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The Perceived Business Value of a Business Intelligence System in the South African Energy Sector

Applied Research Project

submitted by

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

Supervisor:

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[May 2024]

Attestation of the Authorship

I, Kgoramele Joseph Oupa Kgasago, do hereby declare that this dissertation is a result of my own investigation unless otherwise referenced or acknowledged. It is original and has not been, or is being, or is to be submitted anywhere for any other degree award at this university or any other academic institution.

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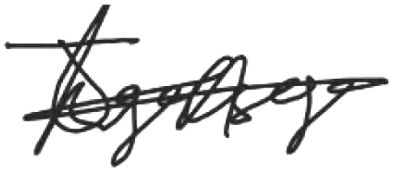

31 May 2024

Abstract

The use of the BI System is assumed to be beneficial to organisations based on several conceptual and empirical studies which were undertaken to establish the business value of this information system. The current era of the fourth industrial revolution is characterised by innovative solutions such as Robotic Process Automation (RPA), Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT) and Big Data Analytics (BD), which have furthermore elevated the significance of BI System. The adoption of these technologies creates voluminous amounts of data and information, which need BI System to integrate and manage these data and generate relevant insight to enhance decision-making. However, the literature about how the adoption and use of BI Systems add business value to organisations is still limited. Most studies on the impact of the adoption and use of BI Systems to establish its business value have adopted quantitative empirical studies. Furthermore, the extant literature on BI System is still very limited when it comes the impact and business value that the BI System has on the South African energy sector.

This study adopted a modified version of the Balanced Scorecard (BSC) as a theoretical framework that underpinned its investigation on how the use of BI System adds value in the South African energy sector. A qualitative research methodology was assumed to explore this phenomenon about perceived business value of BI Systems in the energy sector. Six professionals working in the South African energy sector's oil and gas segment were sampled thorough purposive sampling technique and interviewed collect qualitative data about the BI System is perceived to impact this sector. Thematic analysis strategy was used to analyse the data from the opinion, views, values, and perspectives of participants to identify themes, concepts, and ideas that adequately explains this phenomenon.

The findings of the study revealed that, BI System impacts organisations indirectly by providing actionable insight that supports the decision-making process in key business areas. As such, the BI System impacts organisations' performance through financial control, customer relationship management, revenue and sale increase, Internal controls and governance management, business process and enhanced asset performance. Consequently, the adoption and use of the BI System is deemed as a strategic initiative which must be embraced to enable organisations to respond to global business dynamics promptly and sustainably.

Acknowledgements

Let me first indicate my gratefulness and thankfulness to Almighty God for affording me this precious gift of Life and the ability to study and complete this dissertation regardless of how challenges the circumstances were. In the book of Philippians 4:13, the apostle Paul says, “For I can do everything through Christ, who gives me strength”.

Throughout this study, my supervisor, Dr Pius Oba, demonstrated trust and faith in my ability and knowledge to preserve and complete this dissertation regardless of the challenges and obstacles that were there. His leadership style, coaching and mentoring approach to supervising at this level were nothing short of inspiration and motivation to remain committed to work hard and believe that this was not insurmountable.

Lastly, I salute the patience, understanding and support of my lovely wife Eva and the children, Reatlegile, Orephemetje, Oreratile and Relokafaditjwe, who had to endure to have limited time from me during this study. The tribulations and challenges you went through. The loneliness conditions under which you left are immeasurable, and only God can adequately reward you for that.

Dedication

I wish to dedicate this study to my parents, Eric Moketse and Francinah Ramadimetje Kgasago, whose guidance, inspiration, support and most importantly prayers have always enabled me to be the Oupa of today. Their approach in raising us has shaped me always to preserve, dream, pray, have hope and achieve more. Although they did not get far with education, they always encouraged us to be inquisitive to learn and become knowledgeable, because of the value that they attribute to education.

Furthermore, I am indebted to my wife and our kids for creating an environment that enabled me to be absent from them during the entire journey. It was not an easy journey, particularly as it was characterised by several challenges, including time constraints and health instabilities; however, by the Grace of the Lord, the goal was finally achieved.

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1 CHAPTER ONE: INTRODUCTION

This chapter presents an introduction to the field of study as well as an overview of the entire dissertation. An introductory background of the study, as well as its significance, is provided in Section 1.1. Subsequently, an overview of the South African energy sector to clarify the significance of the study from a theoretical perspective and the Energy Sector - Oil and Gas segment, which plays a significant role in the development and sustainability of the economy, is presented in section 1.2. The problem that the study aimed to resolve is presented in section 1.3; The purpose of the study is presented in sections 1.4. Furthermore, the chapter presents the assumptions, delimitations, and limitations of this study in section 1.5 to clarify the assumption under which this study was conducted as well as the boundaries that framed the study from a theoretical perspective and demographic in terms of data collection. Lastly, the synopsis of this dissertation are presented in sections 1.6.

1.1 Introduction to the Field of Study

In this era of the Fourth Industrial Revolution and prevailing innovations that are characterised by a globalised business atmosphere, Business Intelligence Systems (BI Systems) gained significant attention from executives (Ain, Vaia, DeLone, Waheed, 2019). Chief amongst all the reasons is because BI System has the capability to bring together and transform data from several systems into actionable insight that enhances decision making processes for executives (Ain, Vaia, DeLone, Waheed, 2019). Also, organisations generate voluminous data and information, which is considered a competitive factor which needs diligent organisation and management in the current global business world. Information Systems (IS) adopted in several business operational areas exacerbate the situation by creating lots of data that traditional techniques cannot process, analyze, and interpret (Tunowski, 2015).

In the most highly volatile and competitive markets like the oil and gas segement, the decision-making process is complex and requires organisations to be good at (Karim, 2011). Such competitions continue to show that there is an increasing need for on-time, relevant and reliable information assistance to support and enhance the decision-making process. Therefore, the main promises of technological innovations such as the BI System continue to rapidly attract more champions for numerous industries (Arefin, Hoque, & Bao, 2015). The BI System is understood to play a very critical role in many organisations due to its

ability to support decision-making and improve organisational effectiveness and performance (Tunowski, 2015).

BI System is known as a suite of technological components that enable companies to gather, integrate and analyze huge amounts of data to understand their opportunities, strengths, and weaknesses (Ain et al., 2019). However, despite all these promises from the BI System and the continued interests from business leaders, many organisations still struggle to measure and comprehend its business value and the impact it has on their organisations (Ahmad, Miskon, Alkanhal and Tlili, 2020).

Several sectors, including but not limited to energy, professional services, industrial and financial services sectors, generate huge amounts of data daily, if not hourly or every minute, due to several factors, including regulatory and market dynamics. Therefore, investments in technologies like the BI System in the energy sector are vital for their success and sustainability, particularly when one considers its volatility. However, attaining success in the implementation, adoption and use of BI Systems is a complex undertaking that comes at significant costs (Suhendra, Ernestivita, Khasanah and Filandari, 2020). What makes this undertaking more complex and difficult to succeed is the inability of organisations to provide objective methods to measure their economic benefit and clearly articulate how such investment results in measurable benefits.

Unlike other Information Systems, it is not easy to articulate the business value of BI Systems because their implementation does not result in verifiable tangible benefits. Several studies have taken place to assess the business value of BI System (Ahmad, et al. 2020, Suhendra, et al. 2020). However, it is still unclear how BI Systems can be evaluated to assist organisations in understanding the impact of such technological innovation on their businesses (Trieu, 2017).

Therefore, this study was undertaken to develop a theoretical framework through which the business impact and value of Business Intelligence Systems in the Energy sector can be well-articulated and comprehended. Furthermore, this study aimed to assist organisations in this sector to derive value from investing in such a technological innovation to deal with their market woes and become sustainable for the development of the economy.

Limited and unclear articulation of the business value of BI Systems in the energy sector can result in a lack of adequate support, adoption, and use of BI Systems in this sector. This

can potentially reduce the growth of the BI System adoption in the energy sector and deprive the sector of the gains associated with its adoption and use.

Often, executives and board members do not approve investments in technological systems which are without a convincing business case and clearer articulation of value for money. Such a scenario will result in an adverse impact on the customers of this sector because of the sector's inability to serve them adequately and optimally through the adoption and use of the BI System.

The energy sector is one of the strategic industries of the economy, so a lack of or unclear investment in the BI System could result in unsurmountable issues to the country's economy. The success and sustainability of every country's economy is solidly and highly dependent on its ability to secure enough reliable and sustainable energy for any area of need for sustainability energy.

Based on this, a study of this nature was embarked on to address these issues of unclear articulation of the impact of BI Systems and the way in which value is derived from the use of BI Systems in this sector to reduce the energy supply crisis. It is lastly, the goal of this study is further to reduce the energy supply shortage in the country by helping organisations to derive economic value from the adoption of the BI system and positively contribute to the growth of the country's economy.

1.2 Overview of the South African Energy Sector

The South African energy sector is a fundamental pillar of every economy's strength, sustainability, and success. After all, it makes a huge input to every economy. Energy is a strategic and significant factor in every business' livelihood, including manufacturing, professional services, transportation, hospitality, and agriculture, thus making it a very critical component of our day-to-day life. Equally, the same scenario is relevant to the South African economy as it was cited that the lack of energy has contributed to the slow performance of the economy.

The source of energy is a critical component of every government because energy is a strategic driver for economic and social development. Water, education, nutrition, infrastructure, health, wealth, and even life expectancy has significant and robust associations with the consumption of energy per capita (Ettmayr & Lloyd, 2017). Because

developing countries like South Africa need to expand their energy supplies to meet emerging demands and improve societal living standards.

Therefore, reliable energy sources to meet South African economic performance demands cannot be overstated because the energy sector's contribution to economic growth is crucial as it influences the creation of job opportunities and the extraction, production and transportation of goods and passengers to the world (DoE Energy Balances, 2018).

1.2.1 Coal

According to the Department of Energy, the South African energy supply is made up of coal, crude oil, gas, nuclear energy, renewables, and waste. Coal contributes a significant portion of the supply. Most of the country's coal deposits are in the Limpopo, KwaZulu-Natala Mpumalanga provinces, where there is an abundance of establishment of a highly recognized synthetic fuels industry for Coal to Liquid to produce Fuel and products. Some of it is used to produce electricity by a South African state-owned electricity generator – Eskom, and the balance is exported to the Asia and European markets.

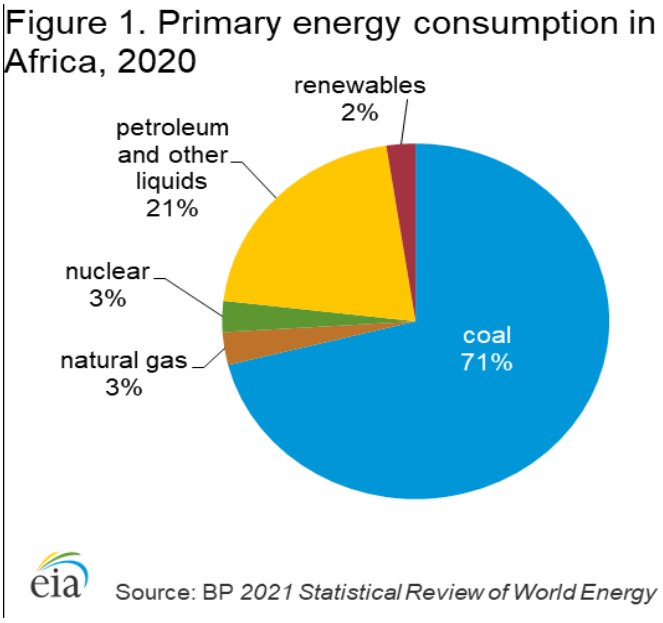


Figure 1: Total primary energy supply – Source: US Energy Information Administration 2020

The country's electricity utility company – Eskom, is currently faced with severe challenges from high debts and ailing infrastructure, which require significant investments in maintenance and upgrades of some of its fleet of coal power plants. This has created a situation in which the country is faced with significant power outages due to major dependency on the ageing coal-fired power plants.

Continued breakdowns and increasing demands for maintenance of these plants have worsened the situation and further plagued the financially stressed Eskom into a crunch. As a result, the state entity found itself compelled to ask the energy regulator to approve skyrocketing traffic increases, which have resulted in a 460% hike since 2007.

The impact of the energy crisis that South Africans have experienced in the last 15 years cannot be overstated. Currently, the main drivers for energy demand in South Africa are commercial, industrial, public services and residents. However, residents drive demand about one-fifth of the total market. This suggests that the industries, commercial and public services are always the most impacted by power outages resulting from Eskom's implementation of loadshedding.

Consequently, the country's economic backbone is damaged by disrupting businesses and public services. The ripple effect of this is that businesses will pass on the rising cost of energy to consumers and further worsen the level of economic inequalities. Furthermore, the business will increase their unit costs or lay off staff in a way that tries to improve their profitability from lower production resulting from power outages. Consequently, the employment rate will rise to unmanageable levels because businesses will be trying to respond to such market changing conditions.

1.2.2 Petroleum and other Liquids

Petroleum and other liquids contribute about 21 percent of the energy supply, most of which comes from refineries. In 2017, South African refining capacity was able to refine 703 000 barrels per day (bpd), as depicted in Figure 2. However, the situation changed due to several developments adversely impacting this sector. The current refining capacity, which demonstrates a reduction in the country's ability to refine oil, is demonstrated in Figure 3, although it ought to be corrected because the situation has improved.

In 2019, what was called Chevron and now named Astron refinery in Cape Town was shut down after it exploded; however, now it is back to beneficial operation after it was down for more than three years. In 2021, the Enref, Engine's refinery in Durban, was shut down after it blew up and currently it is used as a storage terminal for imported refined products. Sapref BP and Shell's refinery halted operations at the end of March 2022 after its owners considered selling it due to what is alleged to be the government's published regulation for cleaner fuels because the regulations imposed higher operating and capital costs on

domestic refiners, which needed to upgrade their refineries to meet the regulatory requirements.

The State-owned PetroSA, which runs a Gas-to-Liquid technology, is also reported to be having mechanical and feedstock supply challenges. According to the US Energy Information Administration, South Africa currently imports 232 000 barrels of crude oil and condensate per day while it exports about 69 000 barrels daily.

Capacity of South African refineries

Capacity (bbl/day)

Refineries	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sapref	180 000	180 000	180 000	180 000	180 000	180 000	180 000	180 000	180 000	–
Enref	120 000	120 000	120 000	135 000	135 000	135 000	135 000	135 000	–	–
Astron Energy	100 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000
Natref	108 000	108 000	108 000	108 000	108 000	108 000	108 000	108 000	108 000	108 000
Sasol*	150 000	150 000	150 000	150 000	150 000	150 000	150 000	150 000	150 000	150 000
PetroSA*	45 000	45 000	45 000	45 000	45 000	45 000	45 000	45 000	–	–
Total	**703 000**	**703 000**	**703 000**	**718 000**	**718 000**	**718 000**	**718 000**	**718 000**	**538 000**	**358 000**

*Crude equivalent

Figure 2: Refinery Production Capacity - Source: SAPIA, 2022

The current state of the country's energy sector has had adverse impact on the country's economy, and the ripple effect of these is felt by the poorest of the poor. Different industries had shed jobs due to a lack of a stable supply of energy, while the cost of living continued to rise due to increases in transportation costs.

Refinery name	Ownership	Location	Notes	Nameplate capacity (barrels per day)
Natref refinery	Sasol (64%) TotalEnergies (36%)	Sasolburg	Operational	107,000
Sapref refinery	BP (50%) Shell (50%)	Durban	Closed indefinitely; possible future restart	180,000
Astron refinery	Astron Energy	Cape Town	Shut down in July 2021; possible restart in 2022	110,000
Enref (Engen) refinery	Petronas (74%) Phembani (21%) Phembani-led consortium (5%)	Durban	Shut down in 2020; planned conversion to a storage and import terminal by 2023	125,000
Total				**522,000**

Figure 3: South African Energy Refining Capacity
Source: US Energy Information Administration, 2022

The latest estimates from the World Bank Group indicate that South Africa is one of the most developed economies in Sub-Sahara Africa, following Nigeria in terms of Gross Domestic Product (GDP) (USA Energy Information Administration, 2022). However, it is regarded as the highest consumer of petroleum and other liquids in the continent, while its energy-intensive industrial, commercial, and mining exert more pressure on its coal-dependent energy source.

This sector finds itself in this difficult situation despite its investment in high-tech solutions such as BI Solutions, which have the potential to help these organisations run their business sustainably and effectively. By its nature, it creates voluminous amounts of data daily, cutting across fuel usage, machinery running hours, fuel production volumes, electricity usage, shift many hours, and forecasts and demands. However, it is unclear, or in the literature little is known about how this sector should leverage the adoption of BI System to minimise its challenges.

Furthermore, it is unknown how the BI System adds business value and which business areas are impacted by the BI System to enhance organisational performance in this sector. Consequently, this presented a need to investigate the impact of the adoption and use of BI Systems in this sector and how this sector can benefit from effective utilisation of this innovation. The inspiration behind this study was, therefore, to examine the impact of BI System adoption and usage on the performance of organisations.

1.3 Problem Statement

The South African energy sector has become very vulnerable lately due to an increase in the number of factors such as geopolitical evolutions, technological evolutions, environmental dynamics, and an increase in demand. This has happened so rapidly that the traditional key fossil fuel producers must find alternative ways of remaining relevant, sustainable, and competitive. They are constantly facing the potential loss of existing customers due to several factors, such as price competitiveness, perceived customer loyalty, and other innovative ideas that lure customers easily.

This sector plays a very important role in the sustainability and growth of our country's economy. Because it serves small and multinational industries and government at all levels, including but not limited to medium, low, and higher households across the country, these can include rural and urban-based, illiterate, and highly qualified customers, including the

most vulnerable poorest class of society. The inability of this sector to meet the growing demands for a sustainable supply of energy presents a serious risk to the country's economic growth because the wheels of the country's economy are non-existent if the supply of power fails to meet the desired demand (Ratshomo & Nembahe, 2018).

To meet the expectations of such a diverse clientele, organisations in this sector need to have real-time, reliable, and complete information and insight at all the times to enhance their decision-making processes and remain competitive (Huang, Savita, Dan-yi, Omar, 2022). Their ability to be agile enough and respond to market dynamics requires access to the right content at the right time to make the right decisions, which is critical for their relevance and sustainability. Consequently, the relevance of the BI System to this sector is deemed to be very high because organisations and customers create voluminous amounts of data which need to be stored and analyzed daily. Also, this data requires the capability to collect, integrate, store, and analyze it from different sources to provide reliable insight for decision-makers across organisations. BI System is the only technological innovation amongst ICT Solutions that seems to be able to provide such capability (Elbashir, Collier, & Davern, 2008; Hocevar & Jackic, 2010; Trieu, 2017).

Despite several organisations' significant increase in interest in Business Intelligence Systems, adequate evaluation of Business Intelligence Systems remains a challenge (Hocevar & Jackic, 2010; Eybers, Kroeze & Strydom, 2013; Hou, 2016). In the main, organisations still battle to evaluate the business value of the BI system adequately, and they use incorrect financial mechanisms such as Return on Investment (ROI), Internal Rate of Return (IRR) and Net Present Value (NPV) (Hočevar & Jaklič, 2010). However, the escalation of investments in financial and intellectual resources to drive the adoption of systems such as the BI System (Martinsons, Davison, Tse, 1999) cannot be measured in this way. Yet it is frequently asked more than ever whether such investments are worth the resources and effort and what will be the benefits of such expensive investments (Hočevar & Jaklič, 2012). Because evaluating the business value of ICT investments, including BI Systems, remains challenging for many practitioners and researchers.

Therefore, these increasing phenomena present a need for an effective approach to be used to measure and evaluate the value of the BI System. Organisations are expected to derive true business value from adopting the BI System so that they can remain relevant to their markets and retain long-term sustainability and profitability. Conversely, it must be noted

that the value and benefits of the BI System are often intangible, delayed, indirect and non-financial by nature (Hočevar & Jaklič, 2012).

Therefore, nuances about how BI Systems deliver value are still not well understood in many organisations that have implemented BI Systems, which poses a risk to the BI Systems market (Paradza and Daramola, 2021). Because most executives approve investment decisions in technological innovations that demonstrate the potential to deliver economic benefits. However, there is a lack of a specific, effective, and rigorous methodology through which the business value of the BI System can be measured (Elbashir, Collier, & Davern, 2008). Several studies relating to the business value of BI System have been conducted with the use of different theoretical frameworks (Hočevar & Jaklič, 2010; Paradza and Daramola, 2021). However, it remains unclear whether and how the adoption of the BI System impacts organisational financial performance, customer services, business process innovation, risk management and learning and growth.

A lack of a conclusive framework that explains how the adoption of the BI System influences the organisational performance indicators leaves organisations with a limited understanding of how this innovation adds value. Therefore, organisations' failure to adequately articulate the benefits of BI System will discourage them from supporting BI System investments (Gibson, Arnott, & Jagielska, 2004). The executives are always keen to see the return on investment or return on equity before they can support or approve any business investment decision.

A practical or empirical evaluation of the business of BI systems is often not carried out because of a lack of measurement methods and resources (Popovic et al., 2010). Researchers adopted and enlisted various theories, lenses, and approaches to investigate the BI System value creation (Trieu, 2017), while the literature reports mixed findings on the impact of the BI System. Several theories, models, frameworks, and taxonomies have been developed because of several studies that investigated the business impact of IT capabilities. Some of the studies remained conceptual without thorough testing, and some have been subject to several empirical studies that tested their postulations (Eybers, Strydom, & Kroeze, 2013). However, all these studies aimed to reach a common goal of establishing the business value that organisations realize due to investments in technologies, including BI Systems.

Furthermore, the inability to articulate the business impact of the BI System creates doubts about its worthiness and makes it difficult for such investments to be approved by South African energy organisations. What heightens the complexity of the matter is the hight cost that is associated with the implementation and adoption of BI System. Consequently, these doubts about the economic benefits of BI System adoption leads to significant losses of business value due to lack of or delays in adoption and effective use of BI Systems.

This sector is critical to the country's economic growth and sustainability. Its failure to leverage the potential of the BI System through slow to inadequate adoption of BI System is likely to cause catastrophic experiences for the country. The country's sustainable economic growth is dependent on a secure and cost-effective energy supply to all sectors that are reliant on energy as a main production driver, such as mining and industrial. Therefore, the energy sector's lack of ability to derive economic value from the adoption of the BI System is likely to cause unintended consequences to the economy. So, this study is needed to determine whether and how BI System adds business value in these business performance areas to assist organisations in this sector to be competitive, agile, and sustainable.

1.3.1 Primary Research Objective

The objective of this study was to investigate and understand how does the adoption and use of Business Intelligence Systems deliver business values in the South African energy sector.

1.3.2 Secondary Research Objectives

1. To investigate what are the business performance areas which are impacted by the adoption and use of BI Systems in the South African energy sector.
2. To investigate how does the adoption and use of the BI System influence the organisational performances in the South African energy sector.
3. To explore the method through which the business value of the adoption and use of BI Systems in the South African energy sector can be recognized.

1.4 The Purpose of the Study

This study's purpose was to establish how does the adoption of BI Systems have impact on the overall performance of organizations in the energy sector with focus on key concepts of balanced score card (BSC). This purpose was driven by the need to reduce the intense level

of shortage through informed decision making processes that are supported by the right insight to the right people at the right time.

Furthermore, the purpose of this study was to establish how can the impact of the adoption of BI System be measured across various business performance areas. Lastly, this study intended to enhance the knowledge and understanding of how BI System adds value within the South African energy sector to aid in the development of a convincing business cases for the adoption and use of BI Systems.

Lack of convincing business cases for BI Systems adoption and use will result in non-approval of BI initiatives and deprive the energy sector of the potential gains and successes that can be realized from the use and adoption of BI Systems.

1.5 Assumption, Delimitations and Limitation of The Study

This study's assumptions are that its participants were involved in the implementation of BI System and are also using the system in their roles. The study had also assumed that the participants had a thorough understanding of the research interview guide's questions to provide adequate and reliable responses. It is the assumption of this study that, the respective organisations from which the participants work have implemented and are using BI System.

The delimitation of this study is that it assumed specific concepts of Balanced Score Card to investigate the perceived impact of the adoption and use of BI System in specific performance areas of the energy sector through a qualitative inquiry. As such, the scope of the study was limited only to how BI System impacts the Financial Performance, Customer Retention, Risk Management and Business Process enhancement of the energy sector. Because these are generally critical areas against which most of the organisations' performance is measured, this is not an exhaustive list of organisational performance measures. Often, the business' vision, mission, strategy, and objectives will determine what performance areas will be monitored to ensure the attainment of the business's strategic objectives.

Consequently, this study did not investigate the phenomenon about the impact of BI System with respect to Marker Share, Governance, Strategy performance and Information Technology Metrics although they are important to measure. It was also not the intention of this study to investigate the determinants of adoption, use and implementation methodology

of BI System. Neither did this study measure the extent to which the use of BI impacts the organisations' performance in respect to the Financial Performance, Customer Retention, Risk Management and Business Process enhancement areas. Instead, the study wanted to explore and establish how does the usage of BI System usage impacts these specific business areas.

A qualitative methodology was adopted by this study and limited this study to collection of qualitative data through interviews wherein 6 participants from various organizations were interviewed. Most of its respondents or units of observation were professionals who work in the Oil and Gas business segments and are using the BI System in their roles. Consequently, this study included international organizations which are in this segment however focused on their South African operations. Therefore, although its outcomes are expected to be generalizable to the energy sector, it should be noted that its applicability to the renewable energy and coal segments might be unequal or yield different results. However, it must be noted that currently, the South African energy demand is met by supply from Coal and Petrochemical. It is therefore important to also note that this study excluded personnel and employees who do not make use of the BI System and have never been involved in the use of BI System. Furthermore, this study did not cover the coal, renewable, and nuclear segments which presently are significant to the supply of energy in the country.

By virtue of the methodology adopted by this study, data collection and analysis methodology did not include statistical data and neither applied regression analysis. Furthermore, in line with the applied methodology, the study collected qualitative data and adopted thematic data analysis technique to analyze the data. Therefore, the researchers' level of involvement in the process of collecting the data and analysis could potentially present insignificant biases, which influences the understanding and results. Consequently, the reliability and consistency of the results might be a challenge for potential lack of rigor and significance of the proposed consents and themes. Furthermore, the adopted framework (Balanced Score Card) might have potentially affected the researcher's analysis, interpretation, and reporting, thus introducing what is called theoretical insensitivity. Nonetheless, the researcher undertook to ensure that the analysis and interpretation of data are by no means influenced by the study's underpinning theory or the applied research methodology.

1.6 Synopsis of The Study

The outline of this study is organized into Six chapters, as demonstrated in Figure 4. Chapter One presents an introduction to the study, an overview of the South African energy sector, the research problem, the research question, and the objectives of the study. The justification, assumption, limitation, and affirmation of adherence to the University's Research and Ethics policy are also presented in this chapter.

A detailed review of the extant literature on what is BI System, the Business Value of the BI System as well as how it influences the performance of organisations is presented in Chapter Two. In the main, concepts and themes around the business value of BI Systems are presented in this chapter. Furthermore, the chapter presents how the adoption and use of BI System results into beneficial outcomes that add value in specific areas of the organisations.

Chapter Three discusses the literature's Theories and Frameworks that explain how organisations gain business value from adopting Information Systems. The chapter presents each framework's suppositions and further evaluates its relevance to this study. Lastly, the study presents a conceptualization of variables and a conceptual model which underpinned this study.

Chapter Four discusses the study's research design and methodology, which was adopted by this study to ensure its goal is achieved by providing answers to questions posed by this study.

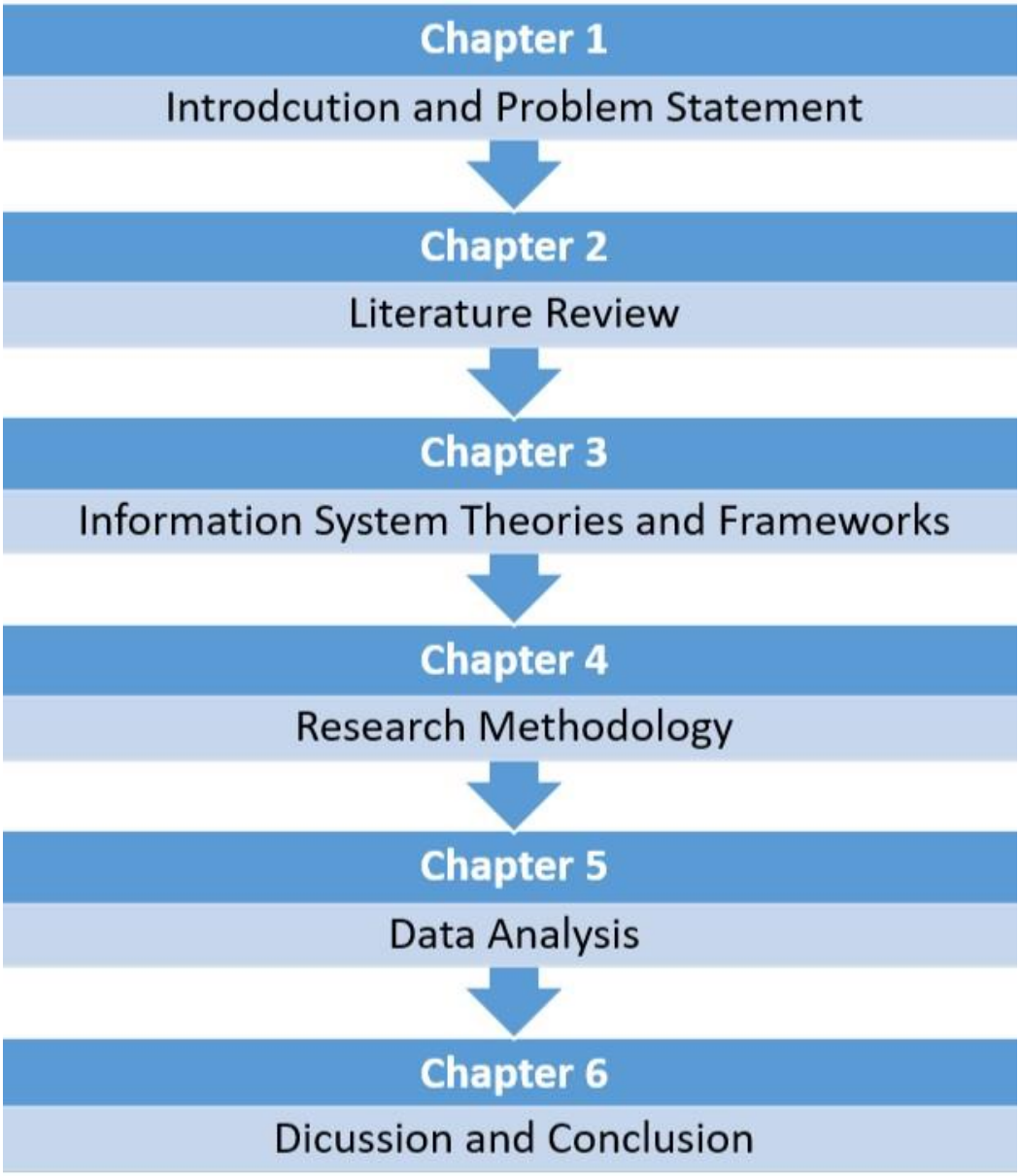


Figure 4: Study's Synopsis

Different research strategies and techniques are discussed, and this chapter discusses the selection and justification of the relevant approaches. Furthermore, data collection tools and analytical techniques which will be adopted by this study are discussed in this chapter.

Chapter five is dedicated to the present analysis of the findings in relation to the objectives and the study's research questions. Also, the chapter discusses the analytical methodology that was adopted by the study in detail, as well as the synthesis of the findings of this study in contrast to the extant literature and existing theories and frameworks.

Chapter six presents a discussion on the conclusion of the study and its contribution to the literature. Furthermore, the chapter presents recommendations and suggestions on what

further studies can be undertaken to contribute to the literature on adopting the adoption and use of BI, which adds business value to organisational key performance areas that are often used.

In conclusion, this chapter presented the introduction to this study, an overview of the South African energy sector, the problem statement, the objectives, and the research question. Furthermore, the chapter presented the purpose of the study, the goal, assumptions, and outline of the entire dissertation.

2 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents an introduction to the BI System literature to provide an overview of BI System literature and the extent to which BI System has been researched and reported. Firstly, the chapter presents the literature on what a BI System is and the kind of system that it is. Furthermore, the literature's perspective on the business value of Information Technology investment decisions is discussed.

A high-level perspective on the business value of BI Systems and how BI System impacts the performance of organisations is also presented to point out the existing gap in literature to substantiate the significance of this study.

The review of Literature on Business Intelligence system is provided in this chapter to further the status of research on the business value of adopting and using BI Systems in an organisation. In the process, a definition of BI Systems and its type as a unique Decision Support System (DSS) is presented in section 2.1, followed by the definition of Decision Support Systems in section 6.2. Furthermore, the components of a BI System's architecture are presented in section 2.3. Lastly, the current literature on the commercial impact of BI and how it influences organisational performance is presented in section 2.4.

2.2 Business Intelligence System

A Business Intelligence System is a system that encompasses technologies, applications, processes, skills, and practices to collect, integrate, store, and analyze large amounts of organisational information to provide insightful wisdom that enhances decision-making processes (Arefin et al, 2015; Bach, Celjo, and Zoroja, 2016). Briefly, this system is about delivering the right information to the right recipients at the right time to enable them to make informed decisions. It is one of the technological innovations that gained popularity from the escalated demand for organisations to always make informed decisions due to growing business environmental uncertainties and market pressures (Popovic, et al, 2010).

However, before elucidating more about what a BI System is, perhaps it is paramount first to clarify what Business Intelligence and Business Intelligence Systems are because there are several interchangeable uses of the two. Business intelligence is a concept that dates to 1865 when Richard Millar Devens explained the usage of business environmental data by a banker, Sir Henry Furnese, to make a profit (Davis & Woratschek, 2015). It refers to

the collection of business data and actionable insight that is acted upon as Business Intelligence.

Later, after several decades, the term found expression in the work of an IBM researcher, Peter Hans Luhn (Davis & Woratschek, 2015). According to Davis and Woratschek (2015), Hans Peter Luhn's definition of business intelligence originated from Webster's dictionary definition, which refers to the ability to understand the relations of the presented insight in a way that influences behaviour towards the intended goal.

So, nowadays, this term is also used to refer to a system that evolved from a decision support system that started in the 1960s and developed and was enhanced until the 1980s. Therefore, Business Intelligence is a concept that refers to the adoption of technological capabilities and methods to collect, store, analyze and use business information to improve business decision-making by utilizing fact-based support systems (Chen, Chiang, Storey, 2012). It is an umbrella term that refers to the application of managerial philosophy, methods and tools to analyze voluminous business information to enhance the effectiveness of the decision-making process (Rouhani, Asgari, & Mirhosseini, 2012).

This is a concept that has gained prominence in most organisations and has become a top priority for several Chief Information Officers and a primary technological investment area (Bedeley, Ghoshal, Lyer & Bhadury, 2016). Organisations find themselves pressurized to invest resources to develop capabilities that are aimed at leveraging and exploiting their business data to be competitive. The concept of Business Intelligence is not new, but it has lately gained prominence from executives in companies because of its integration into elements like big data, analytics, and artificial intelligence, which are integral to digital transformation (Vugec, Vuksic, Bach, Jaklic, & Stemberger, 2020).

However, the BI system is defined as a system that is made up of organisational components and technologies that present external and internal organisational information to users for query, analysis, and reporting to support effective and efficient decision-making to improve processes Trieu (2017). It is a system that has the capability to enable organisations to analyse their business data and information to improve and support decision-making processes across numerous business activities (Elbashir, Collier, & Davern, 2008).

BI System is commonly regarded as a technological innovation that has the capability to present users with efficient access, effective analysis, and intuitive presentation of

organisational wide information from several Information Systems (Popovic et al, 2012). It is a system that is of important category for analysis and reporting of information to meet the needs of managers across various levels of the organisation for access to timely actionable insight to enhance decision-making (Elbashir, Collier, & Davern, 2008). This implies that it is a system that is meant to enhance the decision-making process, thus categorizing it as a strategic tool for executives and other leaders of organisations. The IS literature and ICT industries provide various definitions of BI Systems based on their context and business capabilities (Ain et al., 2019; Ahmad et al., 2020; Bach et al., 2021).

Bach. et al. (2021) define it as a data-driven decision support system that amalgamates the adoption of technology, processes, and methods to collect, store, and analyse data with the primary goal of supporting and enhancing business decision-making. Correspondingly, Maghsoudi & Nezafati (2023) refer to a BI system as a set of technologies that have the capability to collect, integrate and analyse business voluminous data to enhance their competitiveness.

BI System is a technological solution that is commonly known for its core capability to enable organisations to assemble, integrate, and make sense of structured and unstructured data to comprehend their strengths and weaknesses (Ain et al., 2019; Dawson, L. and Van Belle, J-P. 2013; Bischoff, Aier, Winter & Haki, 2015; Ahmad et al., 2020; Bach, Zoroja & Celjo, 2021). So, the extant literature definition on BI Systems indicates that there are various definitions or diverse views of BI Systems. However, a common theme about these definitions is the collection, integration, and analysis of data to support decision-making to become competitive by leveraging strengths and fixing weaknesses.

However, furthermore, the above definitions of BI and BI System are not different from one another, except that Business Intelligence is a concept and Business Intelligence System is a system. In this case, a BI is a concept about supporting the decision-making process through the adoption of a fact-based support system that is reliant on business insight instead of management's intuition. The BI System is a technological innovation that has made this concept a reality. A deduction from the foregoing definitions clarifies that the BI System falls in the category of Decision Support System (DSS), as indicated by Hou (2015). It is not a Transactional Processing System, Process Automation, or Manufacturing Execution System (MES).

2.3 Decision Support System

A decision Support System (DSS) is defined as an Information System that has a class to handle Transactional Processing Systems such as ERP Solutions and can interact with other components of the information system to enhance decision-making (Hogenboom et al. (2016). It is also defined as a computer-based interactive system that allows users to immerse themselves in the process of handling and processing data to gain insight into tackling business problems and making decisions (Bonczek, Holsapple, Whinston, 1980).

According to Phillips-Wren, Daly, & Burstein (2021), DSS is a well-established kind of information system with the goal of enhancing a decision-making process based on data and analysis. Consistent with other authors, Schelling, and Robertson (2020) define it as a computer-based information system with objective insight into the process of decision-making by using data to generate recommendations for decision-makers. This is a kind of information system that is designed to aid users in environments which are characterised by voluminous data and beyond human capacity to process information, and the relation between a decision and results is probabilistic or unclear (Kayande, De Bruyn, Lilien, Rangaswamy, & van Bruggen, 2009).

Phillips-Wren et al. (2021) further allude that it is a kind of information system that draws from several Transactional Processing Systems and interacts with other components to support decision-makers and knowledgeable users' decision-making activities. It is clear from these definitions that DSS is regarded as a computer-based information system that is aimed to enhance decision making process. At the same time, other authors (Salvado, Villeneuve, Masson, Akle, Bur, 2022) coined what is termed a Decision Support System (DSS) based on Multi-Criteria Decision-Making (MCDM. It is a system that enables decision-makers to search the solutions space based on a set criterion, order those solutions in a preferred way, and specify the graininess in the valuation of the technologies concerning individual criteria. Also, they allude to such a system based on a ranking algorithm that operates based on numerous kinds of qualitative and quantitative variables from human and technological sources.

So, in general, it can be concluded that DSS is a kind of system that helps organisations resolve issues by way of reducing uncertainties when decisions are made (Zeebaree & Aqel, 2019).

A conclusion can be made by synthesising Salvado et al. (2022) and Phillips-Wren, et al. (2021) definitions that there are five attributes which are fundamental to any DSS: namely, interactive computer-based system dealing with voluminous unstructured and structured data; modelling and analytical capability; reduction in uncertainty and aiding in decision making to solve problems. Accordingly, these definitions from Salvado et al. (2022) and Phillips-Wren, et al. (2021) describe DSS based on its functional capabilities to enhance decision-making processes.

Literature highlights that often there is interchangeable use of Business Intelligence Systems, Data Warehouses, Big Data, Data Mining and Business intelligence (Triue, 2017). Business Intelligence is defined as an umbrella term for a concept and methods through which an organisation puts processes, people, and technologies together to collect, store, and analyse the organisation's external and internal data to deliver actionable insight to enhance the decision-making process (Trieu, 2017; Paradza & Daramola, 2021). BI System is, in brief, defined as a technological system that enables the achievement of BI as a concept.

Therefore, it can be argued that the BI System is a technological innovation that falls in the category of DSS. However, BI Systems distinguish itself from traditional DSS by their capabilities to i) simplify the aggregation of data, ii) organise and integrate structured and unstructured data, iii) deal with voluminous data, iv) users to unearth new knowledge, and v) deliver capabilities for ad-hoc queries, reporting, and forecasting (Giovanni & DeLone, 2019). Furthermore, Zeebaree & Aqel (2019) asserts that BI System is a Knowledge-Driven DSS. Deducing from the foregoing diverse definitions and perspectives about BI Systems and DSS, as well as the continued growth and interest in BI Systems in academics and industries, it is important for a study of this nature to determine how it adds value to organisations. However, key themes from these definitions are methodologies, processes, and techniques for collecting, storing, and analyzing data to provide actionable insight to enhance decision-making. Furthermore, the BI System is made up of several components that enable it to deliver on its core feature of enhancing decision-making by making the relevant, actionable insight available at the right time.

2.4 BI System Components

BI System is made up of several components that integrate to enable it to fulfil its potential as a Decision Support System. Several varying BI Architectures have been identified from

literature based on the proposed components and how they are organized (Ong et al, 2011; Lee, 2018; Sarma & Prasad, 2014; Ranjan, 2009; Gupta, 2017). The differences are in their structures; however, the most common components found in these BI system architectures are Data Source; Extraction, Transformation and Loading; Data Warehouse; Reporting Tools; Metadata Layer; Online Analytical Processing Layer, and Presentation or Reporting Layer) as depicted in the figure 5.

2.4.1 Data Source

The Data Source component is the most important component, which represents several operational systems such as the Customer Relationship Management (CRM) system, Transactional Processing System (TPS) and Manufacturing Execution System (MES). Some of these systems create, edit, delete, and retain different kinds of structured and unstructured systems; some are internal to the organisation while others are external (Ong et al, 2011). Internal systems are systems such Customer Relationship Management (CRM) systems, Transactional Processing Systems (TPS) and Manufacturing Execution Systems (MES). Whereas external systems are Market Research Institutions' systems, Internet Online subscriptions, Government publications, regulators' standards and specifications.

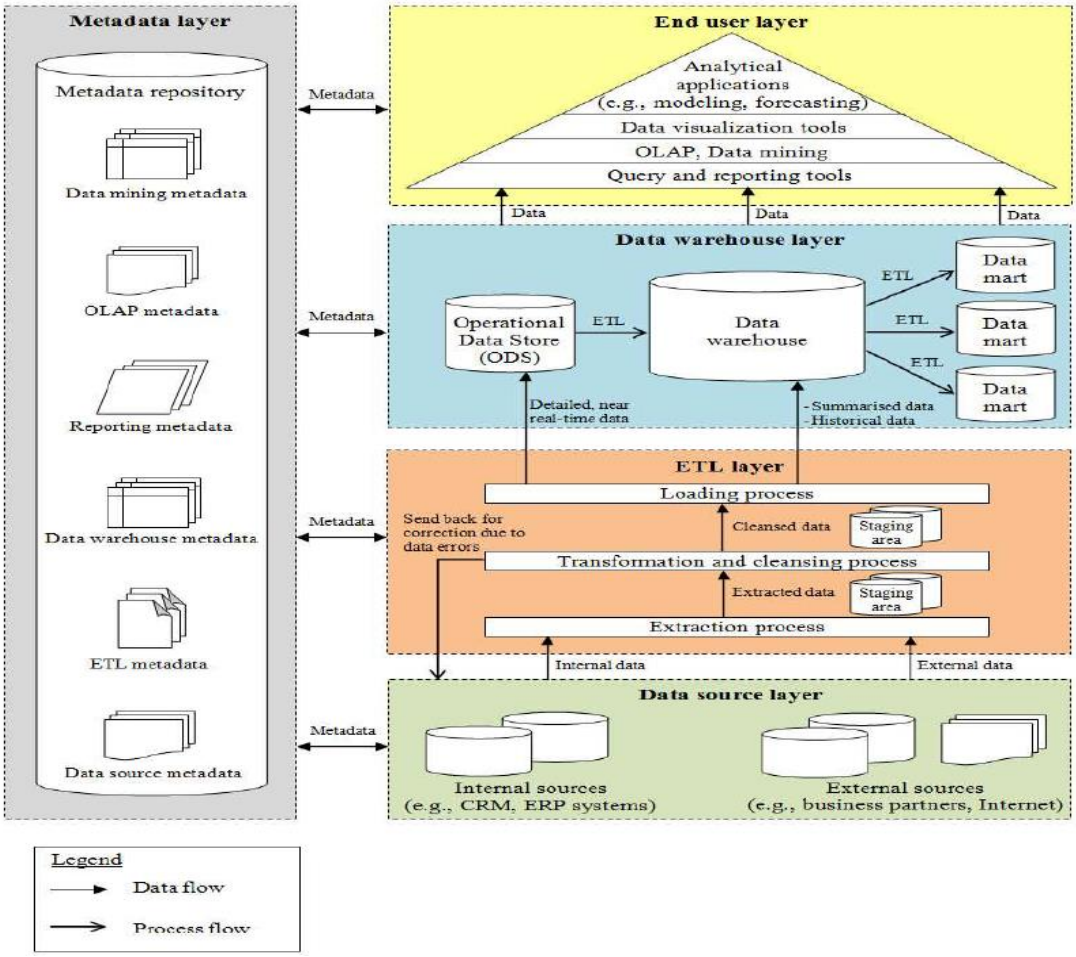


Figure 5: BI Architecture - Source Ong et la. (2011)

2.4.2 Extraction, Transformation and Loading Layer

The Extraction, Transformation and Loading Layer represents a key component of the system that focuses on data extraction, transformation and loading processes in the BI System (Ong et al, 2011). The extraction process handles the collection of the required data from the data sources but often that data is not organized, not formatted and neither normalized. Therefore, the transformation process formats the data based on an organisational set of rules and maps and standardized it in a way that is suitable for reporting. The last process is the loading process that loads the data into the target repository, which is the Data warehouse.

2.4.3 Data Warehouse

A Data Warehouse is a significant component of any BI System because of the role it plays in the physical propagation of the data by handling several formats of data for integration

aggregation and reporting (Ranjan, 2009). The Data Warehouse layer comprises three components: Operational Data component, Data Marts, and Data Warehouse. The integration of all the data from the ETL Layer and the loading into the data warehouse occurs on the Operational Data store component (Ong et al, 2011). Data Marts is a subset of the Data Warehouse that is meant to provide support to the analytical requirements of different business units. The Data Warehouse is a central data storage facility that gathers and stores data from both external and internal sources/systems to support strategic, tactical and operational decision-making processes (Imhoff et al., 2003, Balaceanu, 2007; Westerlund & Persson, 2015).

2.4.4 End-User Layer (Online Analytical Processing Layer, Data Mining and Presentation or Reporting)

The end-user layer consists of several tools that visualize insight in distinctive formats to different users that have other decision-making needs across different levels of the organisation.

1. Online Analytical Processing (OLAP) – This tool is used as a data manipulation engine intended to support multidimensional data structures and manage data in the warehouse for modelling, analysis, and reporting (Ranjan, 2009). It is a user-friendly graphic visualization tool that is intended to enable users to quickly display and analyse business information from different perspectives.
2. The Query and Reporting Tool – This is a very useful tool of the BI System that allows users to have access to run queries and generate several reports to enhance decision making processes.
3. Data Mining – This is a process in which the data is analyzed to identify insights like patterns, relationships, and trends that are often hidden within the huge volume of data.
4. Data Visualization – this refers to tools like dashboards and scorecards that enable executives and managers to comprehensively view the overall business performance from one glance.

2.4.5 Metadata Layer

This layer is often referred to as Data about Data. It is used to store information that describes how and where the data is stored, what changes were made to it and how it is being used, and how pieces of data relate to one another (Ong et. Al, 2011).

All these components serve very much critical functions of the BI System to enable it to comprehensively fulfil the functional capabilities of the system to support and expedite decision making process. It is unimaginable for a BI System to make an impact and be effective and efficient in delivering value to organisations in the energy sector without these components. Because the energy sector generates gigantic volumes of data daily, and this data cannot be leveraged to add value to organisations in this sector, without these components.

2.5 The Business Value of Business Intelligence System

Business value of Business Intelligence system adoption refers to a set of organisational advantages and benefits that originate from the adoption of the BI System (Paradza & Daramola, 2021). However, a key fundamental question that always needs to be clarified is what the business value of a BI System or Information System is and how it is measured. Because it is important to ensure there are no uncertainties about this subjective concept prior to measuring the BI System against it.

2.5.1 Business Value of Information Technology

The business value of ICT has often been reported as one of the top ten major concerns of executive leadership because, although their acknowledgement of its potential, few are able to justify its expense (Cronk & Fitzgerald, 1997). There are different ways to articulate what is deemed business value and how it is measured; Phillip (2014) asserts that the assessment of the value of a business or an owner's interest in a company is conducted in a particular way. Furthermore, the net effect or the outcome that will be realized by the customer at the end of a project and its measurement can be in non-monetary or monetary terms (Phillip, 2014).

This term is often utilized to refer to the business performance impact of IT in relation to inventory reduction, profitability improvement, competitive advantage, cost reduction and other performance measurement metrics (Melville, Kraemer & Gurbaxani, 2004). The literature further indicates that the IT Business Value is a sustainable value that IT adds to

the business, either individually or by a collection of systems, reflected from an organisational perspective in comparison to the required resources to be spent (Cronk & Fitzgerald, 1997).

Organisations measure the outcomes using several methods by applying metrics to soft measures such as quality improvement, customer satisfaction and loyalty, or leveraging intellectual property (Dumitrescu & Budac, 2008). At the same time, some businesses apply a myriad of economic measures and metrics to track their financial and operational performance. According to Dumitrescu & Apostu (2008), the elements of business value can be something that may cause improvements, reductions or decreases in something, which can culminate into something good for the business.

Consequently, the business value of IT, including systems such as BI Systems, cannot be measured in the same way because it might always be subjective to several conditions. Cronk and Fitzgerald (1997) postulate that the value and appropriateness of Information Technology investment are a contextually dependent, Multifaceted, and subjective phenomenon. However, Melville et al. (2004) assert that the business value of IT business performance is the impact that IT has at both organisational-wide and intermediate process levels. Consequently, it is the impact of IT on those measurement elements and metrics through which business value is assessed, as alluded by Dumitrescu & Budac (2008).

Several studies have attempted to discern how ICT can support the performance of the business and failed to clearly articulate or establish theoretically how to empirically support how and why IT consistently impacts business performance (Melville et al., 2004). However, the literature suggests a hypothetical process through which the relationship between IT and Business performance can be articulated to identify the relationship between IT and organisational performance.

For example, the process involves; 1) Correctly defining what is deemed to be the IT Construct, 2) Making distinction between firm and process levels of analysis, 3) identifying the important organisational performance systems and moderating and mediating determinants within the firm and its environment, 4) making a suggestion for theoretical lenses of analysis, 5) Defining performance constructs and how they will be measured, 6) Developing a conceptual model for the business value of information technology.

Practitioners and academics have given significant attention and focus to the impact of ICT/IS on the performance of organisations. However, several studies that investigated the association between the performance of organisations and investment in IT have yielded mixed outcomes (Hou, 2016).

Therefore, the literature highlights that it is important for adequate methodology and processes to be developed to assist in establishing the impact of the BI System at both the organisational and process levels. Furthermore, several contextual measurement criteria are used to assess the impact of technological innovations like the BI System.

Synthesizing the literature, the Business value of IT can be defined as the impact of Information Technology on the organisation at both organisational-wide and intermediate business process levels, and it is characterised by efficiency, efficacy, and competitive impacts.

2.5.2 Business Value of BI System

Business Intelligence System is a technological innovation that enables organisations to be more informed and competitive in decision-making processes by using Data Warehouse, Data Management, Data Mining and Online Analytical Skills to analyse detailed enterprise data (Karim, 2011) extensively. This implies that the system enables organisations to be competitive by having access to the right knowledge and insight about their business processes so that they can make informed decisions (Hočevar & Jaklič, 2010).

Competitive advantage is a condition of being aware of what competitors are aiming for and being ahead of them by having access to the right and relevant knowledge and insight about the organisation's internal and external environment (Karim, 2011). It is a process that leads to a condition of letting organisations leverage information on their customers, competitors, and their market to be competitive and sustainable.

However, for organisations to achieve presumed competitiveness, certain business metrics must be defined and measured to articulate the influence in specific areas of the business clearly.

2.5.3 BI System Organisational Areas of influence.

Several studies have argued that the use of BI System can deliver numerous benefits, such as greater customer satisfaction and improved competitiveness through easier and faster

access to information and support the business strategy (Hočevar & Jaklič, 2010). BI Systems can transform huge amounts of data into actionable and reliable insight in the shortest possible time to support management in making effective decisions.

Therefore, it is vital for alignment to be established on the difference between

a) Customer Relationship Management and Customer Satisfaction

The BI system has the analytical capabilities from which organisations optimize customer relationship management, thus enhancing customer satisfaction, profitability, and loyalty (Hočevar & Jaklič, 2010). An empirical study by Hou (2016) suggests that a higher level of the use of BI Systems can result in enhanced internal processes and customer performance.

According to Williams and Williams, (2003) the use of BI System can potentially add value to organisation by enabling them to be agile, responsive and customer intimacy. Furthermore, organisations use it to improve customer acquisitions, segmentation, and retention. These improvements can be associated with increased revenue, reduced customer acquisition costs, and increased lifetime value of customers.

Furthermore, several studies have also confirmed that the implementation of the BI System has a positive impact on organisations' performance Tunowski (2015). Similarly, the study of Elbashir et al. (2008) theorizes that the use of a BI System can deliver what is deemed a customer intelligence benefit. This is the benefit that arises from an improved comprehension of customers' buying behavior, the introduction of innovative but relevant products and services and the forecast of customers' future product needs (Elbashir et al., 2008).

b) Sales and Revenue Increase (Financial Performance)

Literature reveals that there are mixed findings on the link between IT and organisational financial performance (Hou, 2016). However, in general, there is no evidence to support the direct impact of IT on organisational performance.

In a study conducted to investigate the impact of the BI System through the lenses of a Balanced Score Card (Hou, 2016), it is revealed that the impact of the BI System on the financial performance of the organisation is indirect and heavily dependent on non-financial performance (customer performance, internal process performance, and learning and

growth). This is supported by Olejniczak and Kubiak (2012); that with the BI System, organisations can implement the what-if scenario as part of the BI System implementation and increase revenue by improving the quality of products.

However, Olszak and Batko (2012) conducted studies in the health care centers and revealed that the implementation of the BI System has the potential to enhance the monitoring of inventory, cost reduction and increase revenue. Similarly, an empirical study by Tunowski (2015) revealed that with a greater intensity of probability, the BI System can impact the organisation's financial performance with respect to debt, capital market position, quality of asset and liability and profitability. As supported by Ziora (2011), the implementation of the BI System assists organisations in accelerating the decision-making process and improving communication, thus resulting in increased revenue and reduced costs.

Elbashir et al. (2008) undertook a study to develop business performance measures to capture the impact of BI Systems at both organisational and business process levels. The study revealed that the use of the BI System enables organisations to increase revenue, reduce costs, reduce inventory levels and enhance profit margins.

c) Cost Management and Profit Increase

According to Hočevar & Jaklič (2010), a BI System brings data from multiple transactional processing systems, such as CRM and ERP, together into a single database to deliver actionable insight to expedite the decision-making process. Therefore, saving the effort that is required to have insight into figures on CRM and revenue figures from ERP systems to get a complete view of customers' behaviors and profitability. The effort of writing queries to extract data from both systems and join it for analysis purposes requires lots of time, which some businesses do not have the luxury of.

According to Teoh et al. (2014), there is a positive relation between the performance of an organisation from both non-financial and financial perspectives with the adoption of BI. This is supported by Hou's (2016) empirical study that the use of a BI System will lead to improved internal and customer performance that can produce improved financial performance.

This implies that although there is no direct link between the BI System usage and organisational financial performance, the impact of the use of the BI System on the organisational financial performance is indirect and heavily mediated by non-financial performance (customer performance, learning and growth and internal process performance). Consequently, this signifies that management should not expect a direct impact of BI System use on the organisational performance. Instead, they should be more concerned about intangible benefits related to BI System enhanced non-financial performance.

d) Business Operational effectiveness

Bedeley, et al. (2018) assert that the BI System generates business value by ensuring an enhanced level of transparency and accessibility to insight into transactions and customer' segments. This serves as the basis for sophisticated analytics to enhance innovative products and service development. Consequently, this leads to overall customer satisfaction due to a reduction in operating cycle times, fast delivery of raw materials, and minimization of the bullwhip effect in supply.

Furthermore, Bedeley et al. (2018) conducted a study using Porter's Value Chain framework to investigate the type of analysis performed on different areas of the value chain and the functional support process. The outcome of the study revealed that a BI System's analytical capability has the potential to enable predictive and prescriptive analysis across inbound logistics, operations, outbound logistics, marketing, and sales, as well as service. Correspondingly, it can encourage predictive and prescriptive analysis across IT Services, Finance, Procurement, Human Resources Management and Technology development.

Based on this evidence and more detailed findings from the study of Bedeley et al. (2018), organisations can gain business value from the BI Systems utilized to enhance the value generated by the core organisational processes. This is further corroborated by Hou (2016) that high utilization of BI Systems has the potential to improve learning and growth, internal processes, and customer performance.

According to Vugec, et al. (2019), a proper alignment of BI initiative with Business Performance Management is very important to ensure that organisations realize the Business Value of the BI System. Therefore, the ability of organizations to realize the full benefits of adopting a BI System relies on how it aligns the BI System with Business

Performance Management and Process Performance Measurement and Organisational Performance.

Therefore, it can be concluded that the use of a BI System can potentially enhance the performance of business processes. This aligns with Willim and William (2003) that the Business Value of a BI System rests within its ability to provide insight that can enhance the effectiveness of the organisational core processes that drive business performance. Furthermore, the alignment of BPM with BI System implementation gives BI much business value. It drives it from being et al. a technical ICT implementation to a business initiative Vugec et al., (2019).

According to Eybers et al. (2013), literature asserts that the business benefits of BI systems are realized across various activities of the business processes. However, the challenge is that it is not easy to measure them due to indirect benefits and delayed benefits in the beginning. Subsequently, these individual process level benefits contribute to the overall performance of the organisation.

e) Risk Management

Williams and Williams (2003) postulate that the benefit of using a BI System to improve demand forecasting will not impact the organisation unless such forecasts are incorporated into operational business processes that deliver reduced inventory and reduced orders. Thus, enabling organisations to indirectly manage the risks of loss of revenue and reduce the risk of order expediting costs.

Furthermore, the use of a BI System can improve the efficiency of organisational internal business processes. The result of this will further enable the business to reduce the risk of losing time to market by reducing the time to develop and deliver innovative solutions and products (Elbashir et al., 2008). This system provides organisations with customer intelligence benefits, which enable them to predict and understand customers' behaviors and respond adequately to prevent the risk of losing customers.

f) Support Decision Making

BI System is intended to provide organisations with important insight that enables them to deploy effective intellectual capital through effective decision-making to attain sustainable

competitiveness (Gibson, et al. 2004; Trieu, Cockcroft & Perdana, 2018). This is further echoed by Eybers (2015). The BI System adds value to organisations in several ways, like increasing sales and meeting the users' expectations by providing insight that contributes to the quality of decision-making.

BI Systems can provide operational management with real-time information and insight into the performance of operational processes, enabling them to make time-sensitive decisions (Hou, 2015).

2.5.4 Evaluating the Benefit of the BI System

In the current global business environment, which provides access to actionable insight into external and internal business drives and measurement of their performance, organisations must consider investing in a BI System. This will enable them to be agile enough to respond to global market dynamics that are influenced by several factors, such as geopolitical and regulatory challenges.

A study by Roodposhti, Nikoomaram & Mahmoodi (2012) points out that organisations that have higher levels of BI Systems and Decision support in Management Account Information Systems (MAIS) are likely to realize high Return on Investment (ROI) and higher Return on Asset (ROA). However, the study did not clarify what kind of investments or assets; however, it posits that there is a correlation between the adoption of DS and BI on MAIS and high ROI as well as the correlation between DS and BI on MAIS and ROA. Consequently, this suggests that adopting the BI System in Management Accounting will enable organisations to achieve more profits and meet stakeholders' expectations (Roodposhti, et al. 2012).

However, it is important to establish those organisational metrics that reflect if those investments pay off to drive the process of evaluating whether organisations reap the rewards for investing in the BI System (Popovic, et al. 2010). Therefore, an understanding of whether there is a connection between the BI System and such performance indicators and how the BI System influences those indicators must be established. Yet, it is understood that a clear and direct linkage between IT investments and business has never been consistently established due to various ways, variables, measurements of productivity and contextual factors.

Therefore, it is paramount to further zoom into contextual factors that drive how organisations derive business value from BI Systems on their business strategic initiatives.

Because even if there might be standard or conventional measurement approaches and processes through which the value of ICT investment is measured, there will always be variances in some sectors. This is echoed by Arefin et al. (2015), who states that organisational factors such as processes, structure, strategy, and culture have an impact on the effectiveness of the BI System's impact on the performance of the firm.

Consequently, Tunowski (2015) and Elbashir et al. (2008) point out that irrespective of several attempts to assess the impact of BI Systems, there is still a lack of universal methodology through which the benefits of BI Systems within an organisation can be measured. The benefits and the value of BI System are derived not necessarily from the system itself but also from improved processes enhanced and better decision making, and other factors (Popovic, et al. 2010). Furthermore, there is a need to consider the specific context within which the system is used and the contextual moderators for the realization of the benefits.

However, by providing quality business information and business analysis, the BI System adds value by enabling fact-based decision-making in the context of business processes. Consequently, the enhancement of business decision-making on business processes is linked to BI Systems (Popovic et al., 2010; Arefin, 2015). Therefore, leaders need to appreciate and consider the impact of other organisational factors like strategy, structure, process, and culture on the BI System's influence on organisational effectiveness (Arefin, 2015).

2.6 Conclusion

This chapter provided a comprehensive overview of the BI System from its definition, the category under which it is classified – Decision Support System (DSS) and the business value of the BI System. In the main, this chapter also covered the architectural components of the BI System and their use or the purposes they serve in the use of the system. Furthermore, the chapter has covered the business value of BI Systems in different areas of the business and the importance of the need to appreciate the context within which such value is created and the impact of contextual factors that mediate the impact of BI Systems in different industries.

Notably, the chapter suggests the BI system can add business value to organisational ROI, ROA and ROE, which are economic measurement models often used to measure whether

an investment is worthwhile. However, such benefits can be realized only if the key data attributes such as quality, usability, accessibility, intelligence, and sales mobility are well considered. Therefore, it is argued that there is an association between these data features and several financial performance measures (Barua et al., 2010).

The literature alludes that the BI System business value cannot be easily articulated and measured objectively because some of the benefits, such as Business Process benefits, are intangible and qualitative (Elbashir et al., 2008). This implies that some of the benefits are measured through perception-based approaches, which provides an opportunity to delve deeper into themes and insights about intangible benefits.

Lastly, there is a lack of a comprehensive measurement model through which the business value of the BI system can be clearly and comprehensively measured due to the need to consider the impact of the contextual factors that mediate the impact of the BI system across industries.

Furthermore, there is still a lack of research on the impact and influence of BI Systems with a focus on diverse areas of the organisation to further discern what measurements ought to be looked at to assist practitioners and leaders in assessing the Business Value of BI Systems.

3 CHAPTER THREE: THEORETICAL FRAMEWORKS AND MODELS

This chapter presents the empirical frameworks and models that have been used to explain how BI System adds value to organisations. The models for IT Business value framework and models are presented to clarify a learner process through which the adoption of technology can impact individual or organisational performance in section 3.2. furthermore, the impact of the BI System and the study's conceptual model are presented in sections 3.3 and 3.4, respectively.

3.1 Introduction

Theories play an important role in determining the business value of an Information System because they define adequate measures of the Business value of adopting an Information System. As such, a review of these theories that have been adopted by literature when studying the business value of business intelligence is a step in the right path to ascertain nuances of value creation in the context of the business intelligence system (Paradza & Daramola, 2021). This chapter reflects on the extant literature on the theories, frameworks and models that have been used to investigate the impact of IS and ICT capabilities, including the BI System.

The difficulty that many practitioners and academics have always struggled with, together with the ever-increasing expenditure on IT, is the growing demand to measure the value of investment in ICT (Cronk & Fitzgerald, 1997). There is a plethora of measurement methodologies that have evolved over time due to the evolution of the systems, their objectives, and contributions to the organisational performance. Cronk and Fitzgerald (1997) assert that there are three levels of complexities in evaluating the Business value of IT. The first one focuses on the impact of an existing single system at an organisational level. This measurement level focuses on quantitative measures such as cost benefit-analysis or the satisfaction of users without any consideration of the value chain from IT and the context within which it is created. The second level of measurement zooms into the complexities of these issues by considering influential factors for value and wider reflection of the ripple effect of IT and, therefore, requires complex metrics. The third level of measurement considers IT investment questions and brings in many factors from the first and second levels, incorporating multidimensional metrics. However, it is alleged that none of these

measures considers the issue of alignment with the organisational strategy and context as well as the process under which the value of IT is realized.

3.2 Models for Business Value of BI System

The extant literature indicates that numerous studies have taken place to study how BI System and Analytics adds business value to organisations, including their adoption and success through a review of literature, empirical studies, and other forms of studies (Popovic, et al. 2010; Vugec et al., 2020; Trieu, 2017). A study by Popovic, et al. (2010) posits a conceptual model that assumes the business value of a BI system is derived in a linear process that starts with the Business Intelligence System maturity, as depicted in Figure 6.

3.2.1 Conceptual Model for Researching Business Value of BI System

According to this model, the value starts with BI System Maturity influencing the quality of information that consequently influences the use of Information in the firm's Business Processes to influence the organisational performance. This model depicts a linear process that dictates that the use of information in business processes is the one that influences the performance of the firm. However, the influence of information quality on use of Information in Business Processes to influence the organisational business performance is moderated by the organisation's absorbability to the BI System. This model indicates that the Maturity level of the BI System plays a significant role in the use of the information that is provided by the BI system in the business processes to influence business performance.

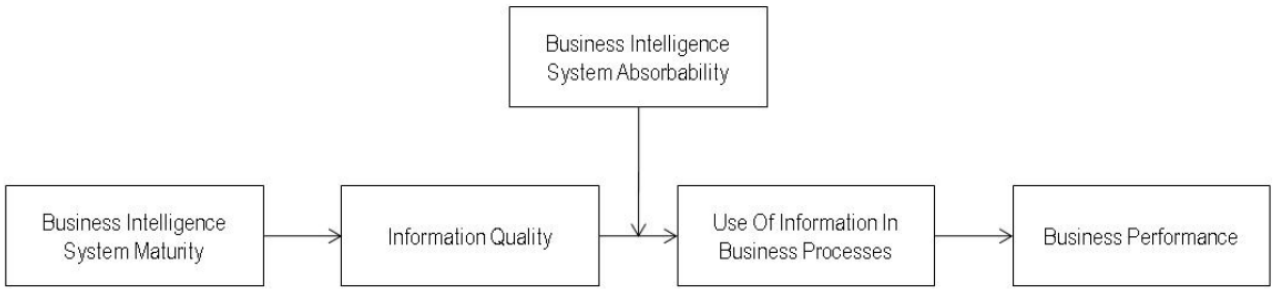


Figure 6: Conceptual Model for Researching Business Value of BI System
Source: Conceptual Model of Business Value of Business Intelligence Systems - *Popovic, Turk & Jaklic, (2010)*

The BI Maturity that is referred to in this model implies the analysis of different data sources used within the organisation, integration of data for analytical decision-making capabilities, and a variety of analytics adopted in the firm (interactive reports, OLAP, analytical

applications, data mining, dashboards, KPI, alerts). With respect to Information Quality, the model refers to variables such as clarity, accuracy, convenience, traceability, timeliness, consistency, interactivity, and currency. These variables or attributes are all important for the reliability of the information provided by the BI System to influence its usage. Regarding the Use of Information in Business Processes, the model refers to variables for measuring the use of information for business processes management, decision making and management of information within the firm.

Furthermore, the model assumes that there are factors which moderate the influence of the information quality for its use. These factors are defined as BI System absorbability, which refers to information analysis and use culture, alignment of BI System to strategy, Cooperation with IT, and culture of business continuous improvement. However, this model does not provide measurement matrixes or outcomes that can be used to evaluate the impact and business value of the BI System at an organisational level. Instead, it provides a demonstration of how BI influences organisational performance and contextual factors that can influence the use of information provided by the BI System.

Consequently, this model is not entirely suitable for this study as it covers one dimension about how BI influence organisation performance with focus on two key elements of BI System (BI Maturity and Information Quality). This model is short of details that highlight which organisational performance areas of the business are impacted by using BI System. Instead, it posits a linear process on how BI impacts business performance without demonstrating specific areas that are impacted by using BI System to assist in measuring such impact.

The objective of this study is to investigate the impact of the use of BI System with focus on specific business areas from which the performance of business can be monitored and measured. Therefore, the use of this model in this study is not suitable for the achievement of this study's objectives and goals. Perhaps, another model or framework should be considered as to assist to frame this study to better explain business areas in which the use of BI System can make an impact to influence the overall business performance.

3.2.2 BI Maturity and Business Process Management on Organisational Performance.

A study by Vugec et al. (2020) asserts that BI Maturity has a positive influence on organisational performance and BI Maturity has a positive influence on the alignment of BI-Business Performance Management (BPM). Additionally, BI has an indirect impact on the performance of any organisation if it is aligned with Business Performance Management (BPM). Accordingly, this implies that BI-BPM alignment has a positive influence on the performance of a firm. Therefore, the implementation of BI cannot or should not be treated as an ICT initiative that is independent from BPM. Instead, it is recommended to ensure that the maturity of BI and alignment to BPM are highly regarded by the implementation of the BI System so that it can yield the desired results of influencing organisational performance.

Although BI is often referred to as a technological initiative, and BPM is regarded as a business processes performance improvement initiative, both are strategic initiatives that need to be coordinated and managed jointly to enhance the delivery of value.

Furthermore, Veguc et al. allude that the influence of BI on organisational performance as assessed by Trieu's (2017) BI value chain, which depicts the process through which value is derived from data and information. On the other hand, there are conditions under which such value can be derived from the impact of the BI System because it is only decisions and actions which can yield value.

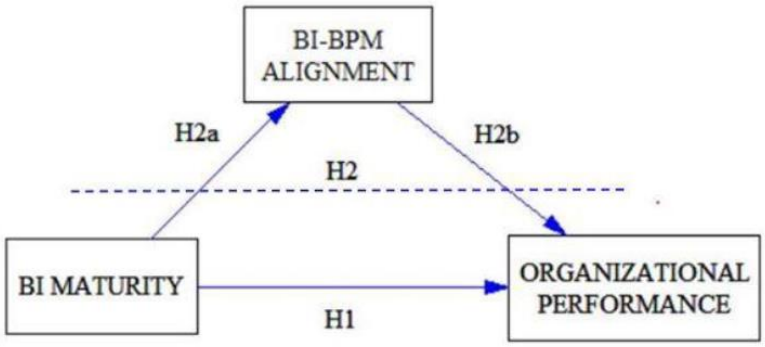


Figure 7: Impact of BI Maturity and Business Process Management on Organisational Performance
Source: Business Intelligence and organisational performance – The role of alignment with business process management - Vugec et. al, 2020

Therefore, the BI System is understood to be a key enabler from which its business value is not easily and directly deduced (Larson and Chang, 2016). However, this model is also short of specific measurement matrixes, which are critical to assess the impact or the business value of BI Systems in an organisational area of the business. Therefore, this model is essential for demonstrating the significance of aligning BI initiatives with BPM to moderate the influence of BI on the performance of an organisation. However, this model fails to clearly outline which business performance areas are impacted by using BI System to enhance the understanding on the value of BI System in this sector.

This model does not indicate which business areas are impacted using the BI System, whereas the performance of any Information System's impact on an organisation can only be monitored and measured by looking at specific matrices. Therefore, this model cannot be used as theoretical framework that underpins this study due to its limitation by lacking business performance matrices through which the impact of BI System usage can be tracked. The objective of this study is to investigate the impact of the use of BI System in specific business areas at a detailed level as opposed to general business performance. A fundamental element that is highlighted in this model though is that, it is paramount for the BI Maturity to be linked to Business Performance Management to assist in identifying specific areas of business interest. This points out a very much important phenomenon in that it highlights the significance of aligning the BI Maturity with the management of Business Performance to enable organisation to derive tangible value from BI System.

3.2.3 A Framework of how BI creates Business Value

Through a systematic literature review, Trieu (2016) proposed a framework by combining certain elements of Soh and Markus, Melville et al. and Schryen's models on the business value of Information Systems to structure his research findings. This theoretical framework provides a systematic view to explain how the effects of BI System adoption and acceptance could influence the performance of an organisation as depicted in figure 8 below. According to this framework, the impact of the BI system on organisational performance is influenced by BI as an asset, which is firstly preceded by investment in the BI System. However, contextual factors such as the Firm, Country and Industry moderate the usage and competitive processes.

This framework is founded on Soh and Markus (1995)'s framework, which asserts that the business value of IT investment is derived through a systematic process, similar to Popovic et al. (2010)'s model in Figure 1 above. However, it also points out that the impact of the BI System is indirectly derived from a decision-making process that enhances operational efficiency processes, new/improved products, and services, and strengthens organisational intelligence. According to Soh and Markus (1995), the conceptualization of organisational performance depends on how the organisations are viewed. However, the most prominent perspective is that its approach is of goal-seeking and accomplishment in processes that source scarce resources and turn them into valued output.

Furthermore, Bedeley, et al. (2018) used Porter's Value Chain Framework to capture and understand how organisations generate value from Business Analytical capabilities, technologies, and techniques. This is achieved by focusing on what kind of analytical capability (Descriptive, Prescriptive or Predictive) is applicable to which component of the VCF. This study also highlights that descriptive analytical capability is the most adopted or established capability organisations enlist to generate value from BI Systems.

However, it is established that it is paramount to first establish the proper business functionality, the people, process, and tools to which Business Analytics should be implemented (Bedeley et al., 2018).

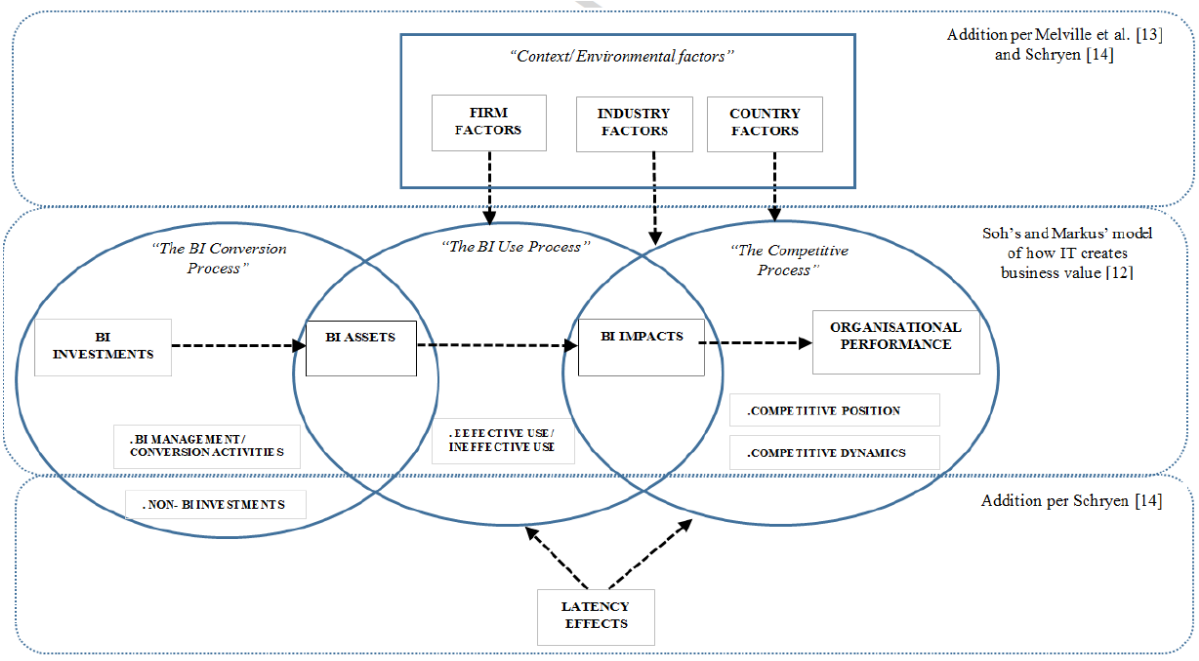


Figure 8: A framework of how BI creates business value.
Source: Adopted from Soh's and Markus' Model, Schryen and Melville et al. Modela

It is clear from this model that there is a linear process through which BI system as an asset can influence the performance of an organisation and there are contextual/environment factors which the use and the performance to derive desired outcomes. However, this model is also linear and not clear about specific business areas from which the impact of the use of BI System can be clearly monitored and measured.

A systematic literature review by Paradza and Daramola (2021) on the business value of BI Systems has revealed that numerous studies adopted diverse frameworks and models. These theories and models originate from various corners of learning, such as sociopolitical, organisational-behavioral, strategic management, microeconomics, business-strategical spectrums and industrial-organisational. However, the commonly used theories are Resources-Based View, Critical Value Factor, Dynamic Capability, IS Success Theory and Technology Organisation and Environment and Knowledge Management, as depicted in Figure 9 by Paradza and Daramola (2021). Furthermore, these models are not capable of underpinning a study that aims to measure the impact or business value of an information system like a BI System.

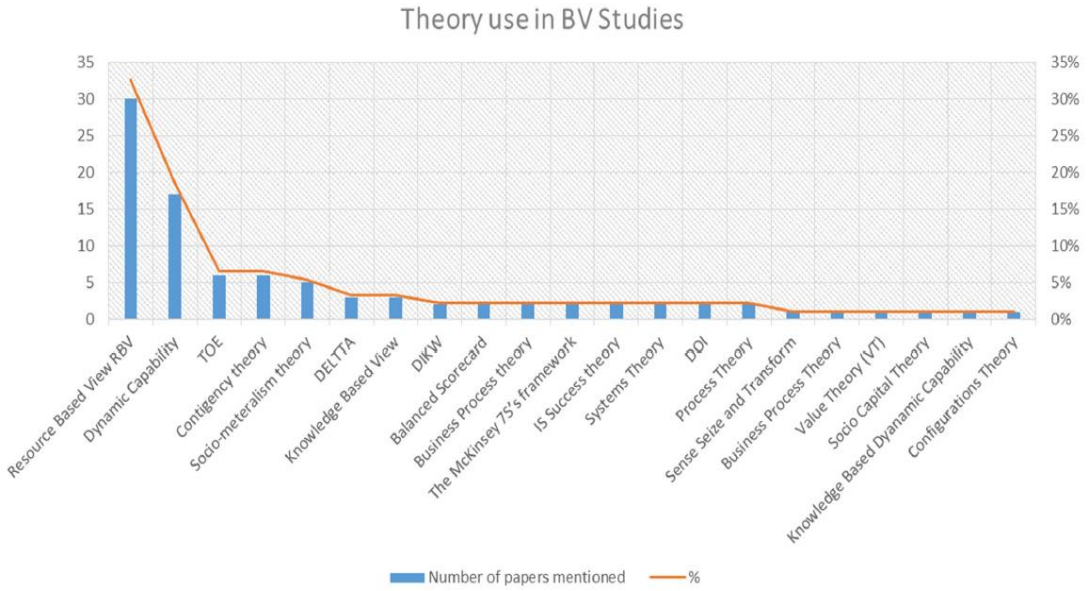


Figure 9: Overview of Theories for BI System business value generation!

Source: Business Intelligence and Business Value in Organisations: A Systematic Literature Review - Dignity Paradza and Daramola (2021)

Reviewing literature on theories that explain the business value of BI Systems has shown that such value is realised through a systematic linear process that is not free to moderate and mediating contextual factors. However, it is further reiterated from the literature that the

BI System has an indirect impact on organisational performance even though it wasn't explained how the use of BI System has a direct effect on the organisational financial performance (Profitability, Cost reduction, and revenue), customer relation, and education and growth.

Eybers, Strydom and Kroeze (2015) proposed a BI Balanced scorecard based on the perceived IT Balanced Scorecard comprising Business Value, User orientations, Operational excellence, and future orientation perspective as a framework to measure the impact of the BI System. However, various methods and frameworks have been used to measure the value and impact of business intelligence systems, wherein the focus is on process level to organisational impact (Eybers, Kroeze, Strydom, 2015).

The Balanced Scorecard (BSC) has emerged as a tool that supports decision-making processes, particularly in the field of strategic management, to assess the performance of an organisation in several areas (Martinsons et al., 1999). This concept was first introduced by Kaplan and Norton in the Harvard Business Review (Kaplan and Norton, 1992) in response to the challenges experienced with the insufficiency of using short-term financial measures (Hou, 2016). The BSC is based on the principle that the organisational performance measurement system must be informed by four dimensions (Financial Perspective, Internal Business Processes, Customer Satisfaction, Learning and Growth), which provide comprehensive indicators of the organisation's performance (Kaplan and Norton, 1992). These four performance indicators are explained as follows: a) Financial Performance perspective refers to the essence of more profit-driven organisations which are intended to increase shareholders' value, which is also relevant to South African energy organisations; b) Customer Satisfaction perspective reflects how customers perceive us as the business. This is due to the fact that the perspective of customers about the performance of an organisation is always a key priority for management; c) Internal Business Process refers to what elements the organisation has to excel in internally. This measure assesses the organisation on internal business processes that significantly impact the satisfaction of customers; d) the Learning and Growth perspective reflects on parameters or measures that are considered important for the success of the organisation.

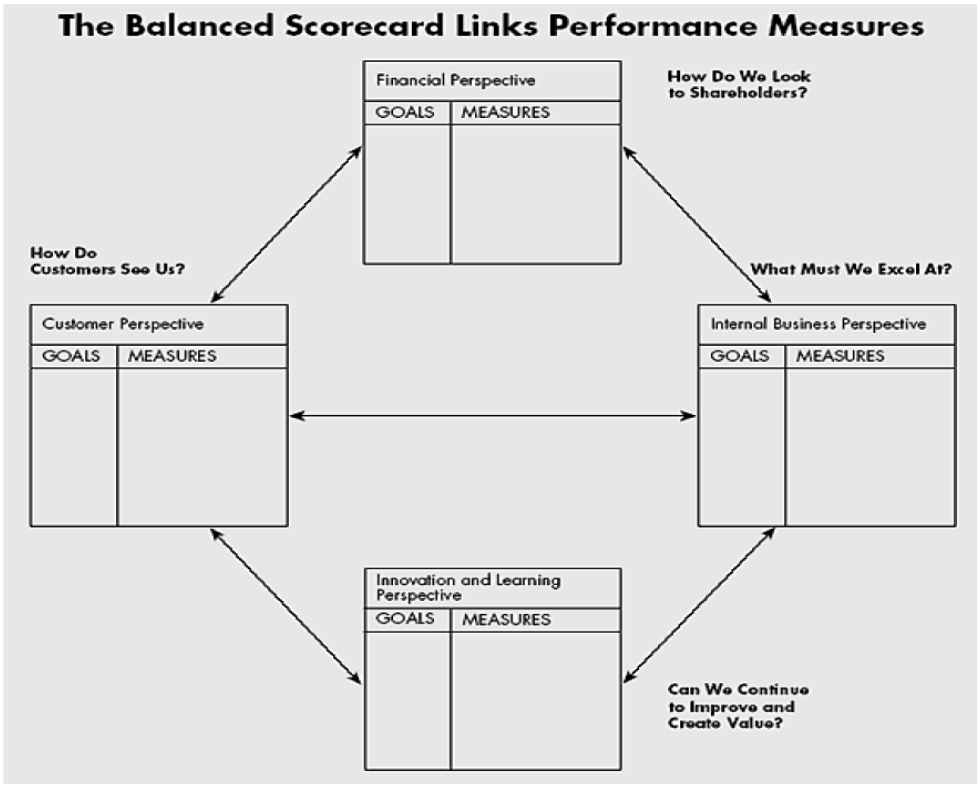


Figure 10: Balanced Scorecard Links Performance Measures

Source: The Balanced Scorecard Measures that Drive Performance (Kaplan & Norton, 1992)

The focus of BSC is to unify the identified Key Performance Indicators of the four categories of Organisational Performance into the strategy of the organisation to drive the organisation towards the achievement of the strategic objectives. Several studies have already been undertaken using a Balanced Scorecard to the point that other researchers resolved to propose what is now deemed IT Balanced Scorecard to be used to measure the business value of IT (Eybers, et al. 2013). The IT balance is based on four different perspectives, different from the original Kaplan and Norton balanced scorecard concept. Instead, the IT Balanced Scorecard is based on Business Value, User Orientation, Operational Excellence and Evaluating the Future readiness (Martinsons et al., 1998).

The reason for the original Kaplan and Norton balanced scorecard being modified is attributed to the objectives and the functions of an IT department, as explained by Eybers et al. (2013). Historically, IT has been regarded as a support function, although lately, it has become a business strategic driver.

3.3 The Impact of BI System on Organisational Performance

According to the literature, the BI System enables organisations in different industries to crunch and analyse enormous amounts of data to generate strategic information by identifying correlations among variables and discovering patterns that can enable informed decisions which can improve the business (Paradza and Daramola, 2021). It is a technological component that allows easy and faster access to information within an organisation to drive market competitiveness (Wieder, Ossimitz, & Chamoni, 2012). However, some benefits are more difficult to measure or evaluate to a degree that supports the assessment of justification for investments in BI Systems (Hocëvar and Jaklic, 2010).

In some cases, it is even difficult to ascertain whether some of the benefits are indeed because of the use of the Business Intelligence system or something else. This could be a result of the fact that some of the benefits or business improvements are partly due to other aspects and partly to the adoption and use of the BI System (Hocëvar and Jaklic, 2010). Additionally, it might be due to varied range of applicable areas of the use of BI System in both internal and external business environment, from which companies can reap many intangible and tangible benefits.

Literature asserts that the use of BI systems brings the following benefits to companies: (1) improved customer satisfaction, (2) faster and more accurate reporting, (3) savings in IT, (4) an improved decision-making process, (5) increased revenues, and (6) savings in other areas (Thompson, 2006; Carver and Ritacco, 2006).

Additionally, with the use of a BI System, users can review detailed reports and get the smallest and most detailed information to display the underlying causes of specific events and situations (Hočevar and Jaklic, 2010). Upon identifying the cause, they can take appropriate steps in the right direction either to maintain good practice or correct the problems. Ultimately, it can be identified that the use of the BI System can assist organisations to successfully reach long-term organisational strategy, which is always one of the key criteria to decide on whether investment in BI System is justified.

3.4 Conceptual Model

The conceptual model of this study is underpinned by constructs of the IS Success Model and Balanced Scorecard to understand how and the area in which the adoption and use of BI System add value in the Energy sector. From the IS Success Model, the study adopted

a construct which postulates that the use of the BI System has a direct impact on individual and organisational performance (Gaardboea, Nyvanga, Sandalgaardb, 2017). It was assumed by this study, as supported by literature (Vugec et al., 2020), that the adoption and use of BI System have an impact on organisational performance.

The adoption of the BI System was attributed to the routinisation and embedded use of the BI System after it has been implemented with cognizant of the fact that it is a kind of system whose use in other organisations is optional, unlike Transactional Processing Systems (TPS).

The impact of the adoption and use of the BI System cannot be discerned unless it is unpacked and investigated with a focus on specific organisation performance areas. There is a myriad of business performance measures through which IT or IS can add business value to the organisation (Marthandan & Tang, 2012; Cronk & Fitsgerald, 1997; Dumitrescu Budac, 2008). Therefore, it was deemed important that this study determined the impact of BI Systems in the energy sector with a focus on specific business areas.

This study, therefore, investigated the perceived organisational impact of BI Systems through some of the lenses of the Balanced Scorecard framework with a focus on Customer Retention and Growth, Financial Performance, Risk Management, and Internal Processes. Figure 11 depicts a conceptual framework that was adopted by this study to investigate the business perceived impact of BI Systems in the energy sector.

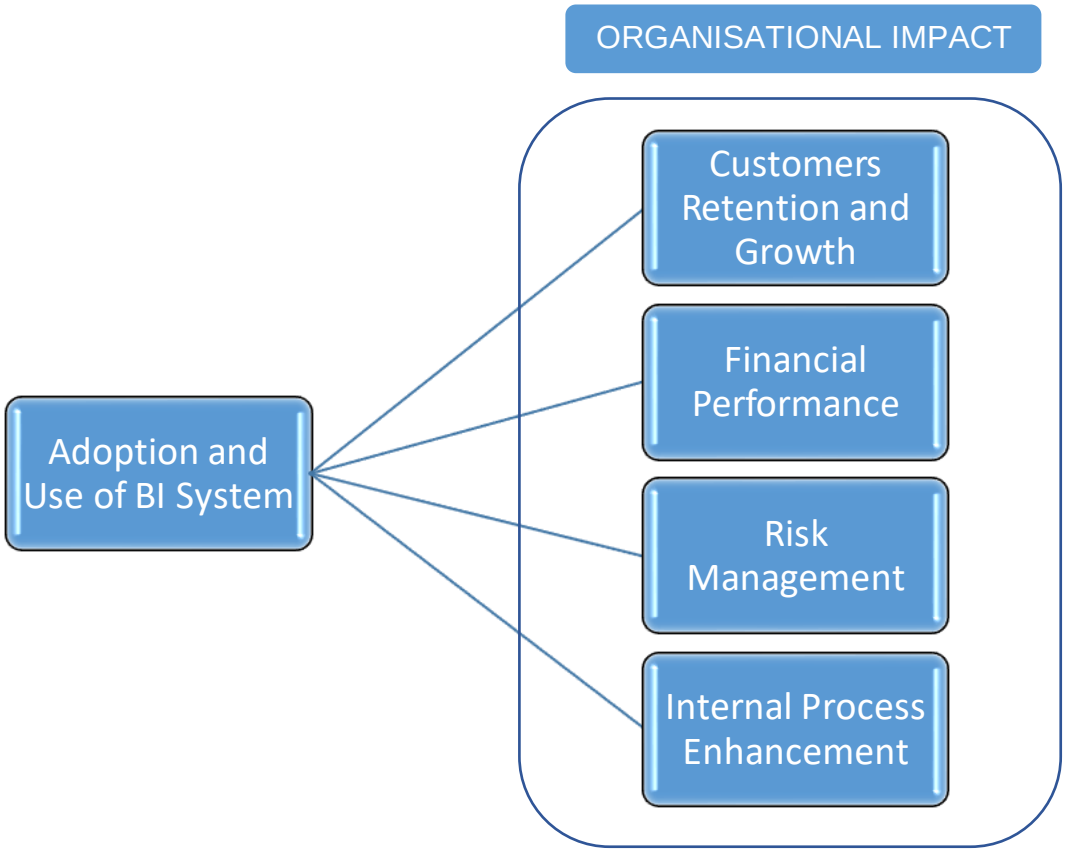


Figure 11: Conceptual Framework for Measuring the impact of BI System usage.

The balanced scorecard underpinned the conceptual model of this study; however, due to its limitation, the model is complemented by risk management and modified by replacing the Innovation and Learning perspective with Customer Retention and Growth.

Customer Retention and Growth performance refers to the ability to use insight from the BI System to make actionable decisions about customers to be innovative and derive new products, retain and expand existing customers, and the ability to expand to new customers (Barua et al., 2010). The reference to Financial Performance referred to the use of actionable insight from the BI System to realise better Return on Equity, Return on Investment, cost reduction, increase in revenue and profitability, and other economic benefits (Tunowski, 2015). Risk Management refers to the use of actionable insight from the BI System to manage strategic and operational risks to sustain the business (Amini, Salimi, Yousefinejad, Tarokh, Haybatollahi, 2021). The perspective of Internal Process Enhancement refers to the use of insight from the BI System to change and enhance processes to optimise the organisational value chain (Popovič et al., 2012).

3.5 Conclusion

This chapter dealt with existing models and frameworks on the impact and influence of BI Systems on organisational performance as well as its business value. It is evident from the

literature that there is a lack of adequate research on the impact or business value of BI Systems to assist organisations in adequately measuring its impact. The extant literature indicates that there is limited research conducted to discern the business value investment in BI Systems.

Only a few models were developed to demonstrate how investments in BI Systems add value, but limited research with a focus on broader business performance perspectives has been conducted. This chapter enlisted the IS Success Model and Balanced Scorecard to develop a conceptual model through which this study investigated the impact of BI Systems in the energy sector.

The model assumed that adopting and using BI System enables organisations to generate actionable insight that will influence the firm's performance to 1) retain and grow customer base, 2) Improve Financial Performance, 3) mitigate the Risks and 4) improve internal business processes.

4 CHAPTER FOUR: RESEARCH DESIGN & METHODOLOGY

4.1 Introduction

This chapter presents the methodology through which this study was undertaken to reach the intended goal of coming up with a theoretical framework that explains the business value of BI Systems in the energy sector. In the main, this study adopted a qualitative methodology wherein a non-probability purposive sampling technique was followed to sample a population of professionals in the energy sector. Six participants, professionals in the energy sector, were sampled based on their roles and involvement in the adoption and use of BI systems. Semi-structured interviews were conducted to collect the data from all the participants, and the research adopted thematic analysis to analyse the data to gain deeper insights into how the BI System adds business value in certain areas of the business.

All research studies are underpinned by some underlying philosophical assumptions relating to what is deemed to be a valid research study, which method/s is/are regarded to be adequate for the study (Rehman & Alharthi, 2016). It is important for researchers to know about these assumptions to conduct and evaluate any research project. This chapter also discusses the philosophical paradigms and approaches adopted by this study and the assumptions underpinning this study. A suitable approach through which the data was collected and analyzed in line with the research objectives and the purpose of this study is explained in this chapter. Furthermore, it also presents the methodology, strategy, and approach through which this study was undertaken to achieve its objectives and provide answers to the study's research questions.

The objective of this study is to gain a deeper understanding of the experiences, perceptions, and views of the business impact of BI System usage in the energy sector. To facilitate the achievement of this objective and adequately respond to the research question, an in-depth analysis of the literature on the business value of BI Systems was reviewed, and thereafter, an interview guide was developed to facilitate semi-structured interviews with sampled participants in the energy sector.

This chapter, therefore, made an introduction of this chapter and high-level research methodology in section 4.1, a brief overview of the research paradigm in section 4.2,

philosophical assumption in section 4.3, philosophical Paradigm in sections 4.4, and research method in sections 4.5 and 4.5.

4.2 Research Paradigm

Any research project follows a paradigm which is made up of several interlinked elements or process steps: -Ontology, Epistemology, Philosophical Paradigm, Methodology and Methods, which shape the approach and outcome of the research study (Al-Ababneh, 2020). As depicted in Figure 12, this process outlines a view that epistemology informs the philosophical paradigm, which will influence the methodology that the study adopts and the methods that specify tools and techniques for data collection and analysis (Creswell, 2014).

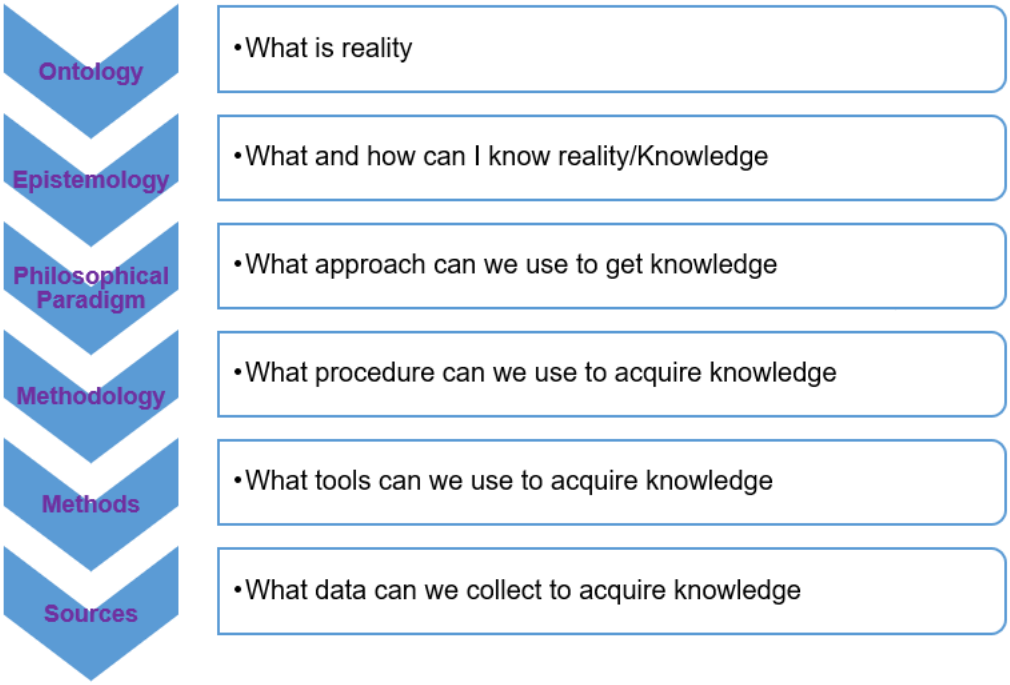


Figure 12: Research Paradigm – Source: Patel (2015)

More details about these sets of beliefs and the methodology that was followed by this study are provided in the following sections of this chapter.

4.3 Philosophical Assumptions (Ontology and Epistemology)

Irrespective of whether we are cognizant or not, any research project is always informed by the inquirer's specific philosophical assumptions, beliefs or paradigms, as well as the methodology that shapes the study (Creswell, 2009). Researchers are always expected to be mindful of this assumption, beliefs about the nature of reality, the process of acquiring

knowledge and what can be known (the methodology). These philosophical assumptions consist of 1) Ontology - beliefs and stance toward the nature of reality; 2) epistemology - how the inquirers or researchers get to know what they know; 3) Axiology - the role that is played by the researcher's values in the research, 4) Rhetoric – research language 5) Methodology – methods adopted by the study (Rehman & Alharthi, 2016, Creswell, 2008). Prior to clarifying the type of ontology, epistemology, axiology, rhetoric and methodology used in this study, it is paramount first to present an elaboration of what they imply.

Ontological issues relate to the nature of the researcher's beliefs about reality and its characteristics (Rehman & Alharthi, 2016). According to Ahmed (2008), it is a study of being concerned with the kind of world that we are investigating, the nature of existence, and how reality is structured. This is further echoed by Kant (2014), who states that ontology is a branch of metaphysics that is concerned with the nature of reality or existence that is a part or portion of the nature of any object. It addresses the questions about what is out there to be known, the characteristics of existence, and the nature of social reality as an example (Creswell, 2009). It is the ontological study questions that lead a researcher to study what is the character of reality that is in existence (Rehman & Alharthi, 2016).

Instead, reality is created by individuals or groups interacting with each other or objects (Hasa, 2016). This is affirmed by Creswell (2009), who states that qualitative researchers embrace the ideal of the existence of multiple realities.

Epistemology refers to a philosophical branch concerned with the study of the nature of knowledge and the process through which knowledge is generated and validated (Rehman & Alharthi, 2016). According to Hasa (2016), epistemology is concerned with the nature of knowledge and various methods through which knowledge is created or gained. At the same time, Kant (2014) upholds that epistemology studies theories of knowledge in respect of how it is derived and the claims about the validity and reliability of knowledge.

In simple terms, Rehman & Alharthi (2016) postulate that epistemology is concerned with nature and forms (establishment of knowledge), the way it is acquired and transferred from one human being to another. It is concerned with answering questions about what is known and how it gets known.

Methodology refers to an articulated and theoretically informed approach with respect to how data will be produced and critically analyzed in the study. It presents a strategy, plan of

action, process and design that shapes what kind of data is to be collected and how such collection will be undertaken (Patel, 2015). It is about how the researcher got about inquiring about the phenomena to answer the research question to achieve the study's objectives and goals (Rehman & Alharthi, 2016).

The **Methods** is concerned with specific approaches, tools and techniques for collecting and analyzing data (Creswell, 2009). Often, this is informed by the researcher's assumptions, the methodology adopted, and the philosophical paradigm adopted by the study.

4.4 Philosophical Paradigm (Theoretical Perspective)

Ontological and epistemological assumptions are concerned with what is commonly referred to as researchers' worldviews and often influence the subjective view of the significance of reality (Rehman & Alharthi, 2016). According to Bhattacherjee (2012), the research paradigm is a system that encompasses all practices and thinking that define the nature of a research project along ontology, epistemology, and methodology.

A research project often adopts two broad contrasting worldviews or philosophical paradigms: objectivism/positivism and constructionism/interpretivism (Neuman, 2003; Antwi & Hamza, 2015). However, several researchers suggest that there is a plethora of paradigms - Positivism, Interpretive, Advocacy/Participatory and Pragmatism, Post-Positivism, Postmodern Perspectives, Critical Theory, Feminist Theory, Disability Theory (Creswell, 2009; Rahi, 2017; Rehman & Alharthi, 2016). However, Creswell (2009) classified Postmodern Perspectives, Critical Theory, Feminist Theory, and Disability Theory as interpretive perspectives of research. On the other hand, classify Positivism, Interpretive, Advocacy/Participatory Pragmatism, and Post-Positivism as four worldviews or paradigms that inform a qualitative study.

This is contrary to the perspective of Rahi (2017), Rehman & Alharthi (2016) and Antwi & Hamza (2015). Rahi (2017) believes there are four paradigms (Positivism, Interpretive, Advocacy/Participatory and Pragmatism). Rehman & Alharthi (2016) postulate that there are three philosophical paradigms (Positivism, Interpretivism, and Critical theory). Antwi & Hamza (2015) point out two broad contrasting philosophical paradigms (objectivism/positivism and constructionism/interpretivism).

4.4.1 Positivism Paradigm

The Positivist Paradigm of exploring reality is based on August Comte's (French Philosopher) philosophical ideas Antwi & Hamza (2015). This paradigm's view is that human behavior is best understood through observation and reason; true knowledge is based on the researcher's experience, and observation and experiment are means of acquiring knowledge (Rahi, 2017). Positivism research is called Empirical Science, Scientific Method, Post-Positivism and Quantitative Research. Ontologically, Positivism assumes that reality is objectively given and measurable through attributes that are independent of the researcher and adopted instruments (Myers, 1997; Antwi & Hamza, 2015). According to Rehman & Alharthi (2016), Positivists' ontological position is that of realism, that in nature, there is a cause-effect connection amongst phenomena and can be prophesied with certainty.

The positivists' epistemological position is that of objectivism that empirical facts exist independently from personal thoughts and ideas and are governed by cause-and-effect laws (Antwi & Hamza, 2015). For positivists, there are laws that govern social phenomena and the application of scientific methods, and these laws can be developed and presented as factual statements (Rehman & Alharthi, 2016). This implies that researchers are objective observers who study a phenomenon which exists independently from their views, and they have no influence on how it is being observed. The methodological process of positivism places reliance on experimentation wherein hypotheses are proposed or questions which test the causal relationship between variables (Rehman & Alharthi, 2016).

This paradigm is not suitable for this study as it limits the exploration of a phenomena based on a scientific process confined within specific parameters. Its danger is that it limits the respondents from elaborating on other salient ideas, themes and contextual elements which might help to comprehensively answer the research's question.

4.4.2 Interpretive Paradigm

Interpretivism's position is based on the view that access to reality is only through shared meanings and social constructions like language and consciousness (Myers, 1997). According to Antwi & Hamza (2015). Interpretivists believe in a deep understanding of ideas or thoughts and explore the understanding of the ecosphere in which they live (Rahi, 2017). This paradigm is underpinned by observations and interpretation of ideas, whereby observation of results from the collection of information about events and interpretations of results to making meanings about the information by drawing inferences between

information and abstracts (Antwi & Hamza, 2015). Interpretivism attempts to study and understand a phenomenon through the meaning that the research assigns to it. Thus, it is concerned with making sense of the world from individuals' subjective interpretations (Rehman & Alharthi, 2016).

The ontological view of the interpretive paradigm is that reality is socially constructed and that there are several realities that are created by people interacting with each other (Kawulich, 2012). This assumes that reality is established within the limitations of time, space, and contexts and, more importantly, that a generalized view of what reality cannot be common to individuals or a group of people.

The epistemological perspective of interpretivism is that knowledge is only created or obtained through a deep understanding of the subject (Rahi, 2017). Knowledge is created through the general meanings that people assign to phenomenon (Myers, 1997). According to Antwi & Hamza (2015), interpretivists view the process of creating knowledge as such that evolves out of meanings created by people in a non-manipulative, non-controlling, and unobtrusive way. Positivism, on the other hand, assumes the process of knowledge creation through the laws of cause-and-effect relations that are made up of measurable data utilizing conventional standards and tools with precisely defined questions.

So, this study followed the interpretive philosophical paradigm because it aimed to gain a deeper understanding of the perceived business value of the Business Intelligence System from the experiences of the users and the leadership of the organisations. The purpose of this study was not to test a theory but to develop a theory to explain the commercial value of the Business Intelligence System to organisations through the perspective of those who currently use the system. Consequently, interpretivism is deemed relevant as it enables researchers to create or develop new theories and concrete them through contextual interpretations of concepts and ideas (Park, Bahrudin & Han, 2020).

Furthermore, the interpretive paradigm is suitable for this study because this study aims to determine the impact of the adoption and the use of BI Systems in the South African energy sector from the perspectives of BI System users. The researcher's perspective about the suitability of this theoretical perspective is that a better understanding of what is perceived to be the impact of BI system in this sector can be well obtained through firsthand experiences, honest reporting, and conversational interactions with users of the system

Antwi & Hamza (2015). This is informed by the fact that the value of the adoption and use of this technology in the South African energy sector can only be well articulated and induced by exploring the phenomena from the observations, experiences, and perspectives of the participants within subjective contexts. Consequently, this study followed qualitative methodology, as explained in the following section.

4.5 Research Methodology

According to the literature, there are three advanced research methodologies: (a) Quantitative Research Methodology, Qualitative Research Methodology, and Mixed Research Methodology (Creswell, 2014). However, they are not as distinct as they first appear. Qualitative research methodology is an approach to exploring and understanding the meaning that individuals or groups ascribe to a social or human problem. In contrast, Quantitative research methodology is an approach that is followed for testing hypotheses by examining a relationship between variables. A Mixed research methodology resides in the middle of the quantum between qualitative and quantitative methodologies as it incorporates the elements of both methodologies.

This study adopted a qualitative research methodology because it aimed to determine the impact of the use of BI systems in the South African energy sector. The suitability of this methodology is informed by the fact that the study seeks to explain what the perceived impact of BI Systems and how BI Systems influence organisational performances in the energy sector. The choice of this methodology is also underpinned by the ontological and epistemological stances of this research's interpretive philosophical paradigm.

Consequently, the study adopted research strategies, approaches, techniques, tools and instruments, which are congruent with a qualitative study and are explained in the remaining sections of the chapter.

4.5.1 Research Approach

Any research study follows a particular approach that informs how the research will be conducted to arrive at the goal of the study. Conventionally, there are research approaches that are often adopted based on the research question, the goal, and the objectives of the study, namely inductive and deductive (Gabriel, 2013). The inductive research approach entails departing from observations of preliminary patterns and regularities in the data,

developing tentative theory that explain the patterns, and forming concepts and theories based on them (Burney & Saleem, 2008).

This approach is deemed necessary or relevant for the process of developing a valid theory, thereby preceding deduction (Woiceshyn & Daellenbach, 2018). This is corroborated by Kim (2021), who states that this approach starts with a set of observations and, after that, moves from such experiences to wider generalisations about those experiences. In other words, they move from data to theory or from the specific to the general. In contrast, the deduction approach entails moving from the general to the exact, in which it starts from a theory, developing hypotheses from it, testing those hypotheses, and revising the theory (Woiceshyn & Daellenbach, 2018).

In the same way, Kim (2021) emphasises that the deductive approach develops specific facts from general facts in social science, post-investigation, pre-theory, theoretical proposition investigation, observation and generalisation. The below picture depicts the difference between deductive and inductive research approach.

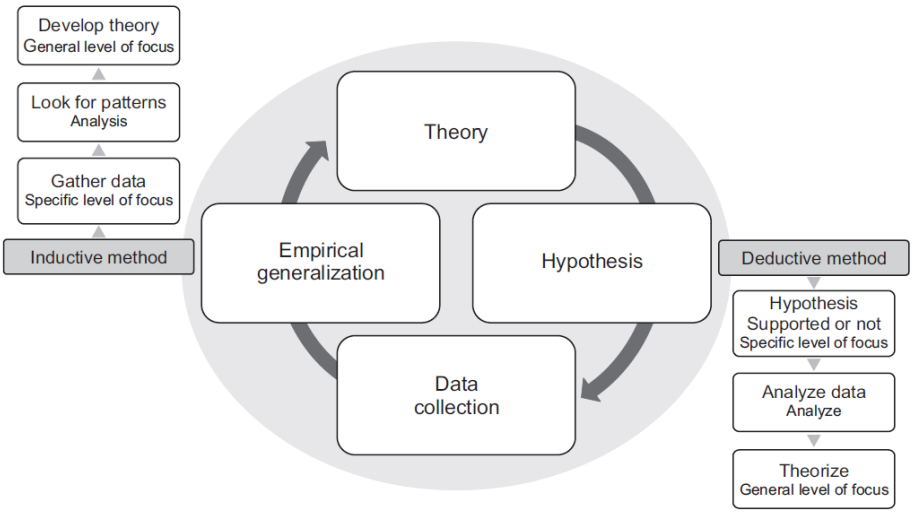


Figure 13: Schematic chain of the approaches to inductive and deductive research. - Source Soung Min Kim: Inductive or Deductive? Research by maxillofacial surgeons. J Korean Assoc Oral Maxillofac Surg 2021

The objective of this study is to investigate how the adoption and use of BI Systems adds commercial value to the and the impact of the adoption and use of BI Systems on the Energy Sector. This study sought to answer the question of what is the business value of the adoption and use of BI Systems? The objective of this study is to establish how does the adoption and use of BI system impacts the energy sector in the set specific business areas through qualitative inquiry. Based on the objectives, the research question that the study

sought to answer, and the paradigm that informs this study, an inductive approach was adopted by this study.

A deductive approach is based on the quantitative methodology that is often enlisted to test hypotheses, which is not relevant and neither suitable for this study. The disadvantage of the deductive approach is that it limits the researcher's inquiry to a predefined structure, and it is inflexible. Furthermore, a deductive approach could not be used in this study as it is appropriately used in studies that test hypothesis as opposed to developing theories.

Inversely, an inductive research approach entails departing from observations of preliminary patterns and regularities in the data, developing a tentative theory that explains the patterns, and forming concepts and theories based on them (Burney & Saleem, 2008). This approach is deemed suitable for the process of developing a valid theory and was followed by this study in line with its goals (Woiceshyn & Daellenbach, 2018).

4.5.2 Research Strategy

Eight different kinds of research strategies can be adopted to define how the data was collected and analysed: Experiment, Survey, Archival Research, Case Study, Ethnography, Action Research, Grounded Theory and Narrative Inquiry (Saunders, Lewis & Thornhill, 2018).

This study adopted the Grounded Theory strategy because the intention of this study was to develop a theoretical construct from imperial data, which was categorized into a framework under a systematic process (Yu and Smith, 2021). Such a process encompassed theoretical sensitivity and constant compromising to ensure that it was not influenced by the choice of theory.

4.5.3 Research Design

This study followed an exploratory research design to explore the study's phenomena and gain a deeper understanding of the impact of BI System usage in the energy sector in its entirety. Through this strategy, the study was able to analyse this problem in more detail, understand the phenomena and answer the study's research questions (Dudovskiy, 2012).

4.6 Research Method

This study assumed qualitative methodology as an approach through which the data was collected, analyzed, and interpreted to help answer the research question of this study. A

qualitative methodology was deemed fit and relevant for the purpose of this study because of the problem that was aimed to be resolved by this study, the question that was sought to be answered and the objectives of the study. A quantitative methodology study would not have enabled this study to gain a deeper understanding of how the Business Intelligence System adds value to the organisation.

4.6.1 Time-Horizon

This study adopted a cross-sectional research design because it aimed to understand the business value of Business Intelligence in organisations at a particular point in time. This kind of study does not require collection of repetitive collection of data from similar data subjects. Instead, it aims to collect data from multiple and relevant participants at a particular time.

4.6.2 Research Population

The research population for this study was the organisational leaders, managers, strategists, and analysts who are deemed professionals responsible for adopting and using the Business Intelligence System in the energy sector. Furthermore, the population included professionals such as managers and leaders working in ICT functions assisting organisations to design and implement BI System

4.6.3 Techniques, Tools, and Procedures

Every study adopts different techniques, tools and procedures for data collection, analysis and interpretation based on the assumed methodology in line with the question the study intends to answer.

4.6.3.1 Data Collection Technique

This study adopted semi-structured interviews as a means of collecting data from the units of observation. This technique enabled the researcher to get more relevant and detailed data from the participants and gain a deeper understanding of the phenomena through the observations interpretations of participants' perceptions and experiences of how BI System adds business value to the organisations.

4.6.3.2 Data Collection Instrument

An interview guide was used as an instrument for the collection of data to guide the researcher through the processes. However, because semi-structured interviews were

followed, the researcher and the participants were allowed flexibility to go deeper into fundamental elements, which could assist in explaining how the system adds value in more detail.

4.6.3.3 Units of Analysis

The units of analysis for this study are the factors that explain the impact and business value of the adoption and the use of Business Intelligence systems in the South African energy sector.

4.6.3.4 Units of Observations

The units of observation for this study are the system's actual users of the system and practitioners responsible for the implementation of the Business Intelligence System in the energy sector.

4.6.4 Research Validity and Reliability

The reliability and validity of any research project presents a fundamental key aspect of quality of qualitative research project (Chetty & Thakur, 2020). A research project that handles these aspects meticulously, stands the chance of differentiating itself between bad and good research and further assures the readers about the credibility and trustworthiness of the findings. To ensure the validity and reliability of this study's findings, the following principles were strictly followed:

1. Triangulation was applied by collecting data from multiple participants that work in different organisations.
2. The researcher's knowledge and understanding of different theories hadn't been applied in the interpretation of the findings (researcher subjectivity and reflexivity).
3. An audit trail of all the data was established to enable external audit that allows critical thinking and helps the researcher.
4. The researcher ensured consistent adherence to the data analysis and documentation of all the steps followed.
5. The researcher had prolonged engagement from participants to get views that vary from one participant to another in respect to their perspectives and experiences.
6. The researcher made sure that there's no bias in asking questions, analyzing the data, and writing the report.

4.7 Ethical Consideration

This study was conducted in compliance with the University of Witwatersrand values, principles, and guidelines of the research ethics policy as guided by the Wits Business School.

In adherence to the University's Research and Ethics policy, the research undertook to ensure that any occurrence that would have potentially had an adverse impact on the ethics requirements is reported to the WBS Research Ethics Review committee.

This study was further undertaken in accordance with the requirements of all the statutes and regulations of the Republic of South Africa, as well as associated practices and guidelines. Respondents' participation in this study was voluntary, and all the participants signed a consent form to affirm that their participation was voluntary.

5 CHAPTER FIVE: DATA ANALYSIS

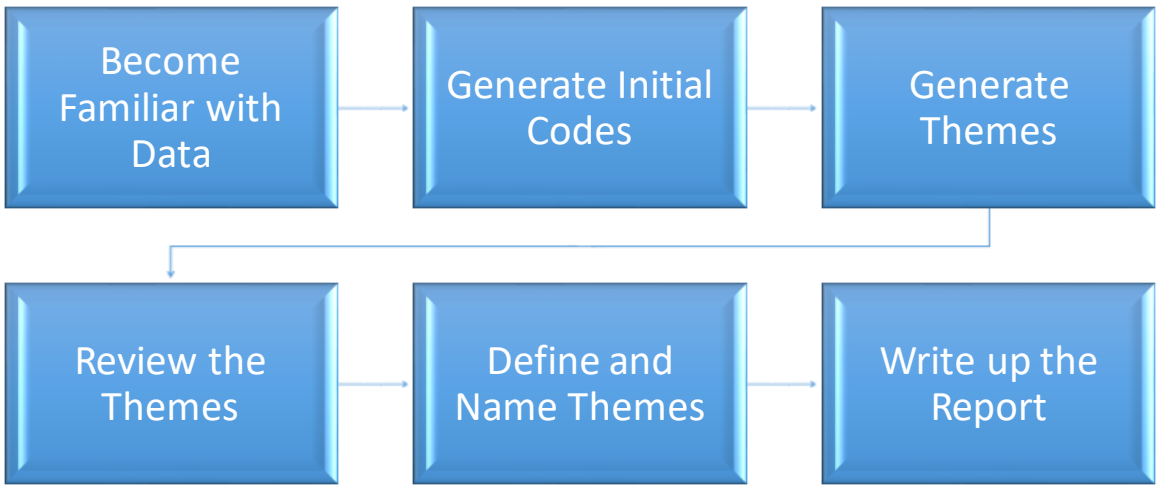
5.1 Introduction

In this chapter, the data analysis from different participants in the South African energy industry – Oil and Gas Segment is presented. This chapter is essential because it connects the empirical data obtained from semi-structured interviews with the theoretical frameworks developed in the preceding chapters. The primary objective is to analyse the qualitative data to identify the underlying themes and patterns that disclose the commercial value BI systems are thought to have in this important industry. The study's goals, which include comprehending and advancing the influence of business on the adoption and use of BI systems in the energy industry, serves as the foundation for this investigation. This chapter provide a thorough analysis and understanding of the current state of BI system utilisation in the South African energy sector, along with its opportunities, challenges, and comparative standing in the global context, by carefully examining the insights provided by the participants. The main thematic data analysis method was adopted to assist the researcher in identifying patterns and themes in interpreting the experiences, observations, and perceptions of the participants because the goal of the thematic analysis method is to identify themes and use them to address the question/s.

5.2 Data Analysis Process

There are various data analysis methods which are adopted in research to inform the process through which the researcher analysis the data based on the research objectives and the types of data that is collected. This study adopted Thematic analysis method and process based on its applicability for analysing set of text such as interviews and transcripts (Caulfield, 2019). Because this method allows the researchers to closely examine the data to identify common themes, ideas, patterns of meaning that pops-up repeatedly. It further allows the researchers to establish something about the participant's knowledge, views, experiences, values and opinions from a set of qualitative data (Dawadi, 2020).

This method has various approaches, however there is a common six-step process which is often used in qualitative research studies and that process was adopted in this study as depicted below.



The first step, the researcher spent time transcription, reading and re-reading the transcripts to familiarize himself with the entire body of the data before doing any further steps. This step is important and useful for making notes and jotting down expressions from the data.

In the second step, the researcher organised the data in meaningful and systematic ways to reduce the data into small chunks of meaning as part of the process. In this step the meanings of the data are established in addressing the research's questions and objectives of the study.

The third step is the one in which the researcher examined the codes the meanings they gave about the data. Thereafter the codes that fitted together were organized into themes that gave meaning about the data. As an example, codes that related to Customer Relationship Management were collated into a theme named Customer Relationship Management. At the end of this step codes were organised into broader themes that seem to express specific concepts and ideas about the study's research question.

The fourth step was thereafter undertaken to review, modify and develop preliminary themes that were identified in step three above. This was conducted to further refine the themes and make sure that the assumed meaning of the data is a true reflection of reality. The data related to each theme was read again to establish its support to those themes.

In step five, the researcher had further refined the themes in terms of the meaning they provide about the data and identified subthemes that might have emerged during the analysis. In this step the researcher had also analysed the data to determine if there are meanings and relationships between the themes.

The last step was a write up on sections 5.3 to section 4.5 below to provide a report of what the emerged from the data in relation to the objectives and the goals of the study.

5.3 Demographics of the Participants

The demographics of research participants are important because they give context for understanding the variety and representativeness of the data gathered. Six participants were interviewed for this research on the "Perceived Business Value of Business Intelligence System in the South African Energy Sector." Their demographics provide information on their origins, roles, and experiences, which is necessary for evaluating the study's results.

The first participant, Participant 1, works in the energy industry, primarily in analytics and data interpretation. This person's position is crucial in knowing how Business Intelligence (BI) systems are utilised in the organisation on a practical level. Participant 1 works for a major, potentially international corporation, based on the size of their organisation, which employs roughly 30,000 people. This is critical since more prominent organisations often have more complicated BI demands and systems (Davenport, 2013).

Participant 2 represents the IT viewpoint in BI system utilisation as an ERP platform manager. Participant 2 provides observations from a business setting similar to that of Participant 1, with an organisation size of roughly 31,000 personnel. This participant's technical experience gives a new perspective on BI systems, concentrating more on implementation and interaction with current IT structures (Wixom, Yen & Relich, 2013).

Participant 3, from a smaller firm of roughly 60 people, contrasts with the previous two. This person's expertise in a smaller context may give insight into how BI technologies are modified and used in less sophisticated settings. This organisation's size implies a more agile and possibly creative usage of BI tools (Cooper et al., 2012).

The function and organisational background of Participant 4 give a new viewpoint focused on the retail side of the energy business. The use of BI systems in this field is especially

intriguing since retail operations demand distinct data analysis from other industries (Barton & Court, 2012).

Participant 5, who leads operations at a 300-person organisation, provides insights from a medium-sized business. This viewpoint is critical since medium-sized organisations may encounter distinct problems and possibilities in BI system adoption compared to bigger enterprises (Brynjolfsson & McAfee, 2012).

Finally, Participant 6 presents a strategic and top-management viewpoint on BI systems as the COO of an 800-person organisation. These participants' insights are critical for understanding how BI systems match organisational strategy and objectives (Peppard & Ward, 2016).

The study's various demographics give a complete perspective of BI systems' usage and perceived value in the South African energy industry. The study's results are enriched by the varying sizes of the organisations included, as well as the different functions of the participants, and add to a more nuanced knowledge of BI systems in this sector. The demographic variation highlights the varied nature of BI system adoption and use across various organisational settings in this sector, as explained by the findings of this study.

Key amongst the themes highlighted by the findings of this study is that BI System adds business value in enhancing organisational decision-making processes, operational efficiencies, financial analysis and management, risk management and fraud detection, data accuracy and reliability. Furthermore, the study revealed that the BI system influences organisational performance in financial management, customer relationships and credit management, Internal Control and Compliance and Human Resource Optimisation.

5.4 Findings & Analysis

The general overview of the findings is that some of the organisations have not adopted traditional economic benefit analysis models to determine the business value or the effect of the adoption and use of BI Systems, while others do. This was confirmed by Participants 3 and 4 that they are not at a matured level where they utilise models NPV, ROI, ROE and CBA to assess the organisational, economic benefit of the use and adoption of the BI System in the sector. Whereas according to Participant 1, Participant 2 and Participant 5, their organisations have been using these models to assess the net benefit of the adoption and use of the BI System. However, it is understood because the BI System is the kind of

Information System whose benefits are intangible, difficult, and sometimes impossible to measure, thus cannot be adequately measured by these traditional evaluation techniques (Gibson et al., 2004).

Most of the participants indicated that they do not have any systematic mechanisms through which their organisations endeavour to advance and deepen their organisational adoption and use of the BI System. For example, Participant 5 raised the fact that there is more insight that can be gained from the embedded use of the BI System, but he does not understand why some of his colleagues are not investing time in using the system and instead rely on others. This is a demonstration of the level of BI Maturity in the sector. Furthermore, although BI Systems and tools are implemented, infusing the embedded adoption and assessment of the business impact is still limited.

Several themes have emerged from the analysis of the data to present how the BI System's adoption is perceived to be beneficial to the energy sector.

5.4.1 Major Theme 1: Enhance Decision-Making and Data Integrity

5.4.1.1 Sub-Theme 1: Enhanced Decision-Making

Analysis of the findings from interviews conducted in this study provided valuable insights into the critical function of business intelligence (BI) systems in supporting business decision-making processes across several industries. Furthermore, the data results demonstrate how BI technologies have played a key role in changing the decision-making paradigm from intuition-based to data-driven methods. A common theme among those who took part in the interview was the need for businesses to use real-time data analytics to better respond to shifting market conditions and internal performance metrics. Data is now seen as an essential resource for day-to-day operations and long-term planning, marking a significant cultural shift inside the business that goes beyond a simple change in procedure.

Several participants gave detailed accounts of how their use of different BI System tools added business value by improving decision-making processes across different areas. For instance, one participant stated, *"We use BI to analyse market trends and forecast demand, which has significantly reduced our inventory costs and enhanced customer satisfaction"* (Participant 2). Furthermore, the participant highlighted that they recently implemented an executive dashboard that is used at the Executive level to enhance the decision-making process (Participant 1). Participant 3 alluded that through analysis of the trends from

operational data, they can assist the terminal manager in forecasting or projecting the required workforce in a particular terminal to meet the required volume demand in a depot. Another participant mentioned, *"The insights from BI have been crucial in identifying new business opportunities and optimising our resource allocation"* (Participant 4). A fifth participant offered a more nuanced perspective: *"BI systems have not only improved our decision-making but also increased the accountability in our processes, as decisions are now backed by concrete data"* (Participant 5). BI System is used to enhance decision-making processes in the sector by enabling management to answer key questions about what happened to lead them to the presented performance. It also helps them analyse the trends to answer the why questions and how the business performed across different segments. Participant 1 said, *"I mean, we use it, especially some of the insights in terms of which to why? Why certain products are performing are generating the revenue that is generating we are getting insights around that". "So, if you don't have the proper insights, you know you're not going to be able to make the right decisions with respect to all of those key parts of being a manager or a leader in the organisation."* (Participant 5).

These results are consistent with the larger story in BI research when compared to the body of current literature. BI systems have been transforming organisational decision-making by giving managers access to fast, accurate, and complete data, as stated by Watson and Wixom (2007). According to Shollo and Kautz (2010), these technologies also enable firms to be more agile and quickly adjust to environmental changes. Moreover, Participant 5's claim that BI increases responsibility in decision-making is consistent with Yeoh and Popovič's (2016) observation that BI systems improve decision transparency and traceability.

Nonetheless, the interviews' emphasis on real-time analytics and how it affects operational effectiveness broadens the conversation beyond the conventional strategic focus that permeates much of the BI literature. According to Davenport et al. (2010), this operational bent indicates that BI adoption is maturing and has moved beyond strategic decision-making to infiltrate more granular layers of the organisation. This was also affirmed by Participant 1 in this study that the system enables them to do business analytics at different levels of the organisation to help achieve the objectives of the organisation. The results of Laursen and Thorlund (2010), who emphasised the expanding trend of BI systems' effect on routine operational choices, also align with this. Furthermore, not all participants could confirm with

certainty that their use of the BI System is embedded at a strategic level. Instead, some indicated the operational level and some at strategic, while some highlighted both. This might have been influenced by participants' roles in the organisations and the kind of questions.

These findings support the body of research on the influence of business intelligence (BI) systems on decision-making, highlighting the benefits of these tools for improving operational and strategic decision-making. This reiteration strengthens the between academic study and actual data, highlighting the critical role business intelligence (BI) plays in today's corporate climate, especially in data-intensive industries like energy. Additionally, it pointed out the need for continuous development in the use of BI systems, extending their impact beyond strategic choices to include real-time analytics and operational effectiveness.

5.4.1.2 Sub-Theme 2: Data Accuracy and Reliability

A significant focus on the precision and dependability of data supplied by Business Intelligence (BI) systems is evident from the findings of the interviews conducted in this study. Participants in diverse roles emphasised how important data reliability is to ensure sound decision-making and performance assessment. This phenomenon emphasised how important it is for BI systems to guarantee the integrity of the data in addition to collecting and processing massive amounts of data. The reliability of the insights obtained by BI tools, which influence operational modifications, long-term planning, and strategic choices, was consistently cited as being dependent on the correctness of the data.

Participants shared their views on this crucial aspect: *"The reliability of the data from our BI system gives us confidence in our strategic decisions"* (Participant 2). *"We depend on the accuracy of BI data for performance tracking and market analysis"* (Participant 3). *"Ensuring data integrity in our BI tools has been paramount in maintaining operational excellence"* (Participant 6). Participant 1 indicated that using the BI System, they have been able to identify missing data elements or incorrect data fields in the data itself and, therefore, engaged the relevant departments about the importance of data integrity.

When analysed in contrast with the literature, these findings corroborate what has already been reported. Academic research has well-documented the importance of data accuracy in BI systems. For example, Wixom and Watson (2010) emphasise the significance of data quality in guaranteeing the efficacy of BI systems. Similarly, the need for trustworthiness in

BI-derived data for dependable decision-making coincides with the views of Shanks and Sharma (2011), who emphasised the importance of accurate and reliable data for BI systems to be successful.

However, the respondents' focus on data correctness and dependability shows an even larger reliance on BI systems for organisational decision-making than is often mentioned in the literature. This dependence indicates a growing understanding of the impact of BI Systems, which is consistent with the viewpoint of Laudon and Laudon (2016), who underlined the rising reliance on BI Systems for strategic and operational choices in modern organisations.

5.4.2 Major Theme 2: Financial Control and Operations Management

5.4.2.1 Sub-Theme 1: Financial Analysis and Management

The findings of this study have further suggested a substantial focus on the deployment of Business Intelligence (BI) tools for financial analysis and management within the South African energy industry. Participants stated how BI systems are critical in altering their financial processes, notably in economic forecasting, cash flow monitoring, credit risk management and budget management. This focus denotes a shift from conventional financial management techniques to more sophisticated, data-driven alternatives. BI systems are depicted as vital aspects of strategic financial planning and decision-making, allowing for a more proactive and predictive approach to financial management.

Several participants have vividly described the impact of the BI System on their financial operations. For example, one participant stated, *"BI has revolutionised how we handle financial forecasting, allowing us to anticipate market changes more accurately and adjust our strategies accordingly"* (Participant 2). Participant 3 indicated that their BI System provides them with trends and insight that enable them to forecast the right level of the workforce, which consequently results in a reduction of undue expenditure. Furthermore, this participant indicated that their BI System enables them to monitor and analyse the project budget performance and make corrective strategic decisions to repurpose unutilised. Another participant noted, *"The real-time tracking of cash flows via our BI system has been crucial in maintaining our financial health, especially in this volatile market"* (Participant 4). Additionally, a third participant highlighted, *"Our budget management process has become more dynamic and precise thanks to the insights provided by our BI tools"* (Participant 5).

He further elaborated that the adoption of the BI System provides them with insight to enable them to understand the total cost to serve and assist them in making informed decisions about how to move a portfolio of products from one location to another or one client to another. This sounds more like operational efficiency, but such insight assists in driving cost management as a competitive strategic thrust.

Analysis of these data with consideration of the previous research offers a fascinating perspective. The perspective offered by Davenport et al. (2010), that contemporary BI technologies provide previously novel capabilities in financial planning and analysis, is consistent with the function of BI in financial management. The participants' experiences corroborate with Laudon and Laudon's (2016) observation that the BI System is essential for converting unprocessed financial data into valuable insights that aid in strategic decision-making. Moreover, the expanding significance of real-time analytics in corporate operations, including financial management, is recognised by Shollo and Kautz (2010), whose results are consistent with the focus on real-time data for financial operations.

Participants' perspectives on the degree of BI system integration into financial operations pointed to a greater dependence on these systems than is often covered in the literature. Although academics such as Watson and Wixom (2007) have recognised the importance of business intelligence (BI) in financial analysis, the level of dependence and integration revealed by these findings points out a growing role for BI that may go beyond the parameters given by the current body of literature.

5.4.2.2 Sub-Theme 2: Financial Operations and Management

The study's findings also demonstrated the significant influence of the BI System on the financial operations and management in the energy sector. Participants from various roles discussed how adopting the BI System has completely changed how they handle financial reporting, cost control, and planning. They improved capacity through financial analysis, precise forecasts, and effective reporting and ran across most of these conversations with participants. This shift is primarily due to the BI System's capacity to manage massive amounts of financial data, offering thorough insights and supporting strategic and operational financial decision-making.

Participants shared their experiences and insights regarding the influence of BI on financial operations: "*And we use it mainly to get a lot of insights on where, why, how did the business*

perform and why did it perform in the way that it performs. So, we use it really from understanding insights from our performance" (Participant 1). *"Our budgeting process has become more data-driven and accurate since we integrated BI tools into our financial operations"* (Participant 2). *"BI systems have significantly improved our cost management strategies, allowing for more effective control over expenditures"* & "*So, there's visibility across all the departments, across all the cost centres, and it adds value because of that"* (Participant 4). *"Financial reporting used to be a cumbersome process; with BI, it's now quicker and offers more depth in analysis"* (Participant 6). "*let's say you look at a system that is kind of like giving the insights into cost to serve and you want to be able to make decisions on, you know, where to move, you know"* and " *You know, it helps you to make better decisions in terms of what practices to follow with respect to preventative maintenance and so on in order to reduce costs on, you know, you wanna, you want to increase asset reliability for example"* (Participant 5).

Participant 2 also indicated, *"I think from a business perspective-based profit increase due to the number of sales we're getting from our customers due to the data insights we are getting through the system."*

When these findings are compared to the current literature, a high-level corroboration with the literature is revealed. The literature on BI Systems emphasises its influence on improving financial processes inside organisations. For example, Laursen and Thorlund (2010) describe the significance of BI in enhancing budgeting and financial planning, which is consistent with the participants' experiences. Furthermore, Olszak and Ziemba (2012) emphasise the relevance of BI in financial reporting and cost management, which is consistent with the findings of the participants.

However, the level at which BI tools are used for financial operations, as revealed by the interviews, shows a deeper integration into financial processes than is often discussed in previous literature. This shows a developing role for BI in financial operations, which is consistent with Davenport and Harris's (2007) observation of BI's rising scope in strategic financial management.

5.4.3 Major Theme 3: Customer Relationship Management and Revenue Increase

5.4.3.1 Sub-Theme 1: Customer Retention and Sales Growth

Analysis of the data and findings indicates that BI tools play a major part in improving customer relationship management in the South African energy industry. The participants discussed how BI systems are now essential for understanding customers' behaviour and preferences in more detail.

Participants shared their experiences and perspectives: "*BI tools have given us a much clearer understanding of our customer segments, which has improved our relationship management strategies"* (Participant 2). "*So, the insights that you can gather from that is, like I said earlier, it's insights into how you can plan better plan the organisation with respect to forecasting?" "Then you know, making decisions with respect to credit management, so you know whether it's credit limits and we're going into a bit more detail."* (Participant 5). This aspect also enables account managers and the sales team to proactively engage customers, manage payment expectations, and keep accounts up to date. *"Our customer service has improved markedly since we started using BI to analyse customer feedback and behaviour"* (Participant 6). *You need to focus on this customer because you know they used to do, you know, a million litres a month, but suddenly, they do in this month they did 500,000 litres* (Participant 5). "*Yeah, in some cases, I would say yes because, you know, based on some of the insights you'll get from these systems, you can identify opportunities." & "In many cases, it can increase sales directly or indirectly*" (Participant 5). "*The result of adoption, right, because we already know what our customers, being circumstellar centric, we already know what our customers require, what improvements do they need and what type of products that they require from us, right?"* (Participant 2). Furthermore, he alluded that "*we can improve that so that we can enable, we can make sure that we retain our customers and also the existing customers that we have, they can order more products from us also getting new players on the market*".

These findings demonstrate a substantial connection with the extant literature. Academic research supports the use of BI for customer relationship management. Ngai et al. (2009), for example, emphasise the significance of BI in improving customer relationship management, particularly in understanding customer wants and preferences, which is consistent with the participants' experiences.

However, based on the interviews, the degree to which BI technologies are used for customer relationships and credit management implies a more essential role than is normally reported in academic literature. This dependence indicates a developing knowledge of BI's function in customer-centric strategies and risk management, consistent with Bose's (2009) observation of BI's rising breadth in key business domains.

5.4.3.2 Sub-Theme 2: Customization and Role-specific Applications

Analysing the data from semi-structured interviews suggests a strong focus on the customisation of Business Intelligence (BI) tools for various roles inside organisations in the South African energy industry. This customisation feature enables the BI System to give role-specific insights and actions, adapting to the different departments' and personnel's distinct demands. Participants emphasised the need for customisation in improving the usefulness of BI tools, pointing out that a one-size-fits-all approach is less successful in addressing individual operational or strategic goals. Customisation has been acknowledged as a critical aspect in enhancing user acceptance and satisfaction with BI systems since it enables more relevant and actionable insights for various roles.

Several participants provided insights into how BI System customisation has benefited their roles: *"The BI system tailored to our sales department has significantly improved our sales forecasting and customer engagement strategies"* (Participant 2). *"As a finance manager, the customised BI tools have enabled me to track financial performance and make more informed budgeting decisions"* (Participant 4). *"Our customised BI dashboard for operational management has made monitoring daily activities and response to issues much more efficient"* (Participant 5). Furthermore, participant 5 pointed out, "*So it's important to be able to design the system in such a way or the platforms that you use in the BI systems that provide you with the right type of information and not just partial information, because then that always just leaves a gap.*"

When these results are analysed, there is a significant alignment with the current literature. Academic literature supports the notion of customisation in BI Systems by emphasising the need to design a BI System to match the individual needs of diverse users within an organisation. For example, Yeoh and Koronios (2010) addressed the importance of customisation in the optimal deployment and use of BI Systems. Similarly, Wixom and Watson (2011) discussed how role-specific BI tools might lead to better decision-making and higher user satisfaction.

However, the quantity and depth of customisation suggested by participants point to a more intentional and user-centric approach than is often noted in the literature. According to Shollo and Kautz (2010), this postulates a growing BI System implementation trend focusing more on user-specific demands and preferences.

5.4.3.3 Sub-Theme 3: Sales and Revenue Increase

An increase in sales and revenue has also emerged as another theme that demonstrated the business impact of BI Systems in the energy sector. This finding elevates the business value of BI Systems in the industry by harnessing a vast amount of data that is generated from operational systems. Participants confirmed with certainty that the BI System's analytical capabilities enable them to conduct predictive analytics in some aspects of their business to identify business growth opportunities.

Several participants indicated that BI system provides valuable insight that enables them to identify opportunities to increase sales and revenue. *"Yeah, in some cases, I would say yes because, you know, based on some of the insights you'll get from these systems, you can identify opportunities." & "The second part is that, umm, you can increase sales now."* (Participant 5). Furthermore, the participant alluded that the use of the BI System has enabled them to increase sales directly and indirectly. *"In many cases, it can increase sales directly or indirectly."* However, participant 5 pointed out, "I would say from a confidence level, it has improved from a stock level management, it has improved, *and I think hence as a direct result, uh, the sales increase again it's indirect and indirect.* Participant 3 suggested "*The How is you know we obviously track all departments performance from retail to be to be umm lubricants and specialities and in this sense, umm, all businesses are aware of their historical performance".* In addition, participant 2 stated, *"I think from a business perspective-based profit increase due to the number of sales that we're getting from our customers due to the data insights that we are getting through the system."*

This finding corroborates with that highlighted by literature that the adoption and use of BI Systems have a business impact in the energy sector by increasing sales and profitability (Nielsen, 2015). This is echoed by Yiu, Yeung, & Cheng (2020), who state that the BI System has the potential to improve profitability and mitigate risks as highlighted above concurrently.

5.4.4 Major Theme 4: Internal Controls and Governance Management

5.4.4.1 Sub-Theme 1: Customers Credit Management

Data analysis indicates that BI tools also play a significant part in improving credit management in the South African energy industry. The participants spoke about how BI systems are now essential for determining credit risk. A more individualised approach to credit risk assessment and customer management is made possible by the efficient analysis of client data that BI technologies provide. This position is especially important in a sector where controlling financial risks and comprehending consumer dynamics are essential for long-term operations.

Participants shared their experiences and perspectives: "*I mean, we've; we've established that, but that helps us to check specifically when you talk about credit and credit risk and all that stuff we've just done that those specific analytics around it."* (Participant 1). *"BI tools have given us a much clearer understanding of our customer segments, which has improved our relationship management strategies"* (Participant 2). *"The use of BI in credit assessment has significantly reduced our risk exposure. We can now predict and manage credit risks more effectively"* (Participant 4). "*So, the insights that you can gather from that is, like I said earlier, it's insights into how you can plan better plan the organisation from with respect to forecasting?" "Then you know, making decisions with respect to credit management, so you know whether it's credit limits, and we're going into a bit more detail."* (Participant 5). *"Our customer service has improved markedly since we started using BI to analyse customer feedback and behaviour"* (Participant 6). *You need to focus on this customer because you know they used to do, you know, a million litres a month, but suddenly, they do in this month they did 500,000 litres* (Participant 5).

These findings demonstrate a substantial connection with the extant literature. Academic research supports the use of BI for customer relationship management. The influence of BI on credit risk management is consistent with the findings of Xie et al. (2010), who emphasised the relevance of BI in financial risk assessment and management.

However, based on the interviews, the degree to which BI technologies are used for credit management implies a more essential role than is normally reported in academic literature. This dependence indicates a developing knowledge of BI's function in customer-centric strategies and risk management, consistent with Bose's (2009) observation of BI's rising breadth in key business domains.

5.4.4.2 Sub-Theme 2: Risk Management and Fraud Detection

Another Sub-theme that emerged from the data analysis in terms of Internal Controls and Risk Management is Risk Management and Fraud Detection. The Data from semi-structured interviews with participants in the South African energy industry highlighted the role of Business Intelligence (BI) tools in risk management and fraud detection. This sub-theme surfaced prominently throughout the sessions, demonstrating how BI technologies are increasingly used to detect, analyse, and mitigate many operational and financial risks. The usage of BI Systems for credit risk analysis and fraud detection was a focus, reflecting a strategy change towards more proactive and predictive risk management techniques. Participants emphasised the capability of the BI System to analyse vast amounts of data for trends that might indicate possible hazards or fraudulent activity, allowing for early response.

Responses from participants illustrate this trend: *"We've enhanced our risk management framework by integrating BI tools. They help us identify potential credit risks much earlier."* (Participant 2). *"BI has been crucial in our fight against fraud. It helps us detect anomalies and suspicious patterns in transactions."* (Participant 4). *"By using BI, we've been able to monitor and manage financial risks more effectively, especially in credit operations."* (Participant 6).

A substantial alignment is also revealed between these results and the extant literature on BI Systems. In scholarly debate, the use of BI for risk management and fraud detection is well-established. The effectiveness of BI tools in risk detection and mitigation has been studied by academics such as Richardson et al. (2015), which is consistent with the observations of the study's participants. Furthermore, the interviewees' emphasis on the relevance of BI in fraud detection supports Cokins's (2009) findings, which highlight the growing significance of BI in identifying and stopping fraudulent activity inside businesses.

However, the participants' indication of the degree to which the BI System is used for these goals points to a more crucial function than is often acknowledged in the literature. Although BI System is used in risk and fraud management, according to the literature, interviews indicate that BI systems are more important to these tasks in the energy industry (Talwar et al., 2018). This changing function of business intelligence (BI) in risk assessment and fraud detection points to a vibrant and developing sector that aligns with general developments in predictive modelling and data analytics.

5.4.4.3 Sub-Theme 3: Internal Control and Compliance

Internal Controls and Compliance with governance have been discovered as another sub-theme that emerged to indicate the business impact of BI Systems in the South African energy sector. Participants from a range of roles emphasised the growing importance of BI Systems in preserving and enhancing internal control systems. This system provides perceptive analytics that helps guarantee adherence to corporate norms and industry requirements. It was also mentioned that the BI System's real-time tracking, reporting, and data analysis were advantageous for spotting compliance problems and enhancing governance.

Participants shared their insights on the impact of BI on internal controls and compliance: *"BI systems have greatly assisted in tightening our internal controls, particularly in financial reporting and compliance monitoring."* (Participant 2). *"We rely on BI for real-time compliance checks, which has significantly reduced our risk of regulatory breaches."* (Participant 4). *"The governance process has become more streamlined and effective with the integration of BI tools in our operations."* (Participant 5).

The literature on business intelligence systems emphasises their usefulness in improving internal controls and compliance. Therefore, this insight also points out that which is substantially affirmed by the extant literature. For example, Romero and Ventura (2010) emphasise BI systems' capacity to improve governance via improved data management and compliance monitoring. Similarly, the results validate Talón-Ballestero and González-Sánchez (2013) views about BI's function in increasing internal controls and regulatory compliance in organisations.

However, the degree to which participants rely on BI systems for internal control and compliance implies a more essential role than is often reported in academic research. This is consistent with Rikhardsson and Dull’s (2016) observation of the growing importance of BI in organisational governance and compliance initiatives.

5.4.5 Major Theme 5: Business Processes Optimisation

5.4.5.1 Sub-Theme 1: Operational efficiency and Process Improvement

The information collected from semi-structured interviews conducted in this study also shed light on the impact of business intelligence (BI) tools on operational efficiency and process optimisation. Participants have repeatedly emphasised the importance of BI solutions in

optimising processes, increasing productivity, and lowering operating expenses. Detecting and correcting inefficiencies was a constant topic, which was critical in optimising numerous operational procedures. These results imply that BI systems are more than just data analysis tools; they can serve as catalysts for operational change and advancement.

Participants vividly detailed the operational improvements facilitated by BI systems in their accounts. One participant remarked, *"Since implementing BI tools, we've seen a marked reduction in process bottlenecks and improved turnaround times"* (Participant 3). Another participant noted, *"BI has been a game-changer in identifying inefficiencies in our supply chain, enabling us to make data-driven decisions to optimise our operations"* (Participant 1). The emphasis from Participant 1 is that they have been able to identify gaps and inefficiencies from internal Operational Processes perspectives. Furthermore, they have been able to detect data gaps that impacted critical measurement and improvement processes using the BI System. The system's analytical capabilities enabled them to identify process battlements so that they could be streamlined and improved.

Furthermore, another participant stated, *"The real-time data analytics from our BI system has drastically cut down on operational waste and improved our overall efficiency"* (Participant 5). The system has enabled them to identify many defects in the organisational processes, wherein the participant highlighted an example in the credit management processes in which several credit notes might be prevented to reduce the administrative burden that comes with them. "*So, a straightforward example is that you know, if you're looking at from a credit management perspective, uh, you know, the number of credit notes that have been generated in the system. You're able to then look at, maybe not all of them, but in some cases, it might be related to a business process that's resulting in, you know, these credit notes that having to be generated, which adds administrative burden to the organisation as well.* (Participant 5).

A strong relation is revealed when these results are compared to the body of current research. In academic circles, the importance of BI in improving operational efficiency is well-documented. In line with the experiences that the participants provided, Popovič et al. (2012), for example, highlighted the usefulness of BI systems to enhance operational processes by delivering timely and reliable data. Watson and Wixom (2007) also spoke about how BI tools may convert unprocessed data into insights that can be used to improve

processes. This supports what the participants saw as improved decision-making and decreased inefficiencies.

Additionally, Shollo and Kautz's (2010) study supports the participants' focus on real-time data analytics, arguing that real-time data is essential for quick operational changes in dynamic market contexts. This viewpoint is consistent with the research conducted by Yeoh and Koronios (2010), who suggested that BI systems might result in significant operational gains, especially in industries like the energy sector where agility and fast reaction times are critical.

This study's outcomes provide evidence that supports the existing academic consensus about the contribution of business intelligence (BI) systems to process improvement and operational efficiency. The experiences of the participants align with the theoretical ideas that emphasise the importance of BI tools in fostering operational excellence. The affirmation of these results with extant literature not only authenticates the experiences of the participants but also highlights the revolutionary potential of BI Systems in operational settings, namely in data-intensive industries like the energy sector.

5.4.5.2 Sub-Theme 2: Improvement in Operational Procedures

The participants' data revealed persuasive evidence of the transformational influence of the BI System on operational processes. The data indicates a similar narrative in which BI Systems have played an important role in simplifying processes, increasing productivity, and minimising mistakes in day-to-day operations. Participants from diverse positions and organisations reported significant advances in process management. Thus highlighting a move away from manual, error-prone processes and towards more automated, accurate, and efficient approaches enabled by BI Systems. Furthermore, better allocation of resources and time management are two outcomes of this transformation that have enhanced operational procedures and, by extension, overall operating performance.

Several participants shared their thoughts on how business intelligence technology has changed operational processes. One participant noted, *"The introduction of BI tools in our daily operations has drastically reduced the time spent on data processing and analysis"* (Participant 2). Another participant shared, *"With BI, we have been able to automate several of our key operational processes, which has led to a noticeable reduction in errors and increased productivity"* (Participant 4). Additionally, a participant mentioned, *"BI systems*

have enabled us to monitor our operational KPIs more effectively, leading to more informed decision-making" (Participant 5). Furthermore, participant 2 stated, "*We have an analytical tool, and the data enhances us inside of looking at where there are problems with our business processes, where can we go enhance our business process, where there is a stumbling block and also where can we automate the business processes right to make sure that there is an improvement in our business."*

A significant corroboration is established when these results are compared to the body of knowledge on the BI System. Laudon and Laudon (2016) state that the experiences of the participants support the notion that BI systems are renowned for their effectiveness in process management and error reduction in operations. Furthermore, Shollo and Kautz (2010) emphasise that BI technologies provide a platform for data-driven decision-making, which improves operational operations, as affirmed by the study's participants.

This is also congruent with Watson and Wixom's (2007) findings, which address the function of BI in optimising organisational operations, process automation, and resource optimisation. In addition, participant's account of the extent of the effect and degree to which operational efficiency depends on BI Systems point to a more profound impact of BI in operational processes than is often acknowledged in the literature.

5.4.5.3 Sub-Theme 3: Human Resource Optimization

The study's results also indicate the business impact of the BI System on human resource management in the South African energy industry. For, BI Systems have optimised workforce needs and decreased the need for considerable manual labour, especially in data analysis and processing, as reported by participants. Enhanced workforce planning, more strategic HR process simplification, and more effective employee data management are examples of this optimisation. HR personnel may now concentrate on additional value-added duties since BI solutions can automate and streamline complicated data operations, increasing productivity.

The participants' experiences and insights are as follows: *"BI tools have revolutionised our HR processes, automating many tasks that used to require manual input and analysis."* (Participant 2). *"With BI, our workforce planning has become more data-driven and efficient, freeing up time for strategic HR initiatives."* (Participant 4). *"We've seen a significant reduction in manual data processing in HR, thanks to our BI system."* (Participant 6)

Compared to current research, our results are consistent with the known advantages of BI in HR management. The literature emphasises the significance of business intelligence in improving human resource operations via data analytics and automation. For example, Marler and Boudreau (2017) discuss how BI technologies may help with more effective HR decision-making and workforce planning. Similarly, the decrease in manual data processing and the resulting gain in efficiency and strategic focus coincide with Davenport et al. (2010) conclusions on the transformative influence of BI on HR services.

However, the participants' degree of dependence on BI tools for HR optimisation shows a deeper integration into HR operations than is often described in the current literature. This dependency is consistent with Heuvel and Bondarouk's (2013) observation of the growing importance of BI in strategic HR management.

5.4.6 Major Theme 6: Enhance Asset Performance

5.4.6.1 Sub-Theme 1: Improve Asset Reliability

The data has demonstrated that the system has the potential to assist organisations in enhancing the assets' useful life. The This implies that the use of the BI System can assist organisations in ensuring the adequate maintenance of the asset in accordance with the Original Equipment Manufacture's guidelines to enhance the lifespan and increase return on assets (RoA).

According to Participant 1, the BI System enables them to monitor not only plant performance processes but also the plant equipment's real-time performance to enhance its optimum utilisation and entire lifespan to improve the economic benefit of the organisation. Such insight assists to prevent undue interruption and improve shutdown planning and execution processes. Furthermore, the insight received from the BI System about the plant assets enhances the Maintenance Shutdown planning process through predictive analytics by pointing out assets that need to be replaced during shutdown.

He pointed out that "*we collect lots of information around our asset, specifically from the maintenance and integrity space, so that we know what the state of our assets is. And then from that, it helps us, and then those assets are very expensive.*

So, in partnership with OEMs for those I'm assets, then we gather the necessary insights to really help us and that drives material benefits because instead of waiting for the end of life

for such equipment, you can intercept with the right level and be able to use that information to say.

But as much as it's due for service next year, data shows us that it's been overused. Maybe it might be worthwhile to take it out earlier, rather than waiting for them, which might break before the time, and we're talking about the equipment that is costing a lot of money." (Participant 1). *"I mean, if you've got, if you've got like a, if you got a site that's logging a call like three times a week and but you're not doing any preventative maintenance, you want to improve the acid reliability so then you can reduce your cost."* (Participant 5)

Consequently, this prevents undue delays and facilitates planning, execution, and completion of shutdown projects on time and quality. Participant 5 pointed out, "*You know, it helps you to make better decisions in terms of what practices to follow with respect to preventative maintenance and so on in order to reduce costs on, you know, you wanna, you want to increase asset reliability for example*" This revealed that their BI System enables then to monitor assets maintenance records and breaking to assist them to ensure adequate preventative maintenance is done to prevent undue operational interruption. Furthermore, such insight will enable them to enhance the asset's reliability and reduce operating costs.

This demonstrates that the BI System has the potential to enhance operational assets' performance and useful lifespan and consequently reduce the organisational total cost to serve.

5.5 Conclusion

This chapter offered a comprehensive examination of the qualitative information obtained from significant players in the South African energy industry (Oil and Gas Segment). A thorough analysis of the data collected in this study provided valuable insights into the perceived business impact of BI Systems in this industry. The themes and concepts revealed by this study have shown that the BI system is essential for strategic planning and decision-making in key areas of the business.

The findings of this study have therefore, revealed thirteen themes, which were categorised into six major themes relating to the business value of the use of the BI System. Enhanced Decision-making and Data Integrity, Financial Management, Enhanced Customer

Relationship Management, Internal Controls and Governance Management improvement, and enhanced Asset Performance were identified as themes which indicated the perceived business value for the adoption of the BI System.

The findings of this study uncovered that the adoption and use of BI Systems deliver valuable insight which supports strategic and operational decision-making processes in several business areas, as highlighted above. The adopted conceptual model has significantly broadened the scope of this study; hence, numerous themes were identified in this study to reflect how BI System adoption adds business value to organisational performance.

Notably, the findings of this study have also highlighted that most of the organisations' BI Maturity is still at an infancy state. Firstly, most of the organisations' adoption and use of the benefits of BI Systems do not have evaluated matrixes and mechanisms through which the impact of BI Systems can be measured. Secondly, they lack an adequate culture that incorporates principles of systematic processes that infuse the use of BI Systems as well as information culture ethos that embeds data-driven and informed decision-making. Thirdly, some organisations still perceive the implementation of BI Systems as an IT initiative rather than a strategic project to harness the use of organisational data as a strategic asset.

The results of this study outlined the status of BI System adoption in the energy sector's oil and gas segment, particularly specific areas which are impacted by the adoption and use of BI System. Although the findings did not specify measurement metrics that are used to identify the business value of the BI System, participants are resolute about how the adoption and use of the BI system have had an impact in those specific areas.

6 CHAPTER SIX: DISCUSSION & CONCLUSION

6.1 Introduction

This chapter highlights a significant confluence of the research results and analysis performed previously. This chapter discusses and concludes the research on "Perceived Business Value of Business Intelligence Systems in the South African Energy Sector." The discussion summarises the results based on the primary and secondary research goals as well as the implications of the study's findings. It considers the consequences of these results, makes suggestions based on the study's findings, and identifies limits and possible areas for further research. This chapter acts as a capstone, concluding observations that capture the core of the research and its contribution to knowledge of Business Intelligence (BI) systems in the South African energy industry.

6.2 Discussion of the Findings

This study's main goal was to investigate how the South African energy industry benefits from the adoption and use of business intelligence (BI) tools. The findings highlight the critical role of business information (BI) solutions in bolstering financial and strategic planning, enhancing operational performance, and enhancing decision-making processes. These results provide credence to the assertions made by Davenport (2013) on the revolutionary potential of BI systems to foster informed decision-making. The findings also back up what Brynjolfsson and McAfee (2012) said: that business intelligence systems are crucial for companies' strategic planning and operational success.

The study's findings demonstrated that the BI System significantly impacts the organizations' performances, particularly in risk management and operational processes and procedures. Similarly, Wixom and Yen (2014) found that improved risk management methods and enhanced operational efficiency are outcomes of a well-implemented BI system. Nevertheless, this study discovered variations in the impact of BI systems across different organisations, indicating that the outcome is influenced by factors such as organisational size and sector-specific needs. This contrasts with the recommendations of Peppard and Ward (2016), who proposed that BI systems uniformly enhance organisational performance.

The use of business intelligence (BI) systems has been shown to impact the performance of South African energy sector organisations in several ways, such as enhancing operating protocols and improving data precision. These results validate the hypothesis put out by Cooper et al. (2012) that BI systems improve operational effectiveness. They also point to a wider influence on organisational performance than is often mentioned in the literature, suggesting that the South African energy sector's setting may provide exceptional possibilities and difficulties for using the BI System.

The study found that organisations' domains like financial operations, customer relationship management, internal control, risk management, asset performance, and human resource optimisation are significantly impacted by the adoption and use of BI Systems. This bolsters the claim made by Barton and Court (2012) that BI systems have a broad influence on many business operations. Beyond their findings, however, the study emphasises how BI systems might help with adjusting to the changing demands of the energy sector. This topic hasn't received much attention in the literature up to this point.

This research advances knowledge about the function of BI systems in South Africa's energy industry. It confirms previous research on the beneficial effects of BI systems on corporate performance, but it also shows that the kind and degree of these effects might differ based on industry-specific difficulties and particular organisational settings. These results highlight the need for a nuanced strategy when deploying and using BI systems in various organisational contexts. The Business needs and the sector’s external factors have impacted the degree of adoption and use cases of BI Systems in the energy sector.

The purpose of this study was to investigate how business value is delivered in the South African energy industry through the adoption and use of the BI System. The results show that BI systems significantly influence financial management, strategic planning, operational effectiveness, and decision-making. Laudon and Laudon (2016) assert that by providing precise and fast information, these technologies improve organisational decision-making. This perspective is borne up by the present study's findings, which demonstrate that BI tools significantly improve strategic and operational decision-making within South Africa's energy sector. This aligns with Yeoh and Koronios (2010) found that better business decisions and higher organisational performance might result from more effective BI systems.

Research conducted in the South African energy sector has shown that business intelligence (BI) systems significantly influence organisational processes and outcomes. These results lend credence to Shollo and Galliers' (2016) research, which noted that better use of BI systems has the potential to increase operational efficiency. Further support for this comes from recent studies that have zeroed in on energy sector advantages such as enhanced data management and decision-making processes.

The study's findings further showed the impact of BI systems on organisational performance. It was determined that BI systems aid in performance monitoring and resource management based on the insights offered by the participants. In support of the assertions by Chen, Chiang, and Storey (2012), BI systems are crucial for improving the performance of organisations. In contrast, our study fills a gap in the literature by providing an in-depth understanding of these systems' use in the energy sector.

The research also examined how different areas of the company are impacted by BI system adoption and usage. The findings showed numerous impacts on HRM, customer relationship management, financial operations, and internal controls. This lends credence to the assertions by Wixom, Yen, and Relich (2013), who state that BI systems have diverse impacts on various business processes. However, this study sheds light on the unique circumstances of South Africa's energy industry, indicating that the impact of BI systems differs according to the opportunities and challenges encountered by this sector.

6.3 Response to Research Questions and Objectives

The primary objective of this study was to investigate and understand how the adoption and use of Business Intelligence Systems deliver business values in the South African energy sector. The sub-objectives of the study were to determine the impact of the BI System, investigate how the BI System adds value to the energy sector and determine business areas from which the BI System adds value in the energy sector.

The set objective of this study was attained by revealing that the impact of the adoption and use of the BI System delivers business values in the South African energy sector by providing actionable insight that supports decision-making in critical areas of the organisation. Consequently, the impact of the BI System on the energy sector is realisable only if the actionable insight received from the system is utilised or applied across different areas and levels of business. This is supported by the widespread postulation from the

literature that the BI System has no direct impact on organisations' performance against strategic endeavours. However, it indirectly impacts organisations' performance in various areas by supporting and enhancing decision making processes. Thus making it easy for the South African energy sector to respond to market dynamics and sustainably meet global business demands that require organisations to be agile enough.

Furthermore, the findings highlighted that the BI System provides actionable insight to inform and support decision-making processes in financial planning, cost management, risk management, fraught detection, and customer relationship management. Additionally, the study pointed out that the BI System provides actionable insight that enhances decision-making in operational process optimisation, sales and profit increase, and asset performance optimisation areas.

The sub-objective about how adopting and using the BI System adds business value to the energy sector was achieved by revealing that the BI System's analytical tools enable organisations to get insights about the retail segment's performance to monitor and analyse customers' behaviours. Furthermore, the study highlighted that the BI system presents business analysts and decision-makers with insights about customers' credit risk management, volume analysis and the implications of price increases on customers' credit limits.

Although there were no specific performance measure matrixes through which the impact of BI System in those performance areas can be measured, it was further unearthed by this study that BI System provides insight that enables them to determine the product's demand forecast and the total cost to serve such demand. It was also reflected that the adoption and use of BI Systems provide the energy sector which aids them to identify opportunities to increase revenue, sales and profitability whilst improving customer relations.

In addition to the response provided to the primary research objective of the study, the findings assisted in demonstrating the level of BI System adoption and use as well as the BI Maturity level in the energy sector. Varying levels of maturity have been observed from all the participants' organisations. Some of the participants' organisations are at an infancy stage, and others are slowly moving towards an improved level of maturity.

6.4 Summary of the Business Value of BI System Adoption

The primary objective of the research was to examine the role of Business Intelligence System adoption and utilisation in the South African energy industry's value delivery. According to the results of this study, the BI system is critical in improving decision-making processes, largely via data-driven, data accuracy and actionable insights.

Firstly, the study indicated that the BI System impacts the energy sector by assisting the practitioners and leaders to make informed decisions concerning financial management, budget management, cost reduction and financial operations management. Furthermore, the system enables the sector to improve customer relationship management and increase sales and revenue. Secondly, participants noted that BI systems had an impact on their organisations by assisting them to improve operating processes by reducing errors and increasing efficiency. Furthermore, the study revealed that the adoption and use of BI Systems aid the energy sector in pursuing strategic objectives by providing them with insight into operational processes. This is consistent with the ideas of Laudon and Laudon (2016), who emphasise the transformational significance of business intelligence in decision-making. Thirdly, the system impacts the energy sector by assisting decision-makers in enhancing risk management processes, internal controls, credit management, and fraud detection, thus enhancing organisational controls and governance management. Lastly, the study indicated that BI System adds business value to organisations in this sector by providing actionable insight that assists in enhancing plant equipment and assets' useful life and reliability.

Notably, operational efficiency, customer retention, sales growth, risk management and process optimisation, assets' reliability, credit management and cost management appeared as major areas where BI system implementation had a beneficial influence. This is supported by Watson and Wixom's (2010) contention that the BI System and its related tools are critical in simplifying processes and discovering inefficiencies. This is further in line with the results of Popovič et al. (2018), who emphasise the advantages of BI for operations.

The findings provided by Davenport and Harris (2017) are supported by the fact that customisation and role-specific implementations of BI systems developed as crucial components, enabling bespoke insights for diverse organisational functions. Additionally, emphasis was placed on the quality and dependability of the data supplied by BI systems, which is in line with the claims made by Shollo and Kautz (2010) on the reliability of BI data.

6.5 Conclusions of the Study and Recommendations

In conclusion, this study set out to investigate and establish how the energy industry in South Africa may get economic value from the adoption and use of the BI System. According to the study's findings, the adoption and use of BI Systems impact several business areas by providing actionable insight to enhance the processes in those areas. As alluded to by the literature, the BI System adds business value to organisations by analysing huge business data to provide actionable insight that assists in achieving strategic objectives.

Notably, the BI System impacts organisations' performance in thirteen key areas, which can be categorised into six strategic objectives. 1) Enhanced Decision-making and Data Integrity; 2) Financial Control and Operations Management; 3) Customer Relationship Management and Revenue Increase; 4) Internal Controls and Governance Management; 5) Business Processes Optimisation and enhanced Asset Performance are key strategic objectives from which BI System adds business value. However, the study has not pointed support for all business areas, including but not limited to marketing, production volumes and logistics, which are also critical areas of sustainability and competitiveness in this sector. However, it has highlighted key business areas that are significant for any organisation to be agile, sustainable, and competitive in this sector.

The importance of data integrity to core dependency for any strategy delivery is that you can't measure performance against strategic objectives and make informed strategic decisions without reliable data and insight. The study found that energy companies in South Africa might benefit from putting more effort into making data-driven decisions with the use of Business Intelligence (BI) technologies. This lines up with the views of Davenport and Harris (2017), who promote making strategic decisions based on data and actionable insight instead of leaders' intuition. Maximising the potential of business intelligence systems is essential for producing valuable insights that may influence important strategic and operational decisions. If businesses want to help their customers make good decisions, Yeoh and Koronios (2010) say they need to ensure the data they're using is accurate and useful.

This study pointed out that the adoption and use of BI Systems add business value by providing insight that supports decision-makers to enhance financial controls and management of financial operations. Enhanced financial controls and operational management are critical to ensure the sustainable delivery of services and products in this

sector because of the cruciality of working capital in this sector. Capital Projects in this sector are often large-scale; therefore, adequate management of operational finances ensures on-time and budget delivery of such projects. Furthermore, the volatility of this sector requires adequate financial decision-making, which depends on reliable insight to remain sustainable and competitive.

Retention of customers is always informed by how the relationship is managed to ensure long-term and sustainable relations. It is also concluded in this study that the adoption and use of BI System impacts organisations' performance by enhancing customer relationship management processes. Enhanced decision-making about the relationship with customers in this sector is vital to increase revenue, sales, and profitability because this sector is highly dependent on the volume of products. Therefore, the significance of the BI System to enhance customer relationship management to identify growth opportunities and increase volumes elevates the impact of the BI System to influence profitability in the energy sector.

The study concludes also that the adoption and use of BI Systems impact the performance of organisations by providing insight to enhance internal controls and governance processes. Adequate governance and stricter internal controls to mitigate all the risks associated with this sector are very important, mainly because this sector trades in volumes and volumes of products, which creates enormous amounts of data in seconds. Therefore, a system like a BI System is vital to assist in identifying operational risk and detecting fraudulent transactions that might not be noticed from huge volumes of data. The energy sector is characterised by an Operating Model underpinned by sensitive and cumbersome processes from which reliability and consistency are crucial, particularly in the operating plants that are expected to be safe.

The adoption and use of BI Systems in this sector to assist in enhancing the operating processes and efficiencies in key functional areas are also prominent for competitiveness and sustainability in this sector. Supply for energy is a strategic sector of the South African economy; therefore, the reliability of processes and assets in the energy sector is crucial. Therefore, the impact of the BI System in this sector is crucial to ensure the reliability of product supply and asset reliability because players' competitiveness and sustainability are measured by product supply and asset reliability to produce more volumes.

This study has not adopted quantitative measurement metrics through which the impact of the BI System on the above. This is because this was not a quantitative study, and it is not always possible to clearly articulate the business value of information systems such as BI System through quantitative measures. However, the insight and themes that emerged from this study presents logical and convincing evidence that BI System adds business value by impacting those business areas.

Therefore, the BI System is a strategic initiative which must be regarded as a chief technological innovation that has the potential to enable organisations in this volatile sector to respond to market dynamics such as oil price and globalisation. Leaders and Practitioners in this sector must consider the need and put more effort to ensure adequate and embedded adoption and use of BI System as a strategic asset to enable competitiveness and sustainability. Furthermore, the business value of BI Systems cannot always be easily measured in quantitative terms due to the nature of the service and product (Information and insight) that are produced from this kind of information system. The impact of BI System can only be realisable if the actionable insight provided by this system is put into action by those provided with such insight to inform and support their decision-making processes across all the levels of the organisation.

6.6 Limitations of the Study

Despite using a broad approach, this research has a few drawbacks. Firstly, although the six-person sample size offers deep insights, it may not adequately capture the range of viewpoints and experiences within the South African energy industry. This restriction aligns with the opinions of Saunders, Lewis, and Thornhill (2019), who stress the need for more significant sample sizes to improve the generalisability of study results. Furthermore, as Bryman (2016) points out, the study's exclusive emphasis on the South African energy industry may restrict its application to other businesses or geographic locations.

The dependence on qualitative data is another drawback. As noted by Creswell and Poth (2018), this offers rich, comprehensive insights but also raises the risk of subjective interpretation. The present technical and economic environment may also have an impact on the study's conclusions, and these factors may change in the future. This feature aligns with the results of Robson and McCartan (2016), who claim that the changing nature of corporate settings and technology might affect how relevant study findings are.

Furthermore, the limitation of this study is that it focused its investigation on the business impact of BI Systems based on concepts defined per the conceptual model. However, the author suggests that theoretical sensitivity was adopted so as not to limit the study. However, this study can be expanded to cover impact concepts to learning and development, strategic planning, research, and innovation. Furthermore, the research approach and sampling methodology have not covered industry-wide representations to enable the generalizability of the study's results.

6.7 Suggestions for Future Studies

This study adopted the Balanced Scorecard as a conceptual framework that framed the study. As such, the study revealed several themes which can potentially lead to several concepts and ideas that expand and broaden this phenomenon on the business value of BI. Therefore, further studies must be undertaken to go deeper into these themes or concepts to gain a broader and deeper understanding of BI's impact in these business areas. This study has not expanded on each of these themes in more detail to unearth the impact of BI Systems in the set business areas in scientific terms.

This study adopted qualitative methodology and collected data from only six participants from five different organisations in the Energy Sector (Oil and Gas). Based on the limitations noted in the set methodology, future studies might benefit from a larger and more varied sample, including other segments of the energy sector, such as electricity generation and supply. According to Yin (2018), expanding the study to include a more significant number of participants from other sub-sectors within the energy business will give a more thorough understanding. Furthermore, Teddlie and Tashakkori (2010) argue that adopting a quantitative methodology or a mixed-methods design might improve the study's robustness and give a more holistic picture.

This study has not applied quantitative measurement matrices to establish the influence or the impact of the BI System on organisational performance. It is therefore suggested that a quantitative and scientific study must be undertaken to establish the measurement effect of BI systems in the energy sector with a focus on these business areas through a scientific process. Such a study will also assist in establishing what are other dimensions that have a moderating effect on BI Systems in such business areas.

Future research should look at the influence of BI systems in diverse industries or geographical settings to determine the results' generalizability, particularly in consideration of other segments of the sector. This method would be consistent with Patton's (2015) suggestions, which urge for comparative cross-sectoral or cross-national research to explore wider patterns and differences. It would also be beneficial to investigate the long-term effect of BI system adoption, particularly how organisations adjust to changing technology and market situations. Such longitudinal investigations, as Menard (2011) advocated, might provide insights into the sustainability and development of the commercial value of BI systems.

6.8 Final Remarks

This research set out on an exploratory trip to determine the perceived commercial value of business intelligence (BI) systems in the South African energy industry. The results showed that BI systems are more than simply technical instruments; they play a critical role in influencing organisational performance, improving operational effectiveness, and forming strategic choices. The participant narratives offered a sophisticated perspective on the several functions of business intelligence (BI) systems, ranging from augmenting data dependability and correctness to influencing financial functions and customer relationship management.

As the study's findings make clear, BI systems play a crucial role in the digital transformation of South Africa's energy industry. They serve as change agents in the fields of data processing and analysis as well as in creating an organisational culture that is driven by data. This shift is essential in a world of energy that is changing quickly due to rising competition, shifting regulations, and advances in technology.

It is essential to recognise the limits of this research, particularly regarding its breadth and qualitative methodology, which may not fully reflect the range of BI consequences through the scientific process. The study's conclusions provide a snapshot that may alter in response to continuous developments in the industry and the current technology and economic environments.

The suggestions are meant to direct BI System development and deployments in the future. It is crucial for leaders and practitioners to appreciate that the BI System is not just a technological innovation that is advocated by the ICT Department. Instead, it is a strategic

endeavour that should form part of the organisational strategy to embrace emerging industry trends such as big data analytics, machine learning and predictive data analytics. Their goal is to persuade companies in the energy industry of South Africa to deliberately include BI systems into their operational, financial, and management frameworks, in order to become sustainable and competitive in addition to just adopting the system.

In summary, this study adds to the expanding corpus of research on the effects of BI systems in the energy industry, particularly in the setting of South Africa. It highlights the value of ongoing study in this area to stay updated with changing market realities and technology breakthroughs and open new avenues for future investigation. In the South African energy industry, the journey through this study highlights the revolutionary potential of BI systems and ushers in a new age of efficiency, strategic clarity, and data-driven decision-making.

6.9 Significance of the Study

This study aimed to develop a theoretical framework which will facilitate the evaluation of the impact of adopting the Business Intelligence System to ascertain its value to the organisation. As such, the study provided a theoretical framework through which the business impact of BI Systems can be investigated and clarified with a focus on those specific business areas.

This study produced a framework through which an empirical analysis can be undertaken to measure the business impact of the BI systems in the set areas through scientific measures to enable practitioners to apply relevant measurement metrics.

Again, this study will help organisations understand the degree to which the adoption of a Business Intelligence System adds value to their businesses and how such value can be derived. It is also expected from this study's outcomes that organisations will get a tool through which they can determine the relevant KPA for the development of a business case for the adoption of a Business Intelligence System.

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