support the findings by Işık et al. (2013) who posits that data quality is of utmost importance in many organisations that employ BIS as it also affects its success. Additionally, Chang, Hsu and Shiau (2014) found that creating quality reports on the BIS is important for the jobs of managers. Nygaard, Graversgaard, Dalgaard, Jacobsen and Schaper (2021), in their study, found that interest in technology innovation is stimulated by engaging stakeholders.

The following chapter discusses and summarises the findings while referring to the literature reviewed in Chapter 2. The results are aligned to the research questions while they are categorised according to the TOE framework that provided the lens through which this study is conducted. The suitability of the TOE framework for the BIS adoption research is also discussed.

CHAPTER 5 : DISCUSSION OF FINDINGS

5.1 INTRODUCTION

This chapter discusses and summarises the findings that emerged from the data analysis phase of this research, as presented in the previous chapter. The chapter draws from the theoretical literature of the study to interpret the findings. The findings are discussed and interpreted in relation to the research objectives and research questions. The main research objective was to explore factors that division managers perceive to be salient in influencing the adoption of the business intelligence solution available in the public sector organisation?

The research questions and related themes are presented next.

Research questions:

- RQ1: What aspects of the visualisation and data exploration BIS are perceived to influence the adoption of the BIS in the public sector organisation?
- RQ2: What organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation?
- RQ3: What external environmental factors are perceived to influence the adoption of the visualisation and exploration BIS in the public sector organisation?

The study was underpinned by Tomatzky and Fleischer's Technology Organisation Environment (TOE) framework (Tomatzky and Fleischer, 1990) which was applied previously in the adoption of IS at the organisation level (Premkumar and Roberts, 1999; Zhu *et al.*, 2006; Baker, 2012). The framework provided the lens from which adoption was studied by considering influences from the technology context, the organisational context, the environmental context as well as the reasons why the identified factors influence the adoption of BIS.

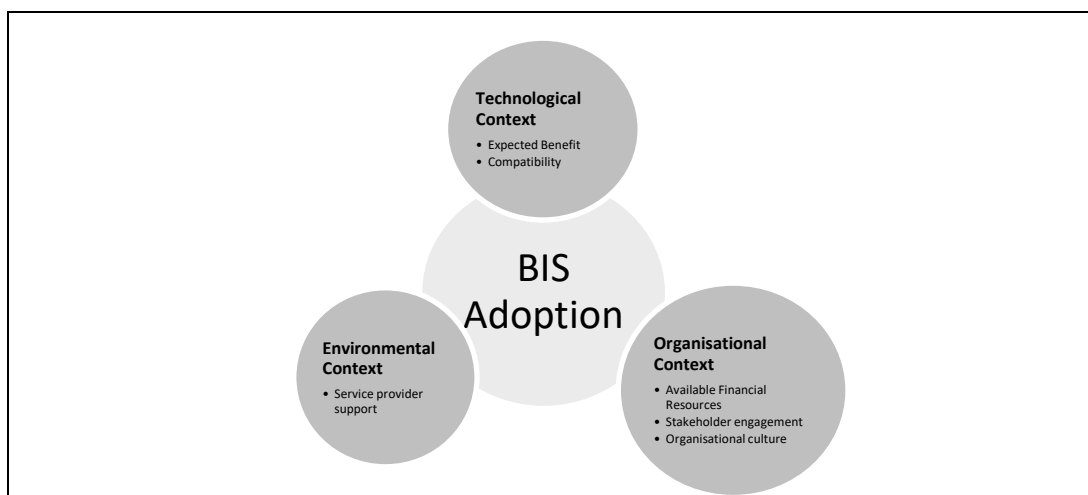


Figure 5.1-1 Final conceptual model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990

5.2 RESEARCH QUESTION 1: WHAT ASPECTS OF THE VISUALISATION AND DATA EXPLORATION BIS ARE PERCEIVED TO INFLUENCE THE ADOPTION OF THE BIS IN THE PUBLIC SECTOR ORGANISATION?

The BIS enables data exploration and converts data into useful information. Information can be visualised to create forecasts and graphs based on historical data and to provide strategic insight. It impacts organisational decisions that enable the organisation to achieve its goals and strategic objectives.

RQ1 aimed to identify and explore the aspects of the technology that are influential in the organisation in the adoption of the BIS. In the technology context of the framework *compatibility* and *expected benefits* were factors identified in the literature. These factors were expected to be important in the adoption of BIS in the organisation. Both these factors were confirmed to be applicable to this study and were corroborated by the literature.

Data integration and *performance monitoring* were aspects found to contribute to the compatibility of the BIS in the organisation. *Ease of use* and *efficient reporting* are both contributing aspects to the theme *expected benefits* from the technology; as shown in **Figure 5.2-1**. It is believed there is a close relationship between *data integration*, *performance monitoring* and *reporting* subthemes. Since data integration is considered to be an important influence on BIS adoption, it is discussed first. Performance monitoring and reporting are discussed together, while ease of use is discussed last.

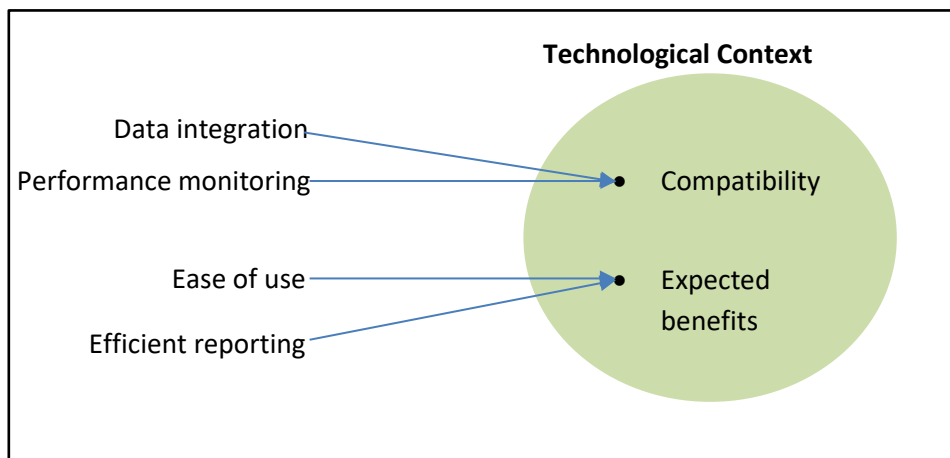


Figure 5.2-1 Contextual diagram of aspects contributing to technological factors that affect BIS adoption.

5.2.1 Data integration

Very often the data are found to be unclean, incomplete and fragmented, therefore not readily usable in BIS (Sahay and Ranjan, 2008). These data outliers have to be corrected at the source system, and data from different sources need to be integrated. Data that has not been successfully integrated and cleaned could discourage users from adopting the BIS.

Data integration is vital for BIS adoption because it links various systems and the data together to create value above and beyond what each individual system can create (Işık, Jones and Sidorova, 2013). The organisation's source documents are received in hard copy and then captured into a data management system. Outsourced service partners send data into the organisation in paper and spreadsheet format with information on the services they rendered while at the clients' sites. These

two data streams are reconciled to create a complete view of the organisation's service offerings. The reconciled data is used to determine billing for clients and to compile preliminary reports.

Middle managers verify the captured data in their areas of responsibility for completeness and accuracy. The BIS is used to check the captured data where disparities and inconsistencies are detected from exception reports of outliers. One of the senior managers confirmed that:

"Previously we had to manually check that data is accurate and that we do not exceed the threshold that is contracted. With the BIS we are able to evaluate data and evaluate whether it is accurate."

The major challenge observed was the delay in capturing and updating data from the source documents into the primary systems at the end of each reporting week. Although this is not a technological aspect, however, this delay affects the completeness and accuracy of reports from the BIS and by the same token the billing information. The reporting output has a lag period of about 10 days which makes the information not to be current, as stated by another senior manager:

"There was a lag time between the reporting system and the reality on the ground. We sometimes had to delay reporting by at least 10 days so that narrative reports are reflective of what is visible on the dashboard."

For the BIS to be fully effective in data integration it depends on data quality. When data are accurate, consistent, and can be trusted then it is regarded to be of good quality (Hartley and Seymour, 2011). The data warehouse is usually the integration point for data from distributed sources (Dayal *et al.*, 2009). However, the quick integration and data cleaning provided by the BIS is sufficient for the organisation for now.

Data integration plays a very important role in the data processing and querying effort of the organisation. Even though the data warehouse has not been implemented in the organisation at this stage, it was revealed that the organisation is employing the BIS to create visuals using data integrated from multiple sources. The capability to quickly check and clean data and integrate it for visualisation has encouraged employees to adopt the BIS in the public sector organisation. The findings in this study are confirmed by Işık *et al.* (2013) who also found that BIS seamlessly integrates with other systems and affords the organisation capabilities to integrate data. Furthermore, Mathu and Tlare (2017) also found that data integration facilitated improved adoption of information systems in organisations.

5.2.2 Performance monitoring and reporting

The BIS is very capable of generating many multidimensional business reports from the integrated data. The data are processed to generate these various reports that enable management to drill down for additional details and support them in their tactical and strategic decision-making process. Reports generated by the BIS help monitor the performance of both the operational and financial aspects of organisational activity.

Operational managers have benefited from the access the BIS has given them to graphical reports where they can view operational activities in their areas of responsibility. At the end of each week, a consolidated report is compiled for submission to division heads.

“Compiling reports used to be a tedious task. The staff were very excited about the tool since its launch. It is easier to draw reports from the system” (A2).

The reports comprise details of services requested and delivered by the outsourced service partners during the week. Operational managers rely on the data received and captured into source systems to ascertain that services that were requested by clients have been provided, the extent to which this was accomplished and if there were additions to services provided or discrepancies to what was initially requested.

The reports depict the performance of the organisation for the week of reporting. Monthly and quarterly reports are used to monitor the overall performance of the organisation. It is evident that the organisation has been able to exploit the data to draw performance information.

On the financial reporting side, the BIS provides reports that reflect the revenue generated by each division and this is compared with the services provided. Where additional services have been provided but were originally not requested, additional billing is generated for the clients' accounts.

“The BIS tool provides age analysis reports. We are able to make managerial decisions by analysing the historical data through the BIS. We are now also able to easily monitor our expenditure against revenue generation” (A6).

The Finance division reconciles the revenue collected and monitors any shortfalls for further collection or accounts that were overbilled for issuing credit notes. BIS reports assist divisions to monitor the collection rate, perform age analysis of revenue and view the financial position of the organisation.

It was found during the interviews that the BIS provides valuable reports for managers. The easy production of useful reports is also discussed in the literature. Rouhani et al. (2016) asserted that the BIS tool assists with drawing valuable reports required for use in the decision-making process. Similarly, Hočevár and Jaklič (2010) confirmed that quick and simple analyses and reports that aggregate and drill into the data can be drawn easily from the BIS. Furthermore, Wanda and Stian (2015) and Wieder et al. (2012) also confirmed that the BIS provides efficient reporting capability through fully automated and easy to use standard reports and self-service ad hoc reports.

5.2.3 Ease of use

Ease of use and user-friendliness are benefits of the BIS that were immediately visible to the early adopters of the technology. The solution only requires a basic level of knowledge and expertise that most employees already possess. One senior manager confirmed that:

“is very easy to use and has elements of self-service where a user with the appropriate access rights can even generate and share own reports on the platform” (A5).

The BIS uses preconfigured data marts and datasets that are explored to run sophisticated queries. Adopters are enabled to design their own visualisation reports, charts and graphs by selecting and running pre-programmed queries. The capability to generate own reports has been received as a significant benefit by the adopters of the BIS. Reports can be interlinked such that when querying one report the user is able to view the effects on related reports to gain complete insight from the data. Hočevár and Jaklič (2010) also describe the benefit of the BIS to be an increased autonomy and

flexibility of users to create quick and simple analyses and reports that aggregate and drill into the data. Gaining this business intelligence used to be a tedious exercise for managers.

What is interesting here is that the adopters of BIS find the tool very intuitive. Despite not being trained, many users can autonomously use the BIS to create custom visual analytic reports. These reports can be shared easily with other stakeholders in the organisation, directly from the platform. Users are also able to export their analytics to more popular formats such as PDF, Excel and JPEG images for easy use in presentations and narrative reports.

The ease of use and intuitive nature of the BIS are important contributors to the *expected benefits* of the BIS. It is clear that the use of the tool is increased by the intuitive ease of use which encourages the adoption of the BIS. There is evidence in the research literature that supports this idea. Moslehpour, Pham, Wong and Bilgiçli (2018) and Sanitnarathorn and Prajaknate (2018) have found in their studies that the less complicated and easy to use a technology application is, the more likely it will be adopted. These findings further concur with Sandema-Sombe (2019) who found that ease of use was key for users in accepting the BIS. Therefore, ease of use is important in the adoption of BIS in the organisation.

Summary of Research Question 1

The implemented BIS does not solve all the immediate data quality and integration problems but it does assist with data integration and it does definitely provide the organisation with the much needed and efficient reporting capability to make decisions and monitor organisational performance. This is certainly a factor that has encouraged the adoption of BIS in the public sector organisation.

Data integration and *performance monitoring* are traits of compatibility of the BIS. *Compatibility* is a factor identified from the technology context of the TOE framework. These traits have contributed immensely to making the solution compatible with the organisation's operations. Data integration is crucial in processing and querying data to create visualisations. This was also discovered by Işık et al. (2013) in their study that BIS integrates data from various source systems. Additionally, data integration through the BIS improved the adoption of information systems (Mathu and Tlare, 2017).

Closely related to the compatibility factor *efficient reporting* and *ease of use* are some of the *expected benefits* of the BIS technology. The BIS was found to provide quick and valuable reports for managers. This was corroborated by Hočevár and Jaklič (2010) who also found that quick and simple analyses and reports can be drawn from the BIS. Furthermore, BIS was confirmed to be easy to use and provide efficient reporting capabilities (Wieder, Ossimitz and Chamoni, 2012; Wanda and Stian, 2015). Additionally, Sandema-Sombe (2019), Moslehpour et al. (2018) and Sanitnarathorn and Prajaknate (2018) asserted that BIS was adopted by users because it is easy to use. Compatibility and expected benefits are important in the organisation in influencing BIS adoption.

5.3 RESEARCH QUESTION 2: WHAT ORGANISATIONAL FACTORS ARE PERCEIVED TO AFFECT THE ADOPTION OF THE VISUALISATION AND DATA EXPLORATION BIS IN THE PUBLIC SECTOR ORGANISATION?

RQ2 aimed to uncover aspects within the organisation that are important in the adoption of BIS. In the organisational context of the framework, *organisation size* and *financial resources* were factors identified from the literature and were expected to apply in the adoption of BIS. The factor *financial*

resources was confirmed to be applicable in this study. However, *organisation size* was found not to be important in this organisation, contrary to the majority of literature that was reviewed.

Two more factors were identified in this study: *organisational culture* and *stakeholder engagement*. Organisation culture was identified from literature but was not considered to be an important factor in the organisation at the beginning of the study. The evidence from interviews confirmed that organisational culture is an important factor in the adoption of the BIS. Stakeholder engagement is a factor that was not found in the theoretical framework to be relevant for BIS adoption. However, it was identified from the evidence as important in the organisation and was corroborated by literature. The aspects that were found to contribute to the factors in the organisational context are shown in the diagram below, **Figure 5.3-1**.

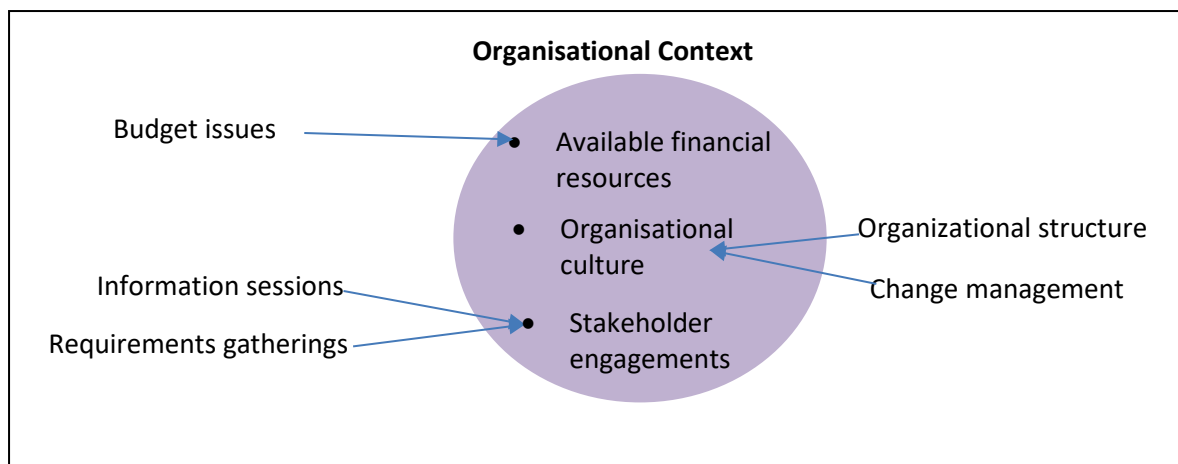


Figure 5.3-1 Contextual diagram of aspects contributing to organisational factors that affect BIS adoption.

The factors in the organisational context are discussed further in detail below.

5.3.1 Organisational size and available financial resources

Organisation size is believed to be interrelated with the *available financial resources* of the organisation. It is for this reason that these are discussed together.

Organisation size

The participants feel that the organisation is small in size when considering the number of its employees, compared to other organisations in the public service. The structure of the organisation is less complex with fewer employees in the organisation. It means there are fewer individuals to convince about new technology being adopted.

“We are a very small department. And this could have been adopted through the department as a whole” (A1).

The literature that has been consulted confirmed that the size of the organisation is often measured by the number of its employees (Rogers, 2003). Organisations that are smaller in size are expected to be agile and flexible. This viewpoint is also held by Nord, Nord and Tucker (1987) who asserted that

smaller organisations can adopt and implement technology innovations a lot faster than large organisations.

It was evident from this study that the small size of the organisation did not necessarily aid the adoption of the BIS.

“I do not think size has anything to do with the non-adoption of the BIS. The organisation has to build fluidness and flexibility when it comes to systems and ICT tools” (A3).

This was the opposite of what the majority of research studies found on this factor. Most literature shows that the size of an organisation does play an influential role in the adoption of BIS (Ramamurthy, Sen and Sinha, 2008; Boonsiritomachai, McGrath and Burgess, 2014; Rouhani *et al.*, 2018b), although other literature reviewed does show that organisation size cannot be linked conclusively with the successful adoption of IS (Lee and Xia, 2006). According to Racherla and Hu (2008), larger organisations have more resources to absorb risks; and technically skilled personnel to implement IT systems than smaller organisations, and therefore tend to adopt more IT innovations.

Despite being regarded as a smaller organisation, the expected agility and flexibility of similar-sized organisations were not obvious. It appears as though the participants expected only a larger organisation, with thousands of employees, to experience difficulty in successfully adopting a technological innovation such as BIS. However, adoption was difficult at this organisation even when the number of employees is smaller. Therefore, organisation size does not influence the adoption of BIS in this organisation. It was in fact observed that change management was a more important influence on BIS adoption in the organisation than the size of the organisation.

Surprisingly, Kotze and Mudzana (2015) found that smaller organisations equally adopt BI just as larger organisations. This suggests that organisation size does not necessarily contribute to the adoption of BIS in this organisation. This argument was also raised by Grover and Goslar, (1993) who concluded that organisation size does not influence the adoption of technologies.

One plausible explanation for this result is that smaller organisations have fewer employees and often lack in-house personnel with information system expertise. Grover and Goslar (1993) and Packalén (2010) explain that smaller organisations do not have the required expertise to facilitate the adoption of BIS. This may not fully apply to the organisation in this study, as it currently outsources the IT function to an external service provider. Interestingly, a more general observation made by Thong and Yap (1995), that smaller organisations suffer from resource deficiency, may apply in this study.

Financial resources

Small organisation size may not encourage the adoption of BIS due to the inherent budgetary constraints associated with smaller organisations. It is common knowledge that public sector organisations receive financial allocations from the national fiscus to fund their operations in the public service. Budgetary demands for important public requirements such as health, education, and social services result in limited resources available for IT innovations.

When looking into the organisation it was evident that there were budgetary limitations as not all the staff had access to licenses for the BIS. The limited available budget resources affected the

organisation-wide rollout of the BIS. Mostly the senior managers were allocated licenses and the rest of the staff did not have access to the solution.

“I think funding has been a big, big issue at the institution, especially for ICT services. So, I'm sure it's because of budgetary constraints, maybe on the ICT budget, that only a certain number of people can access it (BIS), and not every single person” (A5).

Available financial resources also have implications for the training and support for the BIS. When there is a sufficient budget for IT innovations, it would be possible for the organisation to provide the necessary training and support to the managers. Training and support are discussed in more detail below.

From observation, it was noticed that budget limitations have had huge implications on the adoption of the BIS in the organisation. The reviewed literature also corroborates the finding that there is a direct relationship between budgetary resources and the successful adoption of technological innovation (Premkumar, Ramamurthy and Crum, 1997; Rydberg and Lindh, 2004; Dennison, 2014). The same views were found by Cragg and King (1993); Boyabatlı, Leng and Toktay (2016) that constrained budgets affect IT innovation adoption.

The costs of implementing solutions such as the BIS are very expensive and organisations usually have constraints on the budget side.

“The kind of a system that you want that can be so good for the entire organisation normally depends on a good budget. So, money has been a factor too” (N2).

Evidence from the interviews reveals that the organisation faced the difficulty of balancing the high costs of implementing the technology and the constrained available budget. Literature postulates that the high costs of technology are a hindrance to adoption (Adebambo and Toyin, 2011). Similarly, Kannabiran and Dharmalingam (2012) assert that constrained financial resources are inhibitors to the adoption and use of the BIS.

Budget allocations for IT innovations impact the overall financial resources available for the adoption of BIS in the organisation. Consequently, this study has similar results to and concurs with several previous studies that reported *available financial resources* to play a pivotal role to influence the adoption of the BIS in the organisation (Duncombe and Heeks, 1999; Dixon, McAllister and Thompson, 2002).

Summary

Organisation size was a factor expected to be applicable in the adoption of BIS in the organisation, with adoption being more likely in smaller organisations. However, the organisation in this study is regarded as smaller and the results show that organisation size did not influence the adoption of BIS as suggested in previous studies. An explanation for the contrasting result may be the lack of IT expertise within the organisation to facilitate the adoption of BIS supporting the previous studies by Grover and Goslar (1993) and Packalén (2010). In addition, budget allocations for smaller organisations are constrained and thus adversely impact the influence of *organisation size*.

Available financial resources are required by organisations to adopt and implement innovations. Previous studies by Duncombe and Heeks (1999); Dixon, McAllister and Thompson (2002) indicate that available financial resources affect the adoption and roll-out of IT innovation such as BIS in the organisation. It is evident that *available financial resources* are an important influence on the adoption of BIS in the organisation.

5.3.2 Organisational culture

Organisational culture was not originally considered a factor, but participants recognised its importance in the adoption of BIS. The culture of the organisation is an integral part of change management. It is very broad and diverse, covering external and internal relationships, and it subtly influences individual decisions and actions in the organisation (Martin and Siehl, 1983). It is important to understand the culture and the interactions between employees within the organisation.

Culture changes when there are interactions and responses and forms a life of its own (Zhu, 2000). Organisational culture is impacted by *organisation structure* and *change management* which were uncovered from the evidence. These contributors are discussed below.

Organisational structure

The organisation is currently centrally configured and the decision-making authority is vested with a few individuals in management. What is challenging about this organisational structure is that it does not create an environment where the majority of employees can participate in decision making. Furthermore, there is less communication between employees which contributes to the silo culture that has been observed in the organisation.

“Generally, the organisation is so in silos... that if you bring a system, that tries to project information for the entire organization, it's not the entire organization that will buy into it” (A4).

It was evident that the organisation is perceived as being fragmented.

“what you are dealing with is an organisation that is very fractured and fragmented” (N3).

Participants identified the fragmented nature of the organisation as a factor influencing the delegation of responsibility for BIS tools, which would then influence adoption. Literature, on the other hand, discusses an indirect influence in that the structure of the organisation influences the culture within and has an effect on the management of change. Janićijević (2013) supports this idea in their finding that organisational structure influences organisational culture and can strengthen or even change it.

According to Farkas (2013), alterations in the organisational structure are necessary for change to be achieved. This idea is supported by Wells, Rozenblum, Park, Dunn and Bates (2015) who also feel that establishing support substructures in the organisation will enable adopters of technology to adjust during the change process and will help management to monitor and address concerns that may arise and solve potential change management problems. This encourages staff to be more communicative, engaged, and willing to share and acquire knowledge from other colleagues in these substructures. Saghafian, Laumann and Skogstad (2021) found that an organic organisational structure is the most suitable during times of change and the adoption of technology. Evidence in the literature, therefore,

indicates that the structure of the organisation influences the culture within and the management of change. Since, as discussed in the next section, change management has been found by this study to have an influence on BIS adoption, it can be inferred that organisational structure ultimately influences BIS adoption.

Change management

The organisation has undergone a few leadership and structural changes in the recent past. These developments have affected the staff and caused a lot of anxiety and uncertainty. The literature that was reviewed has indicated that every organisation goes through a transition at a point in its lifecycle (Yeoh, Koronios and Gao, 2008). Moreover, the world is consistently changing, thereby, organisations should anticipate and be receptive to continuous change or emergent change.

There are typically two types of changes that an organisation can experience. The organisation experienced both *planned change* and *emergent change*. The introduction of the BIS was a planned change, with a structured execution method of implementation. However, during the implementation of this solution, it was evident, from the participants' point of view, that the organisation was also experiencing emergent change. Emergent change is unplanned, happens naturally in an organisation and is continuous and pervasive (Burnes, 2004). This includes how employees react to the changes in the organisation. Emergent change requires staff to be adaptive and responsive and often affects the culture of the organisation.

The planned change, to implement the BIS, meant that new work practices were introduced to improve the overall performance and efficiency of the organisation.

"I do not think people have adopted the BIS as widely as they could. Most staff still choose to come to me for assistance with accessing business reports. They know the information is there and where to access it. I believe it is a change management issue" (A5).

There were expectations that employees would automatically accept the implementation of the new BIS. It was evident from the interviews that the introduction and implementation of the BIS were not complemented by any change management initiatives as the emergent change was also occurring at the organisation.

Literature confirms that change management deals with approaches to managing change where people and resources are concerned in an organisation (Al-Ali *et al.*, 2017). The effort to introduce new processes and technologies such as the BIS requires all employees to participate in the change (Yeoh, Koronios and Gao, 2008). Furthermore, Metre (2009) asserts that managing change is interlinked to and dependent on the culture of the organisation.

The participants emphasised the importance of change management in the organisation for the adoption of BIS. Change management creates awareness and motivates employees to embrace and accept change while addressing the feelings of anxiety and uncertainty that develops amongst the staff. It appears as though the adoption of BIS in this organisation was influenced by both the planned change of implementing the BIS and the emergent change of leadership that occurred at the same time, since, due to the emergent change, there was no change management process employed to facilitate the planned change.

Summary

The structure of the organisation was observed to influence the culture within. This was also discovered by Husain (2015) in their study of the relationship between organisational structures and culture. Furthermore, the organisational structure has been found to contribute to the effort of managing change in the organisation (Wells *et al.*, 2015). Successful organisational change management is dependent on the prevailing structure as asserted by Metre (2009).

Organisational culture is a factor that was initially not considered applicable at the beginning of this study. It emerged during interviews, however, that *change management* is important in the adoption of BIS as it motivates employees to embrace and accept change. In addition, *organisational structure* impacts *change management*, as the fragmented structure of this organisation has affected the management of change and has thus impacted the adoption of BIS. Since both *change management* and *organisational structure* are important contributors to *organisational culture*, it is evident that *organisational culture* is an important influence on the adoption of BIS in the organisation.

5.3.3 Stakeholder engagement

It was clear from the evidence that stakeholder engagements are of the utmost importance. The stakeholders in this context are employees of the organisation who are potential adopters of the BIS. Engagement with stakeholders was identified as one of the important factors in the adoption of BIS. This is substantiated in the literature by Kannabiran and Dharmalingam (2012) who feel that a simple awareness when there are significant changes imminent in the organisation is not enough.

A successful adoption depends on the support and involvement of stakeholders throughout the cycles of implementation. This was corroborated in the literature by Yeoh *et al.* (2008) who say that the stakeholders provide contributions that add value to the technology adoption effort in the organisation. The participants of the current study feel that when employees are engaged and involved in organisational processes such as the adoption of BIS, it also contributes to the change management process, which, as discussed above, is important for BIS adoption.

The stakeholders can be engaged in two different ways, by holding *information sessions and gathering requirements*. During the implementation of the BIS, there were limited *stakeholder engagements* and awareness across the organisation. The implementation of new technology has implications for the affected stakeholders who have conflicting expectations.

Information sessions

It was evident that management in the organisation had acquired a number of technological tools without the rest of the staff being aware or involved. Information sessions were identified by participants as crucial and yet there were too few of these taking place. In the literature reviewed, it has been suggested that when implementing technology projects such as BIS, all business units of the organisation should be consulted to contribute to the process of adoption. Furthermore, it was evident that merely creating awareness about developments in the organisation is not sufficient for the adoption of technology and Kannabiran and Dharmalingam (2012) concur in their study.

Holding information sessions is meant to create a platform to demonstrate and present the new BIS tool to the employees. The staff is also given an opportunity to be involved in the process of building and acquisition of the new technology.

“I think information sharing sessions need to be held with the staff, to inform them about all these available tools. Because it's not only the BIS. There's a number of other tools, which are not known” (A2).

When the employees are not involved in all the adoption stages of the BIS there is less likelihood of commitment to the technology (Mostert-Phipps, Pottas and Korpela, 2013). Exposing the employees to education and information about the tool, its perceived benefits and its relevance in the organisation would stimulate interest in the tool.

Information sessions are regarded as important by participants because they would help to identify all relevant stakeholders in the organisation to be engaged during the implementation of the BIS project. A study by McIntosh et al. (2011) also confirmed the need to embrace stakeholders throughout the design and development process. The need for relevant training interventions for the identified stakeholders can be determined from engagements with the employees.

The introduction of new technologies brings about anxiety and uncertainty among employees (Pfaffinger, Reif, Spieß and Berger, 2020). The feelings of anxiety, uncertainty about job security and redundancy were caused by a lack of information about impending changes in the organisation.

“The lack of communication to staff and lack of knowledge about upcoming technologies, coupled with the organisation's perpetual restructuring, has created a lot of uncertainty amongst the staff” (N3).

Information sessions would also contribute to the process of change management which is critical when introducing new technologies or new methods of working. This ties with the theme of *change management*, which is discussed earlier.

Therefore, information sessions are a critical part of the stakeholder engagements. Furthermore, they can be used as precursors to one of the lifecycle stages of the BIS project which is the gathering of requirements from stakeholders.

Requirements gathering

Given the vast functional possibilities of the BIS application, it is not surprising that requirements gathering was identified as one of the most important issues in the organisation.

“when you want to implement something new you normally gather user requirements to capture what it is that users want out of a new technology” (A1).

It was also found in the literature that requirements gathering is a best practice activity when planning to implement an IS project such as the BIS (Woodside, 2011).

What is interesting to observe is the overlap between information sessions and the requirement gathering exercises. These two appear to feed off each other. In other words, information sessions

complement requirements gathering and vice versa. Astrix (2018) observed that comprehensive requirements gathering encourages user adoption of BIS through engagement and communication.

What was clear from the evidence is that different stakeholders have different needs and expectations from the BIS. Gathering requirements assist in understanding the reasons the system is being implemented, what the organisation needs the system to do, what are the expected benefits from implementing the system as well as the efficiency gains anticipated (Astrix, 2018). This is a crucial exercise as non-adopting participants reported that their requirements were not considered during the current implementation.

“Senior managers only were consulted to gather requirements. I am not aware of the other levels were engaged for this exercise” (A6).

Requirements gathering would also lead to the discovery of other possible data sources and integration potentials with other systems in the organisation.

Furthermore, the activity of *requirements gathering* provides an all-important opportunity for stakeholders to play a role in building a solution that would impact their working environment and methods. During this process, employees identify their needs for functionality from the system in order to fulfil business priorities. It is also important to distinguish between perceived needs and real needs that the BIS is intended to address. The literature revealed that requirements gathering would help eliminate any ambiguity and manage stakeholder expectations as the project progresses (Mitre, 2013).

It is worth cautioning that stakeholders may reject the BIS initiative if they are not engaged in the requirements gathering. Kesner (2008) also emphasized this viewpoint, saying that the BIS may end up being an expensive and underutilized project that does not meet the needs of the organisation. Interestingly though, Lehtinen, Aaltonen and Rajala (2019) found that not all the stakeholder requirements can be met to the same extent in the BIS initiative project due to prioritisation and compromises. Additionally, Reiter et al. (2019) in their study, found that the best strategy for requirements gathering should be a combination of both broad and limited stakeholder engagement. It has also been stated in the literature that requirements gathering can encourage commitment to the BIS project by stakeholders.

During the interviews, it emerged that *information sessions* are important for identifying and engaging stakeholders. Additionally, *information sessions* have an impact on *requirements gathering* as they provide the opportunity for stakeholders to contribute to the building of solutions that affect their working environment. Both *information sessions* and *requirements gathering* are, evidently, key contributors to *stakeholder engagement*, therefore *stakeholder engagement* is an important influence on the BIS adoption in the organisation.

Stakeholder engagement was initially not considered as important in the adoption of BIS. The literature reviewed, that used the TOE framework in BIS adoption, does not mention it as an important factor. A study by Nygaard et al. (2021) on developing technologies and innovation revealed that stakeholder engagement is very key to the success of a technology project. It has also been found that it leads to less resistance and easier implementation of projects (van de Kerkhof, 2006).

Summary of Research Question 2

Available financial resources and *organisational size* were factors selected from the organisational context of the framework at the beginning of the study. These factors were expected to be applicable in the adoption of BIS. However, only *available financial resources* was confirmed to be influential in the adoption of BIS and *organisation size* was found to not be important. Two additional influences were also uncovered as very important in the adoption of BIS, namely *organisational culture* and *stakeholder engagement*. *Organisational culture* is regarded as the most important as it influences the structure and change management.

The *available financial resources* are a factor that plays a pivotal role in the adoption of BIS. Literature suggests that there is a strong relationship between financial resources and the successful adoption of technological innovation (Premkumar, Ramamurthy and Crum, 1997; Rydbjörk and Lindh, 2004; Dennison, 2014). Furthermore, Dixon et al. (2002) and Duncombe and Heeks (1999) support this idea, saying that the *availability of financial resources* strongly influences the adoption of BIS in the organisation.

Organisation size is a factor that was found as not influential in the adoption of BIS in this organisation. This factor was identified from the organisational context of the TOE framework and is expected to be an important influence in the adoption of BIS. However, the organisation in this study is regarded as smaller and lacking the required expertise to facilitate the adoption of BIS. The findings show that organisation size does not influence the adoption of BIS as suggested in the literature. Previous studies also suggest that smaller organisations lack internal personnel with adequate IT expertise to facilitate the adoption of BIS (Grover and Goslar, 1993; Packalén, 2010).

Organisational culture is a factor that influences BIS adoption in the organisation. Although it was initially not considered to be applicable for this study, it was found to be important and is affected by the structure of the organisation and the management of change, therefore *organisation culture* is applicable in the adoption of BIS in the organisation. Al-Dmour et al. (2017) concur that organisations should pay greater attention to organisational culture when adopting ICT innovations.

Stakeholder engagement is an additional organisational factor uncovered in this study as important in the adoption of the BIS. This factor was not considered as important at the beginning of this study because the literature consulted on BI adoption does not make mention of stakeholder engagement within the TOE framework. However, the author now also understands that *stakeholder engagement* is relevant in BI adoption due to assertions by Hartman and Ashrafi (2002) that adoption and acceptance of the innovation by stakeholders is fundamental. Similarly, Nygaard et al. (2021) have found that stakeholder engagement was a key component in their project's success.

Information sessions are important to initiate engagement and create awareness and *requirements gathering* is important in defining how and what the BIS solution would look like and the needs it will address. Mostert-Phipps et al. (2013) emphasized that the adoption of BIS depends on the support and involvement of stakeholders. The two methods discussed, *information sessions* and *requirements gathering*, were clearly relevant in the engagement of stakeholders, and it is evident that *stakeholder engagement* is very influential on the adoption of BIS in the organisation.

5.4 RESEARCH QUESTION 3: WHAT EXTERNAL ENVIRONMENTAL FACTORS ARE PERCEIVED TO INFLUENCE THE ADOPTION OF THE VISUALISATION AND EXPLORATION OF BIS IN THE PUBLIC SECTOR ORGANISATION?

RQ3 aimed to uncover aspects from the external environment that are applicable to the organisation in the adoption of the BIS. At the beginning of this study *service provider support* and *competitors* were factors selected from the environmental context of the framework expected to influence the BIS adoption. During the gathering of evidence, it became clear that *competitors* were not applicable for this study as originally anticipated. Thereafter, the factor *government regulations*, also identified from the environmental context of the framework, was seen to be more applicable in this study and was selected to replace *competitors*.

The factor of *service provider support* was confirmed to be applicable in the adoption of BIS in the organisation, as shown in **Figure 5.4-1**. However, *government regulations*, even though they guide organisations in the adoption of technological innovation in general, do not influence the adoption of BIS. These factors are discussed in detail below.

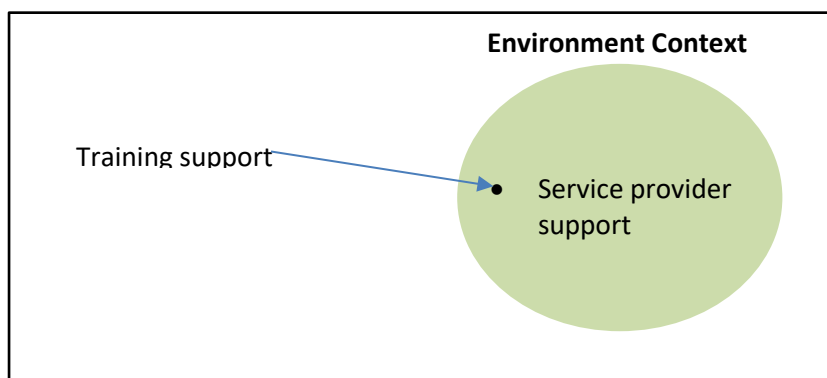


Figure 5.4-1 Contextual diagram of the aspect contributing to the environmental factor that affects BIS adoption.

5.4.1 Government regulations

The public sector is regulated by policies and prescripts. All organisations in the sector have to follow and adhere to these rules. It has been revealed by participants that at times the prescripts may be a challenge to innovation in an organisation. The technological environment has evolved over the years and the public sector is yet to catch up.

The prescripts that public sector organisations are governed under have been shown to affect the adoption of technology innovations such as eCommerce and ERP (Pan and Jang, 2008). Oliveira et al. (2014) assert that the government has the power to discourage or encourage the adoption of technologies through its regulations. Progressive technology frameworks and guiding principles would enable organisations to develop and adopt innovations that enhance government services to the public (Xu, Kevin and Gibbs, 2004).

The literature has shown that *government regulations* have an effect on the adoption and implementation of technology in general (Xu, Kevin and Gibbs, 2004; Kyobe, 2009; Monsreal-Barrera, Cruz-Mejia, Ozkul and Saucedo-Martínez, 2020). In contrast, Hamade (2009), asserts that *government regulations* and rules have been the reason for the lack of adoption of ICT. From the interviews, it was established that *government regulations* have to be adhered to, but these regulations do not influence the adoption. Ramirez-Madrid, Escobar-Sierra, Lans-Vargas and Hincapie (2022) support this idea

when they say that government should create a regulatory framework that removes legal barriers to adopting technology. Therefore, government regulation does not have an influence on the adoption of BIS in the organisation.

The primary reason established that regulations do not influence adoption is that government publishes regulations and frameworks to provide guidelines, principles and practices within which organisations should operate and comply. In the literature that was consulted, there is no mention of regulations that influence the adoption of BIS specifically. Instead, government literature reveals the purpose of ICT regulations is to regularise and institutionalise corporate governance (DPSA, 2012).

5.4.2 Service Provider Support

Support from the service provider includes technical assistance and training. The organisation does not have internal staff to provide technical support. The IT function has been outsourced to an external company that provides support on all technical issues in the organisation. The participants feel that training is the most important support they require from the vendor that implemented the BIS.

The initial adopters of the solution received training exposure when the solution was implemented. During the period of implementation, the vendor was located on-site in the organisation. It is clear that training and support were within easy access and the first cohort of managers benefited the most from that. When potential adopters are trained, they gain hands-on exposure to the solution and develop positive attitudes as they appreciate the BIS quality attributes and potential benefits (Aladwani, 2001).

After the initial implementation phase, however, it was evident that training on the BIS was a major challenge in the organisation. Most of the employees were not trained on the solution. Potential adopters are discouraged by the lack of training or intimidated by a new technological innovation.

“I was never trained and I taught myself. The next person may not be comfortable enough to try out the solution with the fear to mess up the data. So, people would stay away and not adopt the solution” (A2).

The different levels of IT expertise segregate employees into different categories when it comes to trying out new technologies. Mostert-Phipps et al. (2013) asserted that inadequate training on the technology may lead to resistance to adoption and affect the motivation to use the BIS. Some employees were confident to learn the BIS by trial and error while others avoid the risk of “breaking the system” and elect not to adopt the tool at all.

It appears as though the training situation has improved in the organisation in recent times. The IT division has taken initiative to solicit training for the majority of the employees, particularly administrative staff. This initiative is expected to yield positive outcomes and encourage the adoption of the BIS.

It emerged during the interviews that *training* is an important aspect of *service provider support*. One participant also noted that knowledge helps with changing the mindset of employees to embrace change. The evidence confirms that *training support* is very important in the organisation for BIS adoption. Certainly, there’s already enough evidence in the research literature to support this idea.

Grubljesic and Jaklic (2015), Reiter et al. (2019) and Woodside (2011) have expressed that training and education support are key in enhancing knowledge, increasing motivation and exposing the benefits of the BIS to stakeholders to encourage adoption. *Service provider support* is an important influence on the adoption of BIS in the organisation.

Summary of Research Question 3

Competitors were a factor, selected from the environmental context of the framework, which was initially considered to be important at the beginning of this study. During the interviews, it emerged that competitors were not relevant in the context of this organisation. *Government regulations* were a factor identified to replace *competitors* in this study. However, *government regulations* do not influence the adoption of BIS because they provide guidelines, principles and practices that organisations must comply with. Literature concurs with the idea that *government regulations* should remove legal barriers to adopting technology (Ramirez-Madrid et al., 2022).

Service provider support is an important factor that affects the adoption of BIS in the organisation. Training and support that is provided to the organisation encourages adoption and exposes the benefits of the BIS to the stakeholders, as supported by Grubljesic and Jaklic (2015), Reiter et al. (2019) and Woodside (2011).

5.5 REASON WHY THESE IDENTIFIED FACTORS INFLUENCE THE ADOPTION OF BIS?

The following factors from the TOE framework were found to be applicable in the adoption of BIS in the organisation (1) *expected benefits*, (2) *compatibility*, (3) *organisational culture*, (4) *stakeholder engagement*, (5) *available financial resources*, and (6) *service provider support*.

After analysing interview data, it became clear that many of these factors were perceived by senior managers to influence BIS adoption because they felt that *user interest needed to be stimulated*, and they recognised the *importance of data quality*.

5.5.1 Stimulation of employee interest

Technological innovation is introduced in an organisation to assist in achieving and fulfilling goals and mandates that are being pursued. When an information system is introduced in the organisation, not all employees adopt it. It has been revealed in research that it is very important for the employees of an organisation to adopt systems and tools to get the most value from technology (Kamal, Weerakkody and Irani, 2011).

In this organisation employees that adopted the BIS indicated during the interviews that their interest in the solution was stimulated at the beginning of the project. The need to stimulate employee interest was the main reason why each of the following factors were identified as being important in the encouragement of BIS adoption.

The participants felt that *information sessions* that were held to consult about the adoption of the BIS in the organisation sparked the initial interest. The employees had an opportunity to view what the BIS was all about and this also created a sense of involvement in the adoption process. This idea was also found in a study by Mostert-Phipps et al. (2013) that the involvement of employees in the adoption stages stimulates interest and commitment to the technology.

The benefits and capabilities of the solution and its relevance to the organisation were presented during these *information sessions*. The participants felt that these sessions were important as they assisted in identifying all the relevant stakeholders affected by the BIS. McIntosh et al. (2011) found in their study that stakeholders should be involved in the entire process of developing the solution. Therefore, *information sessions* contribute to stimulating interest in adopting the BIS in the organisation.

Participants identified certain other requirements they wished the BIS could address in the organisation. The involvement of employees in *requirements gathering* sessions was found to be invaluable for the process of adopting the BIS in the organisation. Woodside (2011) postulates that requirements gathering is an exercise that follows best practices when developing new solutions. Even though not all user requirements can be met in a project, the involvement of employees in the process has certainly aroused an interest in the BIS. This idea is supported in a study by van de Kerkhof (2006) who found that involving employees in technology projects leads to less resistance. It is clear that *requirements gathering* contributes to developing an interest in the solution.

The participants have further revealed that they developed more interest in the BIS upon receiving *training* on the solution. It has been found in this study that training is an important aspect that also contributed to changing the mindset of employees to embrace change. It was also found in the literature that *training* increases the motivation of employees to adopt the BIS (Woodside, 2011; Grubljesic and Jaklic, 2015; Reiter, Meyer and Parrott, 2019). Training is another contributing factor found to stimulate employee interest in the BIS.

Change management has been cited by participants as an important contributing factor that stimulated their interest in the BIS. It is found in this study that it motivates employees to embrace change. A study by Al-Ali et al. (2017) confirmed that *change management* is important in dealing with change that involves employees in the organisation. This is the reason that change management was found to be a factor that affects the adoption of BIS in the organisation.

The objective of stimulating employee interest, therefore, was an important reason behind the choice of several of the factors that affect BIS adoption.

5.5.2 Importance of data quality

The second most important reason that the participants revealed for the choice of factors influential in the adoption of BIS is the importance of data quality in the organisation. There is a big dependency on quality data as the organisation has to produce high-quality reports. This finding concurs with Wieder et al. (2012) who also found that the quality of data in the BIS also strongly influences the quality of managerial decisions.

The organisation processes data that originates from various sources and it must be integrated successfully to have good data quality. This important process of cleaning and integrating data was also confirmed by Işık et al. (2013) in their study which found that integrated good quality data adds value to the BIS more than an individual system. Hartley and Seymour (2011) posit that data that is accurate and consistent can be regarded to be of good quality.

The BIS is used in the organisation to integrate data and also to detect data inconsistencies after integration which have to be corrected to ensure good quality data. It is thus considered to be compatible with the organisation in terms of data integration. For this reason, and because data quality is of optimum importance, data integration has been recognised by the employees as crucial in the adoption of the BIS.

Summary of reasons

This study found three main reasons why employees perceived the identified factors were influential in the adoption of BIS. The *stimulation of employee interest* in adopting the BIS is the first reason perceived to be very important.

Interest in the BIS is stimulated by holding *information sessions* that disseminate information about the solution. Employees are afforded an opportunity to be involved in the adoption process and see the benefits and capabilities of the BIS. This was supported by McIntosh et al. (2011) that employee involvement in the adoption stages stimulates interest and commitment to the technology. Furthermore, involvement in *requirements gathering* also stimulates employee interest as they enlist their requirements and expectation in the system. The finding concurs with the study by van de Kerkhof (2006) who also found there is less resistance when employees are involved in the technology project. *Training* in the system increased knowledge about it and motivated employees to adopt the BIS. This aspect contributed to stimulating interest in the solution. Similarly, it was revealed that *change management* encouraged employees to embrace change by adopting a new solution in the organisation. These aspects were found to be contributing to *stimulating employee interest* in the BIS.

The second reason perceived as very important is the *importance of data quality*. The managers in the organisation are required to integrate and process data from various sources and systems. This involves verifying it for completeness and accuracy to ensure it is of good quality. Consistent with the finding in this study, Wieder et al. (2012) postulate that the quality of data affects the quality of managerial decisions in the organisation.

5.6 REFLECTION ON THE TOE FRAMEWORK

This study utilised the adoption framework known as the Technology, Organisation and Environmental (TOE) originated by Tomatzky and Fleischer (1990). The framework is considered a suitable model for this study since it provided the lens from which the different contexts affecting BIS adoption can be viewed to address the research problem. This position is supported by Grubljesic and Jaklic (2015) who asserted that organisations considering adopting BIS should focus on factors that influence its adoption.

The framework has been employed extensively in previous research that focused on the adoption of IS at an organisational level as postulated by Baker (2012), Premkumar and Roberts (1999) and Zhu et al. (2006). Furthermore, Malladi (2013), Pool et al. (2018) and Rouhani et al. (2018b) used the framework as a lens to study the adoption of BIS at an organisational level. Drawing from the literature, the framework provided a firm underpinning on which this study was based.

The TOE is a versatile tool of enquiry and has evolved over the years (Ngidi, 2019), and it does not assume the prevalence of any context in understanding IS adoption, but there appears to be a serious

emphasis on organisational conditions in this study. The theoretical framework has assisted to test data and uncover factors that are important and influencing the adoption of BIS in the public sector organisation.

Most of the factors in this study were identified from the original TOE model. The factors from the three contexts of the framework assisted in formulating the research questions that were used for data collection for this study; and resulted in informative findings for addressing the research question. Guided by the TOE framework, the researcher was able to interpret and discuss the findings and how the identified factors influence the adoption of BIS in the South African public sector organisation. However, stakeholder engagement was an additional influential factor that was discovered in this study which could be included in the TOE framework. The framework was not successful in guiding the study to discover reasons as to why these factors are perceived as important in the adoption of the BIS.

This study has given further evidence that the TOE framework is a valid and appropriate model and it can be considered for studying BIS adoption in the public sector as it has assisted the researcher to achieve the objectives of the study.

5.7 CHAPTER SUMMARY

This chapter discussed and summarised the findings of the study. The findings were interpreted by drawing from literature to gain insights. The findings were aligned to the research questions and congregated according to the TOE theoretical framework. A reflection on the applicability of the theoretical framework was done. **Table 5.7-1** below lists all the findings aligned to the framework.

Table 5.7-1 Summary table of findings

TOE alignment	Factors	Findings
Technology	Compatibility	Affects adoption
	Expected benefits	Affects adoption
Organisation	Available financial resources	Affects adoption
	Organisational culture	Affects adoption
	Stakeholder engagements	Affects adoption
Environment	Service provider support	Affects adoption
	Government regulation	Does not affect adoption

Compatibility and *expected benefits* were found to be important and influential to the adoption of BIS in the technological context of the public sector organisation. While *available financial resources* were found to affect the adoption of BIS in the organisational context, the *size of the organisation* does not influence adoption as initially anticipated at the beginning of the study. The shortage of employees with technical expertise was the reason that seems to have an impact.

Organisational culture emerged as an important factor although it was not initially considered as relevant for this study. Similarly, *stakeholder engagement* is a new organisational factor discovered to be important in the adoption of BIS. In the environmental context, *service provider support* was found to play an influential role in the adoption of BIS. *Government regulation* was discovered to not

influence the adoption of BIS as it provides principles and guidelines with which organisations must comply. This factor was considered in this study after replacing the initial factor *competitors*. During the interviews, it emerged that *competitors* were not relevant in the organisation on which the study was based.

The following chapter concludes this research with a summary of the study, a revisit of the research questions, a summary of the study contributions, a discussion of the study limitations and recommendations for future research.

CHAPTER 6 : CONCLUSION

This chapter presents the conclusion drawn from the study. The research questions are revisited, the study findings are summarised, and the study limitations are discussed. Finally, the contributions and recommendations for future research are presented.

6.1 OVERALL SUMMARY OF THE STUDY

An analysis of the literature revealed a gap in knowledge about the factors that influence the adoption of BIS in a public sector organisation in South Africa. The study sought to uncover factors that are influential in the adoption of BIS in a public sector organisation in South Africa, and to explore reasons for the importance of these factors.

The study proposed a conceptual model based on the Technology Organisation Environment (TOE) framework by Tomatzky and Fleischer (1990). The initial factors of the research model were formulated from the literature review. The initial research model consisted of two factors from each of the three contexts of the framework. Technology context: expected benefits and compatibility; organisation context: the size of the organisation and available financial resources; environmental context: competitors and service provider support.

This research followed an instrumental case study approach where data was collected through interviews with participants. The research questionnaire was revised according to feedback obtained from the initial interviews. The questions enquiring about the factor *competitors* were replaced with questions about *government regulations* as it emerged that the *competitors* factor was not applicable in the organisation. The data was analysed following both the inductive and deductive data analysis methods to discover and code emerging themes. In addition to the a priori themes, two additional themes *stakeholder engagement* and *organisation culture* emerged within the organisational context.

The findings revealed that expected benefits from the technology and its compatibility are important for the adoption of BIS. Within the organisation, stakeholder engagement, organisational culture, and available financial resources were found to be important and also supported in literature while service provider support was crucial in the BIS adoption from the environmental context. Size of the organisation and government regulations were found not to be influential in the adoption of BIS in the public sector organisation.

This study also found that the *stimulation of employee interest* and the *importance of data quality* were perceived as the most important reasons that influence the adoption of BIS in the public sector organisation.

6.2 RE-VISITING THE RESEARCH QUESTION

This section reflects on the research questions and how they were answered. The answers contribute to achieving the overall purpose of the study which was to address the main research question: *What do division managers perceive as salient factors that affect the adoption of the visualisation and data exploration BIS in the public sector organisation?*

To address the main research question, the following research questions were identified and investigated. A summary of the answers to these research questions is presented below:

RQ1: What aspects of the visualisation and data exploration BIS are perceived to influence the adoption of the BIS in the public sector organisation?

This research question was intended to identify and explore the aspects of the technology that are influential in the organisation in the adoption of the BIS. Two factors identified from the technology context of the framework were expected to be important in the adoption of BIS in the public sector organisation.

Findings from RQ1 showed that the *expected benefits* from the technology and its *compatibility* with the organisation are influential factors that affect the adoption of BIS in the public sector organisation. **Figure 6.2-1** depicts the factors in the technology context of the modified conceptual framework.

RQ2: What organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation?

This research question intended to uncover aspects within the organisation that are important in the adoption of BIS. From the organisational context of the framework, the *size of the organisation* and *available financial resources* were factors identified from the literature and were expected to apply in the adoption of BIS.

Findings from RQ2 confirmed that *available financial resources* was an important factor influencing adoption. However, the *size of the organisation* was found not to be important in this organisation, contrary to the majority of literature on IS adoption, because smaller organisations lack the critical technical expertise required for BIS adoption. Furthermore, *organisational culture* and *stakeholder engagement* were found to affect adoption in the public sector organisation. *Organisation culture* was originally identified from literature but was not considered to be an important factor in the organisation at the beginning of the study. The evidence from interviews confirmed that organisational culture is an important factor in the adoption of the BIS. *Stakeholder engagement* is a factor that was not mentioned in the theoretical framework to be relevant for BIS adoption. However, it was identified from the evidence as important in the organisation and was corroborated by literature. The factors that were found to answer this research question are depicted in the organisational context side of the modified conceptual framework in **Figure 6.2-1**.

RQ3: What external environmental factors are perceived to influence the adoption of the visualisation and exploration of BIS in the public sector organisation?

This research question intended to uncover aspects from the external environment that are applicable to the organisation in the adoption of the BIS. At the beginning of the study *service provider support* and *competitors* were factors selected from the environmental context of the framework, expected to influence the BIS adoption. During the gathering of evidence, it became clear that *competitors* were not applicable for this study as originally anticipated. Thereafter, the factor *government regulations*, also identified from the environmental context of the framework, were seen to be more applicable in this study and was selected to replace *competitors*.

Findings from RQ3 revealed that *service provider support* contributes immensely to the adoption of BIS. *Government regulations* were also found not to influence the adoption of BIS because they provide guidelines, principles and practices with which organisations must comply. The factor that

influences adoption in the environmental context is depicted in **Figure 6.2-1** of the modified conceptual framework.

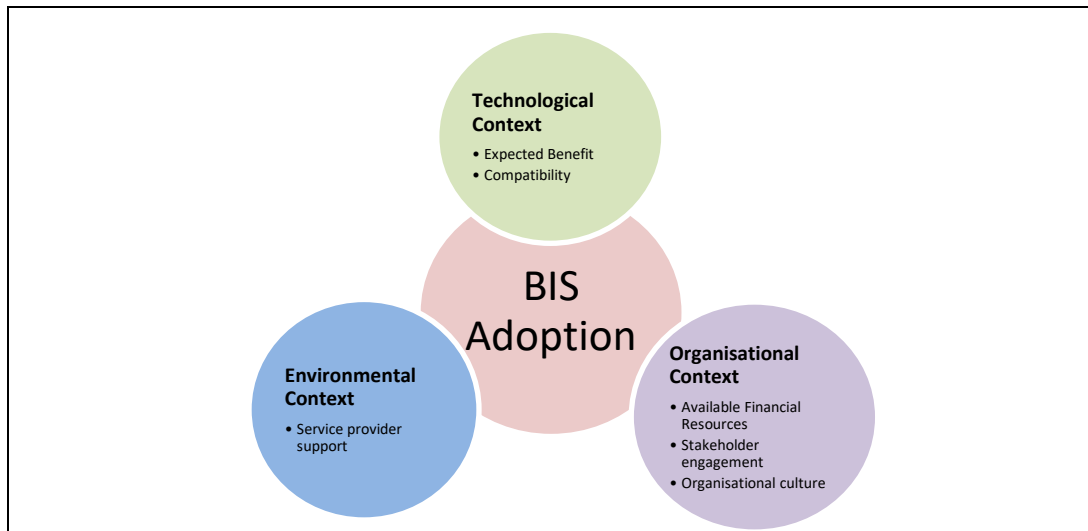


Figure 6.2-1 Final modified conceptual model of factors affecting BIS adoption – adapted from Tomatzky and Fleischer, 1990

Stimulation of interest in the BIS is the underlying reason for information sessions, requirements gathering, training, and change management being considered important influencers for adoption in BIS. The *importance of data quality* that is processed by the BIS is another reason that was revealed by the respondents as important in choosing factors that influence adoption. Lastly, *the need for high-quality reports* that the organisation has to produce from the BIS was another reason perceived as very influential in the adoption of the BIS.

The general observation from this study is that the identified factors should be considered by public sector organisations to improve the adoption of the BIS. Similarly, the important reasons influencing the adoption should be taken heed of.

6.3 CONTRIBUTION TO THEORY

This study has contributed to the improvement of theory by extending IS literature on BIS adoption. This has been achieved by testing the TOE theoretical framework in the South African context of BIS adoption. Adoption factors have been researched previously, however, the majority of studies focused on various applications and technologies, not BIS specifically (Puklavec, Oliveira and Popovic, 2014; Rouhani *et al.*, 2018).

This study adds to the body of knowledge by extending the use of the Technology-Organisation-Environment framework Tomatzky and Fleischer (1990) as suitable for the study of BIS adoption in the context of the South African public sector. The researcher found no prior studies that focused on factors affecting the adoption of BIS in a public sector organisation.

Furthermore, the study has contributed by uncovering the factors that influence the adoption of BIS in the South African public sector context.

Contrary to the majority of literature on IS adoption (Grover and Goslar, 1993; Kotze and Mudzana, 2015), the *size of the organisation* was found not to influence BIS adoption in the public sector organisation. Similarly, *government regulations* have been found not to influence BIS adoption. Instead, they provide guidelines and practices that organisations should comply with. *Stakeholder engagement*, which was originally not in the TOE model, was discovered to be influential in the BIS adoption.

6.4 CONTRIBUTION TO PRACTICE

This study may help South African and other countries' public sector organisations to become more aware of factors that influence the adoption of BIS. Practitioners and managers could be better prepared and minimise the adoption risks by considering these factors.

Furthermore, organisations from other sectors may also benefit from this study by using the identified factors as a checklist when intending to adopt BIS.

The results of this research may also assist BIS practitioners and managers to be proactive and enhance adoption by focusing on the areas that may cause adoption to be problematic.

The results of this study may also be used in the formulation and enhancement of data management policies in the organisation and other similar entities.

6.5 LIMITATIONS OF THE RESEARCH

The researcher was inexperienced in conducting research at this scale. The inexperience may have impacted the articulation of research objectives, the quality of data collection and ultimately the results obtained.

The researcher is employed in the public sector and is familiar with the organisational context. Therefore, researcher bias could have been introduced during the literature review, interviews, analysis of data and interpretation of results. Caution must be exercised when interpreting the data and outcomes.

The study was based on one public sector organisation. The public sector is very diverse and comprises organisations with varying mandates, sizes, and operating models. The sample of participants may not be representative of the entire public sector.

The targeted participants were senior managers in the organisation; therefore, the findings exclude the assessment of employees at lower levels. This exclusion may have an effect on the results. Further, the study included a sample only from the South African public sector organisation, the results may not be generalisable for other sectors or countries.

The participants were asked to answer interview questions based on their perceptions of BIS adoption in the organisation. This may lead participants to over-emphasize the factors based on their bias.

6.6 RECOMMENDATIONS FOR THE FUTURE

Recommendations for future research to address the limitations of this study would include:

- Conducting the research study in a different public sector organisation that is on the coalface of public service, such as education, agriculture, etc.
- Conducting the research study as a multi-case study to gauge outcomes in a broader public sector for contributing to policy formulation.
- Expanding the sample size to include staff at all levels, other than management in the organisation. Future research may also want to empirically test BIS adoption perceptions across the entire organisation.

Future studies should consider a longitudinal research approach to obtain comprehensive outcomes. This study focused on BIS adoption at a point in time.

The size of the organisation is often measured by several variables including the number of employees, transaction volumes or the organisation's resources (Lee and Xia, 2006). This study focused on only one variable, the number of employees, and found that it does not influence the adoption of BIS. It would be interesting to see in future studies what the impact of organisation size would be if the other variables are used.

6.7 CONCLUDING REMARKS

This last chapter summarised the study, revisited the research questions, discussed the main contributions to theory and practice, summarised the limitations of the study and recommended opportunities for future study. The outcomes from this study extend the current IS literature on BIS adoption by looking at factors that influence BIS adoption in the South African public sector context. The study assessed the perceptions of public sector senior managers on the adoption of BIS in their organisation. The results were used to uncover factors that influence the adoption of BIS in the public sector organisation.

Although this study has identified limitations, there are important contributions made to the literature. It tested the suitability of the Technology-Organisation-Environment framework by Tomatzky and Fleischer (1990) for the study of BIS adoption in the context of the South African public sector. Furthermore, it has uncovered factors that influence the adoption of BIS in the South African public sector.

REFERENCES

- Abousaber, I. and Papazafeiropoulou, A. (2011) 'The impact of organisational culture on WiMax adoption by Saudi SMEs'. Available at: <http://bura.brunel.ac.uk/handle/2438/8451> (Accessed: 30 August 2020).
- Adebambo, S. and Toyin, A. (2011) 'Analysis of information and communication technologies (ICT) usage on logistics activities of manufacturing companies in southwestern Nigeria', *Journal of Emerging Trends in Economics and Management Sciences*, 2(1), pp. 68–74. Available at: <https://doi.org/10.10520/EJC133845>.
- Agarwal, R. and Prasad, J. (1997) 'The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies', *Decision Sciences*, 28(3), pp. 557–582.
- Ain, N., Vaia, G., DeLone, W.H. and Waheed, M. (2019) 'Two decades of research on business intelligence system adoption, utilization and success – A systematic literature review', *Decision Support Systems*, 125, p. 113113. Available at: <https://doi.org/10.1016/j.dss.2019.113113>.
- Aladwani, A. (2001) 'Change Management Strategies for Successful ERP Implementation', *Business Process Management Journal*, 7, pp. 266–275. Available at: <https://doi.org/10.1108/14637150110392764>.
- Al-Ali, A.A., Singh, S.K., Al-Nahyan, M. and Sohal, A.S. (2017) 'Change management through leadership: the mediating role of organizational culture', *International Journal of Organizational Analysis*, 25(4), pp. 723–739. Available at: <http://dx.doi.org/10.1108/IJOA-01-2017-1117>.
- Al-Dmour, H., Nweiran, M. and Al-Dmour, R. (2017) 'The Influence of Organizational Culture on E-Commerce Adoption', *International Journal of Business and Management*, 12(9), p. p204. Available at: <https://doi.org/10.5539/ijbm.v12n9p204>.
- Ali, O., Murray, P.A., Shah Nawaz, M., Dwivedi, Y.K. and Rashiti, S. (2022) 'Evaluating Organizational Level IT Innovation Adoption Factors among Global Firms', *Journal of Innovation and Knowledge*, 7(3), pp. 1–14. Available at: <https://doi.org/10.1016/j.jik.2022.100213>.
- Almamari, M.R.H. (2016) 'The Role of Organisational Culture in Digital Government Implementation. Exploring the Relationship between Public Sector Organisational Culture and the Implementation of Digital Government in Oman'. Available at: <https://bradscholars.brad.ac.uk/handle/10454/15709> (Accessed: 20 May 2021).
- Alspaugh, S., Zokaei, N., Liu, A., Jin, C. and Hearst, M.A. (2018) 'Futzing and Moseying: Interviews with Professional Data Analysts on Exploration Practices', *IEEE transactions on visualization and computer graphics* [Preprint]. Available at: <https://doi.org/10.1109/TVCG.2018.2865040>.
- Anderson, C. (2010) 'Presenting and Evaluating Qualitative Research', *American Journal of Pharmaceutical Education*, 74(8). Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2987281/> (Accessed: 26 November 2019).
- Andrews, R., Boyne, G., Law, J. and Walker, R. (2009) 'Centralization, Organizational Strategy and Public Service Performance', *Journal of Public Administration Research and Theory*, 19(1), pp. 57–80. Available at: <https://doi.org/10.1093/jopart/mum039>.

Andrews, R., Ferry, L., Skelcher, C. and Wegorowski, P. (2020) 'Corporatization in the Public Sector: Explaining the Growth of Local Government Companies', *Public Administration Review*, 80(3), pp. 482–493. Available at: <https://doi.org/10.1111/puar.13052>.

Armstrong, M. and Armstrong, M. (2009) *Armstrong's handbook of human resource management practice, 11th edition*. London; Philadelphia: Kogan Page. Available at: <http://www.books24x7.com/marc.asp?bookid=38033> (Accessed: 8 October 2021).

Astrix (2018) 'Why System Requirements are an Essential Part of Your Informatics Project', *Astrix*, 7 December. Available at: <https://astrixinc.com/why-system-requirements-are-an-essential-part-of-your-informatics-project/> (Accessed: 18 October 2021).

Attewell, P. (1992) 'Technology Diffusion and Organizational Learning: The Case of Business Computing', *Organization Science*, 3(1), pp. 1–19.

Baddah, A. (2016) 'The Direction of Change Management in United Arab Emirates', *International Journal of Business and Management*, 11, p. 126. Available at: <https://doi.org/10.5539/ijbm.v11n9p126>.

Baker, J. (2012) 'The Technology–Organization–Environment Framework', in *Information Systems Theory: Explaining and Predicting Our Digital Society, Vol 1*. New York: Springer Science+Business Media (Integrated Series in Information Systems 28), pp. 231–254.

Bhat, A. (2018a) 'Experimental Research- Definition, Types of Designs and Advantages', *QuestionPro*, 12 June. Available at: <https://www.questionpro.com/blog/experimental-research/> (Accessed: 11 August 2019).

Bhat, A. (2018b) 'Exploratory Research: Definition, Methods, Types and Examples', *QuestionPro*, 6 November. Available at: <https://www.questionpro.com/blog/exploratory-research/> (Accessed: 9 August 2019).

Bhatiasevi, V. and Naglis, M. (2020) 'Elucidating the determinants of business intelligence adoption and organizational performance', *Information Development*, 36(1), pp. 78–96. Available at: <https://doi.org/10.1177/0266666918811394>.

Bhattacharjee, A. (2012) *Social science research: principles, methods, and practices*. University of South Florida. Available at: http://scholarcommons.usf.edu/oa_textbooks/3/ (Accessed: 6 August 2019).

Blakstad, O. (2008) *Experimental Research - A Guide to Scientific Experiments*. Available at: <https://explorable.com/experimental-research> (Accessed: 10 August 2019).

Bogdan, R.C. and Biklen, S.K. (2007) *Qualitative Research Education Introduction Theory Methods*. Fifth. Boston: Pearson. Available at: https://www.academia.edu/25034807/Bogdan_Bliklen_Qualitative_Research_Education_Introduction_Theory_Methods (Accessed: 6 August 2019).

Boonsiritomachai, W., McGrath, M.B. and Burgess, S. (2014) 'A research framework for the adoption of Business Intelligence by Small and Medium-sized enterprises', in.

Boyabatlı, O., Leng, T. and Toktay, L.B. (2016) 'The Impact of Budget Constraints on Flexible vs. Dedicated Technology Choice', *Management Science*, 62(1), pp. 225–244.

Bozic, K. and Dimovski, V. (2019) 'Business intelligence and analytics for value creation: The role of absorptive capacity', *International Journal of Information Management*, 46, pp. 93–103. Available at: <https://doi.org/10.1016/j.ijinfomgt.2018.11.020>.

Bryman, A. (2012) *Social research methods*. Oxford; New York: Oxford University Press.

Burnes, B. (2004) 'Emergent change and planned change - competitors or allies? The case of XYZ construction', *International Journal of Operations & Production Management*, 24(9/10), pp. 886–902. Available at: <http://dx.doi.org/10.1108/01443570410552108>.

Cameron, K.S. and Quinn, R.E. (2011) *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework*. John Wiley & Sons.

Cao, Q., Baker, J., Wetherbe, J.C. and Gu, V.C. (2012) 'Organizational Adoption of Innovation: Identifying Factors that Influence RFID Adoption in the Healthcare Industry', in *ECIS*.

Chae, B., Yang, C., Olson, D. and Sheu, C. (2014) 'The impact of advanced analytics and data accuracy on operational performance: A contingent resource based theory (RBT) perspective', *Decision Support Systems*, 59, pp. 119–126. Available at: <https://doi.org/10.1016/j.dss.2013.10.012>.

Chang, Y., Hsu, P. and Shiau, W. (2014) 'An empirical study of managers' usage intention in BI', *Cognition, Technology & Work*, 16(2), pp. 247–258. Available at: <http://dx.doi.org/10.1007/s10111-013-0261-z>.

Chege, S.M., Wang, D. and Suntutu, S.L. (2020) 'Impact of information technology innovation on firm performance in Kenya', *Information Technology for Development*, 26(2), pp. 316–345. Available at: <https://doi.org/10.1080/02681102.2019.1573717>.

Chen, H., Chiang, R.H.L. and Storey, V.C. (2012) 'Business Intelligence and Analytics: From Big Data to Big Impact', *MIS Quarterly*, 36(4), pp. 1165–1188. Available at: <https://doi.org/10.2307/41703503>.

Chen, W., Huang, L. and Zhang, Q. (2022) 'The Adoption of Inter-Organizational Systems in Chinese Local Retail Enterprises'.

Chen, X. and Siau, K. (2020) 'Business Analytics/Business Intelligence and IT Infrastructure: Impact on Organizational Agility', *Journal of Organizational and End User Computing (JOEUC)*, 32(4), pp. 138–161. Available at: <https://doi.org/10.4018/JOEUC.2020100107>.

Cheung, C.F. and Li, F.L. (2012) 'A quantitative correlation coefficient mining method for business intelligence in small and medium enterprises of trading business', *Expert Systems with Applications*, 39(7), pp. 6279–6291. Available at: <https://doi.org/10.1016/j.eswa.2011.10.021>.

Conner, D.R. (1993) *Managing At the Speed of Change*. 1st edition. New York: Random House.

Cragg, P.B. and King, M. (1993) 'Small-Firm Computing: Motivators and Inhibitors', *MIS Quarterly*, 17(1), pp. 47–60. Available at: <https://doi.org/10.2307/249509>.

Creswell, J.W. (2014) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. Fourth. Lincoln: Sage Publications Ltd.

Damanpour, F. (1991) 'Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators', *The Academy of Management Journal*, 34(3), pp. 555–590. Available at: <https://doi.org/10.2307/256406>.

Damanpour, F. (1992) 'Organizational Size and Innovation', *Organization Studies*, 13(3), pp. 375–402. Available at: <https://doi.org/10.1177/017084069201300304>.

Daniel, E. and Myers, A. (2000) 'Levelling the playing field: electronic commerce in SMEs', *Capstone Publishing Limited* [Preprint].

Daniel, E.M. and Grimshaw, D.J. (2002) 'An Exploratory Comparison of Electronic Commerce Adoption in Large and Small Enterprises', *Journal of Information Technology*, 17(3), pp. 133–147. Available at: <https://doi.org/10.1080/0268396022000018409>.

Dawson, C. (2002) *Practical Research Methods: A User-friendly Guide to Mastering Research Techniques and Projects*. How To Books.

Dayal, U., Castellanos, M., Simitsis, A. and Wilkinson, K. (2009) 'Data Integration Flows for Business Intelligence', in *Proceedings of the 12th International Conference on Extending Database Technology: Advances in Database Technology*. New York, NY, USA: ACM (EDBT '09), pp. 1–11. Available at: <https://doi.org/10.1145/1516360.1516362>.

DeJonckheere, M. and Vaughn, L.M. (2019) 'Semistructured interviewing in primary care research: a balance of relationship and rigour', *Family Medicine and Community Health*, 7(2), p. e000057. Available at: <https://doi.org/10.1136/fmch-2018-000057>.

Delen, D. and Demirkan, H. (2013) 'Data, information and analytics as services', *Decision Support Systems*, 55(1), pp. 359–363. Available at: <https://doi.org/10.1016/j.dss.2012.05.044>.

DeLone, W.H. and McLean, E.R. (2003) 'The DeLone and McLean model of information systems success: a ten-year update', *Journal of Management Information Systems*, 19(4), pp. 9–30.

Dennison, T.W. (2014) *Critical success factors of technological innovation and diffusion in higher education*. Ph.D. Georgia State University. Available at: <https://www.proquest.com/docview/1609014397/abstract/4AB8ECD7DB1D4748PQ/1> (Accessed: 21 May 2022).

DiMaggio, P.J. and Powell, W.W. (1983) 'The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields', *American Sociological Review*, 48(2), pp. 147–160. Available at: <https://doi.org/10.2307/2095101>.

Dixon, T., McAllister, P. and Thompson, R. (2002) *The value of ICT for SMEs in the UK: a critical literature review*. Report 02/1377. Department for Business Innovation & Skills. Available at: <http://www.bis.gov.uk/publications> (Accessed: 27 April 2022).

DPSA, D. of P.S. and A. (2012) 'Public Service Corporate Governance of Information and Communication Technology Policy Framework'. RSA Government. Available at: <https://www.dpsa.gov.za/dpsa2g/documents/psictm/2013/CGICT%20Policy%20Framework.pdf>.

Dudovskiy, J. (2018) *The Ultimate Guide to writing a dissertation in business studies*. January 2019. Available at: <https://research-methodology.net/research-philosophy/interpretivism/> (Accessed: 17 August 2019).

Duncombe, R. and Heeks, R. (1999) 'Information, ICTs and Small Enterprise: Findings from Botswana'. Available at: <https://www.research.manchester.ac.uk/portal/en/publications/information-icts-and-small->

enterprise-findings-from-botswana(d2ec2d04-7605-4fa0-8b87-33fb836b8157).html (Accessed: 27 April 2022).

Edirisingha, P. (2012) 'Interpretivism and Positivism (Ontological and Epistemological Perspectives)', 14 March. Available at: <https://prabash78.wordpress.com/2012/03/14/interpretivism-and-positivism-ontological-and-epistemological-perspectives/> (Accessed: 16 August 2019).

Elbashir, M.Z., Collier, P.A., Sutton, S.G., Davern, M.J. and Leech, S.A. (2013) 'Enhancing the Business Value of Business Intelligence: The Role of Shared Knowledge and Assimilation', *Journal of Information Systems*, 27(2), pp. 87–105. Available at: <https://doi.org/10.2308/isy-50563>.

Elena, C. (2011) 'Business intelligence', *Journal of Knowledge Management, Economics and Information Technology* [Preprint], (2). Available at: <http://www.scientificpapers.org/economics/business-intelligence/> (Accessed: 29 April 2020).

Fakier, R. (2021) *Barriers to business intelligence adoption by a government institution in the Western Cape, South Africa*. Thesis. Cape Peninsula University of Technology. Available at: <https://etd.cput.ac.za/handle/20.500.11838/3354> (Accessed: 21 May 2023).

Farkas, M. (2013) 'Building and sustaining a culture of assessment: Best practices for change leadership', *Reference Services Review*, 41. Available at: <https://doi.org/10.1108/00907321311300857>.

Fereday, J. and Muir-Cochrane, E. (2006) 'Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development', *International Journal of Qualitative Methods*, 5(1), pp. 80–92. Available at: <https://doi.org/10.1177/160940690600500107>.

Flanagin, A.J. (2000) 'Social pressures on organizational website adoption', *Human Communication Research*, 26(4), pp. 618–646. Available at: <https://doi.org/10.1111/j.1468-2958.2000.tb00771.x>.

Foley, É. and Guillemette, M.G. (2010) 'What is Business Intelligence?', *Int. J. Bus. Intell. Res.* [Preprint]. Available at: <https://doi.org/10.4018/jbir.2010100101>.

Fox, W. and Bayat, M.S. (2007) *A guide to managing research*. Cape Town, South Africa: Juta & Co Ltd.

Gangadharan, G.R. and Swami, S.N. (2004) 'Business intelligence systems: design and implementation strategies', in *Information Technology Interfaces, 2004. 26th International Conference on, pages 139–144 Vol.1*, pp. 10–1109.

Gibbs, J.L. and Kraemer, K.L. (2004) 'A Cross-Country Investigation of the Determinants of Scope of E-commerce Use: An Institutional Approach', *Electronic Markets*, 14(2), pp. 124–137. Available at: <https://doi.org/10.1080/10196780410001675077>.

Gorunescu, F. (2011) *Data Mining: Concepts, Models and Techniques*. Berlin Heidelberg: Springer-Verlag (Intelligent Systems Reference Library). Available at: <https://doi.org/10.1007/978-3-642-19721-5>.

Grandson, E.E. and Pearson, J.M. (2003) *Electronic commerce adoption: an empirical study of small and medium US businesses*.

Groenhouf, T.K.J., Koers, L.R., Blasse, E., de Groot, M., Grobbee, D.E., Bots, M.L., Asselbergs, F.W., Lely, A.T., Haitjema, S., van Solinge, W., Hoefer, I., Haitjema, S., de Groot, M., Blasse, E., Asselbergs,

F.W., Nathoe, H.M., de Borst, G.-J., Bots, M.L., Geerlings, M.I., Emmelot, M.H., de Jong, P.A., Leiner, T., Lely, A.T., van der Kaaij, N.P., Kappelle, L.J., Ruigrok, Y.M., Verhaar, M.C., Visseren, F.L.J. and Westerink, J. (2020) 'Data mining information from electronic health records produced high yield and accuracy for current smoking status', *Journal of Clinical Epidemiology*, 118, pp. 100–106. Available at: <https://doi.org/10.1016/j.jclinepi.2019.11.006>.

Grover, V. and Goslar, M.D. (1993) 'The initiation, adoption, and implementation of telecommunications technologies in U.S. organizations', *Journal of Management Information Systems: JMIS*, 10(1), p. 141.

Grubljesic, T. and Jaklic, J. (2015) 'Business Intelligence Acceptance: The Prominence of Organizational Factors.', 32(4), pp. 299–315.

Guenduez, A.A., Mettler, T. and Schedler, K. (2020) 'Technological frames in public administration: What do public managers think of big data?', *Government Information Quarterly*, 37(1), p. 101406. Available at: <https://doi.org/10.1016/j.giq.2019.101406>.

Hajmoosaei, A., Kashfi, M. and Kailasam, P. (2011) 'Comparison plan for data warehouse system architectures', in *The 3rd International Conference on Data Mining and Intelligent Information Technology Applications. The 3rd International Conference on Data Mining and Intelligent Information Technology Applications*, pp. 290–293.

Hale, J. (2011) *The 3 Basic Types of Descriptive Research Methods, World of Psychology*. Available at: <https://psychcentral.com/blog/the-3-basic-types-of-descriptive-research-methods/> (Accessed: 10 August 2019).

Hamade, S.N. (2009) 'Information and Communication Technology in Arab Countries: Problems and Solutions', in *2009 Sixth International Conference on Information Technology: New Generations. 2009 Sixth International Conference on Information Technology: New Generations*, pp. 1498–1503. Available at: <https://doi.org/10.1109/ITNG.2009.62>.

Hartley, K. and Seymour, L.F. (2011) 'Towards a framework for the adoption of Business Intelligence in public sector organisations: The case of South Africa', in *ACM International Conference Proceeding Series*, pp. 116–122. Available at: <https://doi.org/10.1145/2072221.2072235>.

Hartman, F. and Ashrafi, R. (2002) 'Project Management in the information systems and information technologies', *Project Management Journal*, 33.

Hasan, H. and Ditsa, G. (1999) 'The Impact of Culture on the Adoption of IT: An Interpretive Study', *Journal of Global Information Management (JGIM)*, 7(1), pp. 5–15.

Hočevár, B. and Jaklic, J. (2010) 'Assessing Benefits of Business Intelligence Systems – A Case Study', in.

Hofstede, G. (2011) 'Dimensionalizing Cultures: The Hofstede Model in Context', *Online Readings in Psychology and Culture*, 2(1). Available at: <https://doi.org/10.9707/2307-0919.1014>.

Husain, S. (2015) *Organizational Structures and Cultures*. Available at: <https://doi.org/10.13140/RG.2.1.1673.4169>.

Iacovou, C.L., Benbasat, I. and Dexter, A.S. (1995) 'Electronic Data Interchange and Small Organizations: Adoption and Impact of Technology', *MIS Quarterly*, 19(4), pp. 465–485. Available at: <https://doi.org/10.2307/249629>.

Ifinedo, P. (2011) 'An Empirical Analysis of Factors Influencing Internet/E-Business Technologies Adoption by SMEs in Canada.', *International Journal of Information Technology and Decision Making*, 10, pp. 731–766. Available at: <https://doi.org/10.1142/S0219622011004543>.

Işık, Ö., Jones, M.C. and Sidorova, A. (2013) 'Business intelligence success: The roles of BI capabilities and decision environments', *Information & Management*, 50(1), pp. 13–23. Available at: <https://doi.org/10.1016/j.im.2012.12.001>.

Jackson, S. (2011) 'Organizational culture and information systems adoption: A three-perspective approach', *Information and Organization*, 21(2), pp. 57–83. Available at: <https://doi.org/10.1016/j.infoandorg.2011.03.003>.

Jaklič, J., Grublješič, T. and Popovič, A. (2018) 'The role of compatibility in predicting business intelligence and analytics use intentions', *International Journal of Information Management*, 43, pp. 305–318. Available at: <https://doi.org/10.1016/j.ijinfomgt.2018.08.017>.

Janićijević, N. (2013) 'The Mutual Impact Of Organizational Culture And Structure', *Economic Annals*, 58(198), pp. 35–60.

Johnson, J., Donohue, W., Atkin, C. and Johnson, S. (1994) 'Differences Between Formal and Informal Communication Channels', *Journal of Business Communication - J Bus Comm*, 31, pp. 111–122. Available at: <https://doi.org/10.1177/002194369403100202>.

Johnson, S.L. (2010) 'A Question of Time: Cross-sectional Versus Longitudinal Study Designs', *Pediatrics in Review*, 31(6), pp. 250–254.

Junior, C.H., Oliveira, T. and Yanaze, M. (2019) 'The adoption stages (Evaluation, Adoption, and Routinisation) of ERP systems with business analytics functionality in the context of farms', 156, pp. 334–348.

Kalla, S. (2011) *A Correlational Study Tries to Find a Relationship Between Variables*. Available at: <https://explorable.com/correlational-study> (Accessed: 19 August 2019).

Kamal, M., Weerakkody, V. and Irani, Z. (2011) 'Analyzing the role of stakeholders in the adoption of technology integration solutions in UK local government: An exploratory study', *Government Information Quarterly*, 28(2), pp. 200–210. Available at: <https://doi.org/10.1016/j.giq.2010.08.003>.

Kang, J.S. (2006) 'Study on Relation between Social Welfare Organization Structure and Effectiveness', *Journal of Public Welfare Administration*, 16(2), pp. 287–311.

Kannabiran, G. and Dharmalingam, P. (2012) 'Enablers and inhibitors of advanced information technologies adoption by SMEs: An empirical study of auto ancillaries in India', *Journal of Enterprise Information Management*, 25(2), pp. 186–209. Available at: <https://doi.org/10.1108/17410391211204419>.

Karahanna, E., Straub, D.W. and Chervany, N.L. (1999) 'Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs', *MIS Quarterly*, 23(2), pp. 183–213. Available at: <https://doi.org/10.2307/249751>.

van de Kerkhof, M. (2006) 'Making a Difference: On the Constraints of Consensus Building and the Relevance of Deliberation in Stakeholder Dialogues', *Policy Sciences*, 39(3), pp. 279–299.

Kesner, R.M. (2008) 'Stakeholder Engagement in Business Intelligence (BI) Solutions - A Case Study in End User Involvement', *i-Manager's Journal on Management*, 3(2), pp. 19–33.

Kotze, E. and Mudzana, T. (2015) 'Some determinants of business intelligence adoption using the technology- organisation -environment framework : a developing country perspective', *Journal for New Generation Sciences*, 13(1). Available at: <http://ir.cut.ac.za/handle/11462/762> (Accessed: 7 July 2020).

Kyobe, M. (2009) 'Factors Influencing SME Compliance with Government Regulation on Use of IT: The Case of South Africa', *Journal of Global Information Management*, 17(2), pp. 30-41,43-56,59. Available at: <http://dx.doi.org/10.4018/jgim.2009040102>.

Labaree, R.V. (2019) *Research Guides: Organizing Your Social Sciences Research Paper: Types of Research Designs*. Available at: <http://libguides.usc.edu/writingguide/researchdesigns> (Accessed: 10 August 2019).

Iacovou, C., Benbasat, I. and Dexter, A. (1995) 'Electronic Data Interchange and small organisations: Adoption and impact of technology', *MIS Quarterly*, 19(4), pp. 465–485.

Lautenbach, P., Johnston, K. and Adeniran-Ogundipe, T. (2017) 'Factors influencing business intelligence and analytics usage extent in South African organisations', *South African Journal of Business Management*, 48(3), pp. 23–33. Available at: <https://doi.org/10.4102/sajbm.v48i3.33>.

Lee, G. and Xia, W. (2006) 'Organizational size and IT innovation adoption: A meta-analysis', *Information & Management*, 43(8), pp. 975–985. Available at: <https://doi.org/10.1016/j.im.2006.09.003>.

Leedy, P.D. and Ormrod, J.E. (2001) *Practical research: planning and design*. Upper Saddle River, N.J.: Merrill Prentice Hall.

Lehtinen, J., Aaltonen, K. and Rajala, R. (2019) 'Stakeholder management in complex product systems: Practices and rationales for engagement and disengagement', *Industrial Marketing Management*, 79, pp. 58–70. Available at: <https://doi.org/10.1016/j.indmarman.2018.08.011>.

Leidner, D. and Kayworth, T. (2006) 'Review: A Review of Culture in Information Systems Research: Toward a Theory of Information Technology Culture Conflict.', *MIS Quarterly*, 30, pp. 357–399. Available at: <https://doi.org/10.2307/25148735>.

Liang, H., Saraf, N., Hu, Q. and Xue, Y. (2007) 'Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management.', *MIS Quarterly*, 31(1), pp. 59–87.

Lin, H.-F. and Lin, S.-M. (2008) 'Determinants of e-business diffusion: A test of the technology diffusion perspective', *Technovation*, 28(3), pp. 135–145. Available at: <https://doi.org/10.1016/j.technovation.2007.10.003>.

Lönnqvist, A. and Pirttimäki, V. (2006) 'The Measurement of Business Intelligence', *Information Systems Management*, 23(1), pp. 32–40. Available at: <https://doi.org/10.1201/1078.10580530/45769.23.1.20061201/91770.4>.

Lucey, J.J. (2008) 'Why Is The Failure Rate For Organisation Change So High?', *Management services : journal of the Institute of Practitioners in Work Study, Organization and Methods*, 52(4).

- Malladi, S. (2013) 'Adoption of Business Intelligence & Analytics in Organizations – An Empirical Study of Antecedents', *AMCIS 2013 Proceedings* [Preprint]. Available at: <https://aisel.aisnet.org/amcis2013/BusinessIntelligence/GeneralPresentations/3>.
- Mamoojee, I. (2001) 'Implementation of BAS (Basic Accounting System) and Reporting in accordance with PFMA and GFS'. Available at: <http://www.treasury.gov.za/legislation/pfma/practice%20notes/oag/2001-12%20Practice%20%20Note.pdf> (Accessed: 3 June 2020).
- Mansell, I.J. and Ruhode, E. (2019) 'Inhibitors of business intelligence use by managers in public institutions in a developing country: The case of a South African municipality', *South African Journal of Information Management*, 21(1), pp. 1–8. Available at: <https://doi.org/10.4102/sajim.v21i1.1004>.
- Martin, J. and Siehl, C. (1983) 'Organizational culture and counterculture: An uneasy symbiosis', *Organizational Dynamics*, 12(2), pp. 52–64. Available at: [https://doi.org/10.1016/0090-2616\(83\)90033-5](https://doi.org/10.1016/0090-2616(83)90033-5).
- Martins, E. and Martins, N. (2002) 'An organisational culture model to promote creativity and innovation', *South African Journal of Industrial Psychology*, 28. Available at: <https://doi.org/10.4102/sajip.v28i4.71>.
- Masha, H., Adeyelu, D.T.S. and Jokonya, O. (2019) 'Adoption of Business Intelligence in the South African public social sector Department', in *Kalpa Publications in Computing. Proceedings of 4th International Conference on the Internet, Cyber Security and Information Systems 2019*, EasyChair, pp. 157–168. Available at: <https://doi.org/10.29007/kqhq>.
- Mathu, K. and Tlare, M. (2017) 'The impact of IT adoption in SMEs supply chains : a case of Gauteng and Free State provinces of South Africa', *South African Journal of Business Management*, (3), p. 63.
- McCombes, S. (2019) *Correlational Research | Definition, Methods and Examples*, Scribbr. Available at: <https://www.scribbr.com/methodology/correlational-research/> (Accessed: 19 August 2019).
- McCracken, G. (1988) *The Long Interview*. SAGE.
- McIntosh, B.S., Ascough, J.C., Twery, M., Chew, J., Elmahdi, A., Haase, D., Harou, J.J., Hepting, D., Cuddy, S., Jakeman, A.J., Chen, S., Kassahun, A., Lautenbach, S., Matthews, K., Merritt, W., Quinn, N.W.T., Rodriguez-Roda, I., Sieber, S., Stavenga, M., Sulis, A., Ticehurst, J., Volk, M., Wrobel, M., van Delden, H., El-Sawah, S., Rizzoli, A. and Voinov, A. (2011) 'Environmental decision support systems (EDSS) development – Challenges and best practices', *Environmental Modelling & Software*, 26(12), pp. 1389–1402. Available at: <https://doi.org/10.1016/j.envsoft.2011.09.009>.
- McKenna, E. (2020) *Business Psychology and Organizational Behaviour*. 6th edn. London: Routledge. Available at: <https://doi.org/10.4324/9781315646312>.
- Merriam-Webster (no date) *Intelligence*, *Merriam-Webster.com dictionary*. Available at: <https://www.merriam-webster.com/dictionary/intelligence> (Accessed: 16 June 2020).
- Metre, C. (2009) 'Deriving value from change management', *Journal of Science in Organisational Dynamics*, 1(1), pp. 1–47.
- Mitre (2013) 'Eliciting, Collecting, and Developing Requirements'. Available at: <https://www.mitre.org/publications/systems-engineering-guide/se-lifecycle-building->

blocks/requirements-engineering/eliciting-collecting-and-developing-requirements (Accessed: 18 October 2021).

Monsreal-Barrera, M.M., Cruz-Mejia, O., Ozkul, S. and Saucedo-Martínez, J.A. (2020) 'An optimization model for investment in technology and government regulation', *Wireless Networks*, 26(7), pp. 4929–4941. Available at: <https://doi.org/10.1007/s11276-019-01958-z>.

Moslehpour, M., Pham, V.K., Wong, W.-K. and Bilgiçli, İ. (2018) 'e-Purchase Intention of Taiwanese Consumers: Sustainable Mediation of Perceived Usefulness and Perceived Ease of Use', *Sustainability*, 10(1), p. 234. Available at: <https://doi.org/10.3390/su10010234>.

Mostert-Phipps, N., Pottas, D. and Korpela, M. (2013) 'A South African perspective on factors that impact on the adoption and meaningful use of health information technologies.', 55(6), pp. 545–554.

Mukherji, P. and Albon, D. (2010) *Research Methods in Early Childhood*. 3rd edn. London: Sage Publications Ltd.

Negash, S. (2004) 'Business Intelligence', *Communications of the Association for Information Systems*, 13. Available at: <https://doi.org/10.17705/1CAIS.01315>.

Ngidi, N.V. (2019) *Determinants of ICT adoption by small and medium enterprises in Pietermaritzburg*. Thesis. Available at: <https://researchspace.ukzn.ac.za/handle/10413/18947> (Accessed: 29 April 2022).

Nkuna, D. (2011) 'Business Intelligence usage determinants: an assessment of factors influencing individual intentions to use a Business Intelligence system within a financial firm in South Africa'.

Nord, W.R. and Tucker, S. (1987) *Implementing Routine and Radical Innovations*. Lexington Books.

Nygaard, K., Graversgaard, M., Dalgaard, T., Jacobsen, B.H. and Schaper, S. (2021) 'The Role of Stakeholder Engagement in Developing New Technologies and Innovation for Nitrogen Reduction in Waters: A Longitudinal Study', *Water*, 13(22), p. 3313. Available at: <https://doi.org/10.3390/w13223313>.

Oates, B.J. (2006) 'Researching information systems and computing', 1 January.

Oliveira, T. and Martins, M.F. (2011) 'Literature Review of Information Technology Adoption Models at Firm Level.', 14(1), pp. 110–121.

Oliveira, T., Thomas, M. and Espadanal, M. (2014) 'Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors', *Information & Management*, 51(5), pp. 497–510. Available at: <https://doi.org/10.1016/j.im.2014.03.006>.

Olson, E., Slater, S., Tomas, G. and Hult, G.T.M. (2005) 'The Performance Implications of Fit Among Business Strategy, Marketing Organization Structure, and Strategic Behavior', *Journal of Marketing*, 69, pp. 49–65. Available at: <https://doi.org/10.1509/jmkg.69.3.49.66362>.

Olszak, C.M. (2016) 'Toward Better Understanding and Use of Business Intelligence in Organizations.', 33(2), pp. 105–123.

Packalén, K. (2010) 'ICT Capabilities and Possibilities in Micro-firms: A Study of Micro-firms in the Åland Islands Archipelago', in *Implications for the Individual, Enterprises and Society. 23rd Bled eConference eTrust*, Slovenia, pp. 496–508.

- Pan, M.J. and Jang, W.Y. (2008) 'Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications industry', *Journal of Computer Information Systems*, 48(3), pp. 94–102.
- Pfaffinger, K.F., Reif, J.A.M., Spieß, E. and Berger, R. (2020) 'Anxiety in a digitalised work environment', *Gruppe. Interaktion. Organisation. Zeitschrift für Angewandte Organisationspsychologie (GIO)*, 51(1), pp. 25–35. Available at: <https://doi.org/10.1007/s11612-020-00502-4>.
- Phan, D.D. and Vogel, D.R. (2010) 'A model of customer relationship management and business intelligence systems for catalogue and online retailers', *Information & Management*, 47(2), pp. 69–77. Available at: <https://doi.org/10.1016/j.im.2009.09.001>.
- Pool, J.K., Jamkhaneh, H.B., Tabaeian, R.A., Tavakoli, H. and Shahin, A. (2018) 'The effect of business intelligence adoption on agile supply chain performance', *International Journal of Productivity and Quality Management*, 23(3), p. 289. Available at: <https://doi.org/10.1504/IJPM.2018.089802>.
- Popovič, A., Hackney, R., Simões Coelho, P. and Jaklič, J. (2012) *Towards business intelligence systems success: Effects of maturity and culture on analytical decision making*. Available at: <https://doi.org/10.1016/j.dss.2012.08.017>.
- Popovic, A., Turk, T. and Jaklic, J. (2010) 'Conceptual Model of Business Value of Business Intelligence Systems', 15(1), pp. 5–29.
- Premkumar, G., Ramamurthy, K. and Crum, M. (1997) 'Determinants of EDI adoption in the transportation industry', *European Journal of Information Systems*, 6(2), pp. 107–121. Available at: <https://doi.org/10.1057/palgrave.ejis.3000260>.
- Premkumar, G. and Roberts, M. (1999) 'Adoption of new information technologies in rural small businesses', *Omega*, 27(4), pp. 467–484. Available at: [https://doi.org/10.1016/S0305-0483\(98\)00071-1](https://doi.org/10.1016/S0305-0483(98)00071-1).
- Priyadarshinee, P., Raut, R.D., Jha, M.K. and Gardas, B.B. (2017) 'Understanding and predicting the determinants of cloud computing adoption: A two staged hybrid SEM - Neural networks approach', 76, pp. 341–362.
- Puklavec, B., Oliveira, T. and Popovic, A. (2014) 'Unpacking Business Intelligence Systems Adoption Determinants: An Exploratory Study of Small and Medium Enterprises', 16(2), pp. 185–213.
- Puklavec, B., Oliveira, T. and Popovič, A. (2018) 'Understanding the determinants of business intelligence system adoption stages', *Industrial Management & Data Systems; Wembley*, 118(1), pp. 236–261. Available at: <http://0-dx.doi.org.innopac.wits.ac.za/10.1108/IMDS-05-2017-0170>.
- Quinn, N.W.T. (2010) 'Environmental Information Management Systems as Templates for Successful Environmental Decision Support', in *5th International Congress on Environmental Modelling and Software. International Congress on Environmental Modelling and Software*, Ontario, Canada.
- Racherla, P. and Hu, C. (2008) 'eCRM System Adoption by Hospitality Organizations: A Technology-Organization-Environment (TOE) Framework', *Journal of Hospitality & Leisure Marketing*, 17(1–2), pp. 30–58. Available at: <https://doi.org/10.1080/10507050801978372>.

Ramamurthy, K. (Ram), Premkumar, G. and Crum, M.R. (1999) 'Organizational and Interorganizational Determinants of EDI Diffusion and Organizational Performance: A Causal Model', *Journal of Organizational Computing and Electronic Commerce*, 9(4), pp. 253–285.

Ramamurthy, K. (Ram), Sen, A. and Sinha, A.P. (2008) 'An empirical investigation of the key determinants of data warehouse adoption', *Decision Support Systems*, 44(4), pp. 817–841. Available at: <https://doi.org/10.1016/j.dss.2007.10.006>.

Ramirez-Madrid, J.P., Escobar-Sierra, M., Lans-Vargas, I. and Hincapie, J.M.M. (2022) 'Government influence on e-government adoption by citizens in Colombia: Empirical evidence in a Latin American context', *PLOS ONE*, 17(2), p. e0264495. Available at: <https://doi.org/10.1371/journal.pone.0264495>.

Ranjan, J. and Foropon, C. (2021) 'Big Data Analytics in Building the Competitive Intelligence of Organizations', *International Journal of Information Management*, 56, p. 102231. Available at: <https://doi.org/10.1016/j.ijinfomgt.2020.102231>.

Reiter, D., Meyer, W. and Parrott, L. (2019) 'Stakeholder engagement with environmental decision support systems: The perspective of end users', *The Canadian Geographer / Le Géographe canadien*, 63(4), pp. 631–642. Available at: <https://doi.org/10.1111/cag.12555>.

Rogers, E.M. (2003) *Diffusion of innovations*. 5th ed. New York: Free Press.

Rosenthal, R. (1994) 'Science and ethics in conducting, analyzing, and reporting psychological research.', 5(3), pp. 127–134.

Rouhani, S., Ashrafi, A., Ravasan, A.Z. and Afshari, S. (2016) 'The impact model of business intelligence on decision support and organizational benefits', *Journal of Enterprise Information Management*, 29(1), pp. 19–50. Available at: <http://dx.doi.org/10.1108/JEIM-12-2014-0126>.

Rouhani, S., Ashrafi, A., Zare Ravasan, A. and Afshari, S. (2018a) 'Business Intelligence Systems Adoption Model: An Empirical Investigation.', *Journal of Organizational & End User Computing*, 30(2), pp. 43–70.

Rouhani, S., Ashrafi, A., Zare Ravasan, A. and Afshari, S. (2018b) 'Business Intelligence Systems Adoption Model: An Empirical Investigation', *Journal of Organizational & End User Computing*, 30(2), pp. 43–70. Available at: <https://doi.org/10.4018/JOEUC.2018040103>.

Rydbjörk, C. and Lindh, N. (2004) 'Exploring Critical Success Factors in adopting new technology', *undefined* [Preprint]. Available at: <https://www.semanticscholar.org/paper/Exploring-Critical-Success-Factors-in-adopting-new-Rydbj%C3%B6rk-Lindh/6ecbe9511a51dae9e9fa2e32c1db677004522a69> (Accessed: 21 May 2022).

Saghafian, M., Laumann, K. and Skogstad, M.R. (2021) 'Stagewise Overview of Issues Influencing Organizational Technology Adoption and Use', *Frontiers in Psychology*, 12, p. 654. Available at: <https://doi.org/10.3389/fpsyg.2021.630145>.

Sahay, B. and Ranjan, J. (2008) 'Real time business intelligence in supply chain analytics', *Institute of Management Technology*, 16(1), pp. 28–48. Available at: <https://doi.org/10.1108/09685220810862733>.

Salkind, N.J. (2010) *Encyclopedia of Research Design*.

Sandema-Sombe, C.N. (2019) *Relationship Between Perceived Usefulness, Ease of Use, and Acceptance of Business Intelligence Systems*, ProQuest Dissertations and Theses. D.B.A. Walden University. Available at: <https://www.proquest.com/docview/2309521890/abstract/D671BC8BA0534BE0PQ/1> (Accessed: 29 January 2022).

Sanitnarathorn, P. and Prajaknate, P. (2018) 'An Analysis of Factors Affecting Thai Consumers' Intention to Use Music Streaming Services', *Asian International Journal of Social Sciences*, 18, pp. 1–19. Available at: <https://doi.org/10.29139/aijss.20180101>.

Saunders, M.N.K. and Lewis, P. (2012) *Doing Research in Business & Management: An Essential Guide to Planning Your Project*. Harlow: Pearson. Available at: <https://epubs.surrey.ac.uk/817620/> (Accessed: 19 May 2021).

Schneider, S.C., Schneider, S.C. and Barsoux, J.-L. (2003) *Managing Across Cultures*. Financial Times Prentice Hall.

Senarathna, I., Warren, M., Yeoh, W. and Salzman, S. (2014) 'The influence of organisation culture on E-commerce adoption', *Industrial Management & Data Systems*, 114(7), pp. 1007–1021. Available at: <https://doi.org/10.1108/IMDS-03-2014-0076>.

Seng, J.-L. and Chen, T.C. (2010) 'An analytic approach to select data mining for business decision', *Expert Systems with Applications*, 37(12), pp. 8042–8057. Available at: <https://doi.org/10.1016/j.eswa.2010.05.083>.

Seng, W.M., Jackson, S. and Philip, G. (2010) 'Cultural issues in developing E-Government in Malaysia', *Behaviour & Information Technology*, 29(4), pp. 423–432. Available at: <https://doi.org/10.1080/01449290903300931>.

Sewdass, N. (2009) *The implementation of Competitive Intelligence tools and techniques in Public Service departments in South Africa to improve service delivery: a case study of the Department of Home Affairs*, Pretoria. University of Pretoria.

Shuttleworth, M. (2008) *Descriptive Research Design - Observing a Phenomenon*, Explorable.com. Available at: <https://explorable.com/descriptive-research-design> (Accessed: 10 August 2019).

Silahtaroğlu, G. and Alayoglu, N. (2016) 'Using or Not Using Business Intelligence and Big Data for Strategic Management: An Empirical Study Based on Interviews with Executives in Various Sectors', *Procedia - Social and Behavioral Sciences*, 235, pp. 208–215. Available at: <https://doi.org/10.1016/j.sbspro.2016.11.016>.

Simon, M.K. and Goes, J. (2018) *Dissertation and Scholarly Research: Recipes for Success*. 2018th edn. (A practical guide to start and complete your dissertation, thesis or formal research project).

Smith, D., Mandy, L. and Lu, F. (2004) *An Exploratory Analysis of the Relationship between Stakeholder Management and Information Technology Project Success*.

Soares-Aguiar, A. and Palma-dos-Reis, A. (2008) 'Why Do Firms Adopt E-Procurement Systems? Using Logistic Regression to Empirically Test a Conceptual Model', *IEEE Transactions on Engineering Management*, 55(1), pp. 120–133. Available at: <https://doi.org/10.1109/TEM.2007.912806>.

Spiggle, S. (1994) 'Analysis and Interpretation of Qualitative Data in Consumer Research', *Journal of Consumer Research*, 21(3), pp. 491–503.

Stake, R.E. (1995) *The Art of Case Study Research*. SAGE.

Sucahyo, Y.G., Utari, D., Budi, N.F.A., Hidayanto, A.N. and Chahyati, D. (2016) 'Knowledge management adoption and its impact on organizational learning and non-financial performance', *Knowledge Management and E-Learning*, 8(2), pp. 387–413.

TechAdvisory (2015) *Three types of business dashboards*, *TechAdvisory.org*. Available at: <https://www.techadvisory.org/2015/08/three-types-of-business-dashboards/> (Accessed: 19 July 2020).

Themistocleous, M., Irani, Z., Kuljis, J. and Love, P.E.D. (2004) 'Extending the Information System Lifecycle through Enterprise Application Integration: A Case Study Experience', in *Proceedings of the 37th Hawaii International Conference on System Sciences*. Retrieved November 1 2004 from: <http://csdl.computer.org/comp/proceedings/hicss/2004/2056/08/205680228b.pdf>.

Thompson, K. (2015) *Positivism and Interpretivism in Social Research*, *ReviseSociology*. Available at: <https://revisesociology.com/2015/05/18/positivism-interpretivism-sociology/> (Accessed: 16 August 2019).

Thong, J.Y.L. and Yap, C.S. (1995) 'CEO characteristics, organizational characteristics and information technology adoption in small businesses', *Omega*, 23(4), pp. 429–442. Available at: [https://doi.org/10.1016/0305-0483\(95\)00017-I](https://doi.org/10.1016/0305-0483(95)00017-I).

Tomatzky, L. and Fleischer, M. (1990) *The Process of Technology Innovation*. Lexington: Lexington Books.

Venkatesh, V. and Bala, H. (2012) 'Adoption and Impacts of Interorganizational Business Process Standards: Role of Partnering Synergy', *Information Systems Research*, 23(4), pp. 1131–1157. Available at: <https://doi.org/10.1287/isre.1110.0404>.

Walker, R.S. and Brown, I. (2019) 'Big data analytics adoption: A case study in a large South African telecommunications organisation', *SA Journal of Information Management*, 21(1), p. 10. Available at: <https://doi.org/10.4102/sajim.v21i1.1079>.

Walsham, G. (1993) *Interpreting Information Systems in Organizations*. 1st edn. New York, NY, USA: John Wiley & Sons, Inc.

Wanda, P. and Stian, S. (2015) 'The Secret of my Success: An exploratory study of Business Intelligence management in the Norwegian Industry', *Procedia Computer Science*, 64, pp. 240–247. Available at: <https://doi.org/10.1016/j.procs.2015.08.486>.

Wang, H.-C. (2014) 'Distinguishing the adoption of business intelligence systems from their implementation: the role of managers' personality profiles.', *Behaviour & Information Technology*, 33(10), pp. 1082–1092.

Watson, H.J. and Wixom, B.H. (2007) 'The Current State of Business Intelligence', *Computer*, 40(9), pp. 96–99. Available at: <https://doi.org/10.1109/MC.2007.331>.

Wells, S., Rozenblum, R., Park, A., Dunn, M. and Bates, D.W. (2015) 'Organizational strategies for promoting patient and provider uptake of personal health records', *Journal of the American Medical Informatics Association: JAMIA*, 22(1), pp. 213–222. Available at: <https://doi.org/10.1136/amiajn-2014-003055>.

Wieder, B. and Ossimitz, M.-L. (2015) 'The Impact of Business Intelligence on the Quality of Decision Making – A Mediation Model', *Procedia Computer Science*, 64, pp. 1163–1171. Available at: <https://doi.org/10.1016/j.procs.2015.08.599>.

Wieder, B., Ossimitz, M.-L. and Chamoni, P. (2012) 'The Impact of Business Intelligence Tools on Performance: A User Satisfaction Paradox?', *International Journal of Business and Economic Sciences Applied Research (IJBESAR)*, 5(3), pp. 7–32.

Wixom, B.H., Watson, H.J. and Werner, T. (2011) 'Developing an enterprise business intelligence capability: The Norfolk Southern journey', *MIS Quarterly Executive*, 10(2), pp. 61–71.

Woodside, J. (2011) 'Business Intelligence Best Practices for Success.', *Proceedings of the European Conference on Information Management & Evaluation*, pp. 556–562.

van Wyk, B. (no date) 'Research design and methods Part 1'. University of Western Cape. Available at: https://www.uwc.ac.za/Students/Postgraduate/Documents/Research_and_Design_I.pdf.

Xu, S., Kevin, Z. and Gibbs, J. (2004) 'Global Technology, Local Adoption: A Cross-Country Investigation of Internet Adoption by Companies in the United States and China', *Electronic Markets*, 14, pp. 13–24. Available at: <https://doi.org/10.1080/1019678042000175261>.

Yeaple, R.N. (1992) 'Why are small R D organizations more productive?', *IEEE Transactions on Engineering Management*, 39(4), pp. 332–346. Available at: <https://doi.org/10.1109/17.165415>.

Yeoh, W., Koronios, A. and Gao, J. (2008) 'Managing the Implementation of Business Intelligence Systems: A Critical Success Factors Framework', *IJEIS*, 4, pp. 79–94. Available at: <https://doi.org/10.4018/jeis.2008070106>.

Yin, R.K. (2009) *Case Study Research Design and Methods*. Fourth. United Kingdom: Sage Publications Ltd (Applied social research methods series).

Yin, R.K. (2018) *Case Study Research and Applications: Design and Methods*. Sixth. Los Angeles: Sage Publications Ltd (Case study research : design and methods).

Ying, L., Lijun, X. and Wei, S. (2009) 'Designing Supply Chain KPIs for Upper-Level Management', in *2009 IITA International Conference on Services Science, Management and Engineering. 2009 IITA International Conference on Services Science, Management and Engineering*, pp. 19–21. Available at: <https://doi.org/10.1109/SSME.2009.139>.

Young, J.C., Rose, D.C., Mumby, H.S., Benitez-Capistros, F., Derrick, C.J., Finch, T., Garcia, C., Home, C., Marwaha, E., Morgans, C., Parkinson, S., Shah, J., Wilson, K.A. and Mukherjee, N. (2018) 'A methodological guide to using and reporting on interviews in conservation science research', *Methods in Ecology and Evolution*, 9(1), pp. 10–19. Available at: <https://doi.org/10.1111/2041-210X.12828>.

Yousaf, M. (2019) 'Explanatory Research Definition, Explanatory Research Types, Comparison, Advantages, disadvantages', *ScholarshipFellow*, 10 March. Available at: <https://scholarshipfellow.com/explanatory-research-definition-types-comparison-advantages-disadvantages/> (Accessed: 19 August 2019).

Zhu, K., Kraemer, K.L. and Dedrick, J. (2004) 'Information Technology Payoff in E-Business Environments: An International Perspective on Value Creation of E-Business in the Financial Services

Industry', *Journal of Management Information Systems*, 21(1), pp. 17–54. Available at: <https://doi.org/10.1080/07421222.2004.11045797>.

Zhu, K., Kraemer, K.L. and Xu, S. (2006) 'The Process of Innovation Assimilation by Firms in Different Countries: A Technology Diffusion Perspective on E-Business', *Management Science*, 52(10), pp. 1557–1576. Available at: <https://doi.org/10.1287/mnsc.1050.0487>.

Zhu, Kraemer, Gurbaxani, and Xu (2006) 'Migration to Open-Standard Interorganizational Systems: Network Effects, Switching Costs, and Path Dependency', *MIS Quarterly*, 30, p. 515. Available at: <https://doi.org/10.2307/25148771>.

Zhu, Z. (2000) 'Cultural Change and Economic Performance: An Interactionistic Perspective', *International Journal of Organizational Analysis (1993 - 2002)*, 8(1), p. 109. Available at: <https://doi.org/10.1108/eb028913>.

ANNEXURE A – INTERVIEW PROTOCOL

Section	Interview Question	Related Research question	Literature review
Demographic information	- What is your job function in the organisation? - What is the aim of your division in the organisation? - What are the daily functions of your division? - How many employees are there in the division?		
General information	- Please tell me about the ways in which you believe BIS has been adopted in the organisation. - What factors do you believe have contributed to the adoption of BIS in the organisation? - Please tell me about the extent to which you have adopted BIS in your division. - What factors do you believe have contributed to BIS adoption in your division?	Applicable to all research questions	
Organisational factors	- What factors in the organisation do you feel have contributed to the adoption of BIS? Please explain why. - What do you think about the size of the organisation has affected the adoption of BIS? Please explain why. - What do you think about the available financial resources have affected the adoption of BIS? Please explain why.	What organisational factors are perceived to affect the adoption of the visualisation and data exploration BIS in the public sector organisation? What are the perceptions as to why these identified factors influence the adoption of BIS?	(Kotze and Mudzana, 2015) and (Puklavec, Oliveira and Popovic, 2014)
Technological factors	What factors of the technological artefact do you feel have contributed to the adoption of BIS? Please explain why.	What aspects of the visualisation and data exploration of BIS are perceived to influence the adoption of the BIS in the public sector organisation?	(Kotze and Mudzana, 2015) and (Puklavec, Oliveira and Popovic, 2014)

	• What do you think about the benefits expected from the technology have affected the adoption of BIS? Please explain why. • What do you think about the compatibility of the technology with the organisation's processes and values have affected the adoption of BIS? Please explain why.	What are the perceptions as to why these identified factors influence the adoption of BIS?	
Environmental factors	The public sector environment encompasses the organisation's competitors, customers, service providers and the applicable government regulatory framework. • What factors in the public sector environment do you feel have contributed to the adoption of BIS? Please explain why. • What do you think about government regulations have affected the adoption of BIS? Please explain why. • What do you think about the support from service providers have affected the adoption of BIS? Please explain why.	What external environmental factors are perceived to influence the adoption of the visualisation and exploration BIS in the public sector organisation? What are the perceptions as to why these identified factors influence the adoption of BIS?	(Kotze and Mudzana, 2015) and (Rouhani <i>et al.</i> , 2018b)

ANNEXURE B – PARTICIPANT INFORMATION LETTER



Dear Sir/Madam

My name is Modiketse Tshehla, and, I am a Masters student in Information Systems at Wits University in Johannesburg. As part of my studies, I have to undertake a research project. The aim of this research project is to explore factors affecting the adoption of Business Intelligence Solutions in the public service organisation.

As part of this project, I would like to invite you to take part in an interview. This activity will involve a once-off interview where you will be answering a set of questions and it will take around 60 minutes. With your permission, I would also like to record the interview using an audio device. The audio recording will be uploaded onto a password-protected computer to ensure safeguarding.

You will not receive any direct benefits from participating in this study, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation, in my final research report. If you experience any distress or discomfort, we will stop the interview or resume another time.

If you have any questions afterwards about this research, feel free to contact me on the details listed below. If you wish to receive a summary of this report, I will be happy to send it to you upon request. If you have any queries, concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (non-medical), telephone + 27(0)11 717 1408, email Shaun.Schoeman@wits.ac.za

Yours sincerely,

Modiketse Tshehla, 2135251@students.wits.ac.za, 0827380105

Lyrice Cohen, Lyrice.Cohen@wits.ac.za, 011-7178153

ANNEXURE C – PARTICIPANT CONSENT FORM



Title of project: Factors affecting the adoption of business intelligence solution in a public sector organisation

Name of researcher: Modiketse Tshehla

I agree to participate in this research project. The research has been explained to me and I understand what my participation will involve.

I agree that my participation will remain anonymous YES NO (please circle)

I agree that the researcher may use anonymous quotes
in his/her research report YES NO

I agree that the interview may be audio recorded YES NO

I agree that the information I provide may be used
anonymously by other researchers following this study YES NO

..... (signature)

..... (name of participant)

..... (date)

ANNEXURE D – ORGANISATION PERMISSION LETTER



Private Bag [REDACTED] PRETORIA, 0001, [REDACTED] PRETORIA
Tel: +27 12 [REDACTED], Fax: +27 12 [REDACTED]

Mr Modiketse Tshehla
[mod\[REDACTED\]@\[REDACTED\].co.za](mailto:mod[REDACTED]@[REDACTED].co.za)

Dear Mr Tshehla

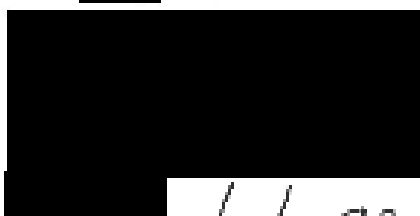
REQUEST TO UTILISE THE [REDACTED] AS A PARTICIPANT IN A RESEARCH STUDY

A letter dated 16 October 2020 from University of Witwatersrand refers.

Kindly be informed that the [REDACTED] has granted you permission to use [REDACTED] as a participant in your research under the topic: "Factors affecting the adoption of Business Intelligence Solutions in a Public Sector Organisation".

Please communicate with Mr [REDACTED] Director: Information Communication Technology (ICT) who will assist you with the required information. Mr [REDACTED] can be contacted at the following e-mail address: [REDACTED] [gov.za](mailto:[REDACTED]@gov.za) or Telephone Number.: 012 [REDACTED].

The [REDACTED] would like to wish you all the best in your research.



Date:

29/10/2020

Cc: Mr [REDACTED]

ANNEXURE E – ETHICS CLEARANCE CERTIFICATE



SCHOOL OF BUSINESS SCIENCES ETHICS COMMITTEE **CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)**

CLEARANCE CERTIFICATE

PROTOCOL NUMBER: CBUSE/1657

PROJECT TITLE

Factors Affecting the Adoption of Business Intelligence Solution in A Public Sector Organisation

INVESTIGATOR

Mr Modiketse Tshehla

SCHOOL/DEPARTMENT OF INVESTIGATOR

School of Business Sciences

DATE CONSIDERED

23 September 2020

DECISION OF THE COMMITTEE

Approved unconditionally

RISK LEVEL

LOW RISK

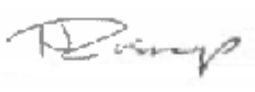
EXPIRY DATE

31 December 2022

ISSUE DATE OF CERTIFICATE

2 October 2020

CHAIRPERSON


(Neetu Ramsaroop)

cc: Supervisor: Lyrice Cohen

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.


Signature

Date

2020 / Oct / 05

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

ANNEXURE F – CODEBOOK

NOTE: The green tick indicates factors that were initially discovered from the literature and framework

