**Gordon Institute
of Business Science**
University of Pretoria

Exploring the impact of renewable energy on the strategy of coal mines in South Africa

21818933

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

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Abstract

Countries are encouraged to invest in sustainable development initiatives to realise a low-carbon economy by 2050 and reduce greenhouse gas emissions (GHG) by 2030. South Africa is experiencing an energy crisis due to the demand for electricity exceeding the capacity supplied by Eskom coal-fired power plants. In South Africa, over 85% of electricity is generated from coal, which negatively impacts the environment due to carbon emissions during the electricity generation process. As a result, South Africa is undergoing a transition from fossil fuels to renewable energy sources. This study aims to explore the impact of renewable energy on the strategies of coal mines in South Africa. Exploring the impact on the strategy of coal mines will provide managers of coal mining organisations with more profound insights that they can utilise to lead effectively during and beyond the transition process.

Qualitative, exploratory research methods were identified as appropriate to acquire new insights into the impact of renewable energy on the strategies of coal mines in South Africa. Eleven semi-structured interviews with individuals representing administrative and executive management categories were conducted. Each interview was analysed using Atlas.ti software to get the primary themes and key insights.

This study contributes to the literature by providing practical ways for managers to conceptually interpret the strategies and alignment of their coal mining organisations to remain competitively sustainable.

Keywords

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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Chapter 1: Definition of the Problem and Purpose

1.1. Introduction

This study explores the impact of renewable energy on the strategies of coal mines in South Africa. Using an exploratory study, it recognised a multi-level perspective framework appropriate for addressing the socio-technical transition to renewable energy sources.

1.2. Background to the research problem

Countries signed the Paris Agreement to tackle climate change at the conference in France (UNFCC, 2020). Countries were encouraged to invest in sustainable development initiatives to realise a future of zero carbon emissions by 2050 and a reduction of 45% in greenhouse gas emissions (GHG) by 2030 (UNFCCC, 2020). Sustainable Development Goal (SDG) 7 encourages a transition from fossil fuels to renewable energy sources (World Energy, 2020). In 2018, the International Panel on Climate Change (IPCC, 2018) requested that changes be made as a matter of urgency in societies so that global warming can be limited to 1.5 degrees Celsius. World Energy (2020) indicated that in 2019, energy generation from renewable sources only had a 2% share in the energy mix in South Africa, whereas the global average stands at 11%. A reduction in fossil fuels for electricity generation means a need to restructure the energy sector in South Africa to renewable energy sources by phasing out some of Eskom's coal-fired power plants and repurposing them for renewable energy sources (Resource plan, 2019). However, a transition to a low-carbon energy system is connected to socioeconomic factors, especially regarding jobs, revenues, and financial and technological challenges in the coal mining industry (World Bank Group, 2019a; Statistics South Africa, 2018).

1.3. Problem statement

Academic case: According to Schumpeter (1942), technological changes are capable of interrupting the way the industry operates. The disruption can affect an industry's rules, orders, beliefs, values, or market environment. Technological changes can severely disrupt organisations that cannot adapt to the change within such an industry. The only way for organisations to survive technological changes is when they can adapt to the new way of operating in their industry (Christensen, 1998). According to Schumpeter (1942), disruptions in the industry occur when entrepreneurs are innovative enough to develop new ways that will constantly create value in an industry while demolishing the old values. Due to the dynamic technological changes, organisations find it challenging to identify disruptions. When existing

organisations struggle to adapt to changes, new organisations come with new technologies and grab the opportunities in the market (Christensen, 1998). However, according to Utterback (2004), new technologies do not always give the best performances in the market. However, they are still capable of disrupting the entire market due to the different approaches that they utilise.

The theory indicates much about environmental sustainability systems and less on socio-technological issues related to inequality, poverty, and work conditions (Jenkins et al., 2018). However, the socio-technical transitions approach is more aligned with understanding the transition processes and does not address issues concerning sustainability impacts (Gillard et al., 2016). The assumption with socio-technical transitions is that green innovations are positive without fully addressing the improvement that comes with sustainability (O'Brien & Signa, 2018). However, it has been realised that there are still gaps in theory regarding the extent of disruption the socio-technical transition to sustainability will cause to the coal mining organisations in South Africa. The socio-technical transition to renewable energy theory further indicates that socio-technical transitions take many years before they can disrupt the existing systems, as it goes through four stages before it can completely replace the old systems with new renewable energy systems (Sengers et al., 2019). According to Sengers et al. (2019), based on the socio-technical transition to renewable energy theory, the first phase deals with experiments and learnings. In contrast, the second phase deals with research and development to penetrate the targeted market, and phase three focuses on investigations and better technologies. In the fourth phase, renewable energy systems replace old systems completely.

Business case: In South Africa, energy demand is higher than the capacity supplied by power-generating plants. In the process of electricity generation, power-generating plants produce high greenhouse gas emissions in the country. South Africa is one of the largest coal producers, ranked number seven worldwide (IEA, 2015). Over 85% of electricity generated in South Africa comes from coal (Thopil & Pouris, 2015). The South African energy mix consists of 14 Eskom power stations, with the majority congregated in Mpumalanga Province due to the accessibility of coal (Eskom 2016). The operation of coal-fired plants negatively impacts the environment due to global warming, acid rain, and air pollution due to greenhouse gases and heavy metals (Wang et al., 2018b; Wu et al., 2018). The primary resource for Eskom power generating plants is coal, which is extracted using opencast or underground mining methods (Zhang et al., 2018). Informed by the cases of Brazil, Australia and Canada in the literature, South Africa should focus on policies highlighting that Eskom's coal-fired power plants will be phased-out and repurposed for renewable energy sources by 2030 (IRP, 2019).

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However, Wright and Calitz (2020) suggested that an accelerated repurposing will see an additional 13 gigawatts (GW) redirected from coal-fired power plants to renewables.

In contrast, an ambitious repurposing could redirect about 18 GW from fossil fuels to renewables. Finally, a super High Road scenario could result in the decommissioning and repurposing of all coal-fired power plants, as well as a complete conversion of the coal mining operations into renewable energy sources (Wright & Calitz, 2020). South Africa should also consider manufacturing local content that will be used in renewable energy plants. In addition, South Africa should ensure that the transition includes issues of social inclusion, employment, and a decrease in poverty (Fabricius et al., 2020). The two technologies with growth potential in the South African energy sector are wind power and solar PV (IRP, 2019).

1.4. Scope of the study

South Africa is considering going green by incorporating renewable energy sources into its electricity mix to meet the obligations of the Paris Agreement by addressing climate change challenges. Eskom power stations were strategically constructed next to substantial coal reserves, mainly in Mpumalanga Province. Mpumalanga is the province where most electricity generation occurs through coal-fired power stations. Some ageing power plants, such as the Komati power station in the province, are being phased out, and renewable energy sources will eventually replace these power plants

This research's scope was designed to understand the impact of renewable energy on coal mining organisations that supply Eskom coal-fired power plants with coal in South Africa. The socio-technical transition to sustainability theory was considered for this research. The multi-level perspective framework was preferred as the best approach due to its contribution and ability to analyse green technologies and social innovations (Kohler et al., 2019). The study will also focus on global best practices regarding renewable energy to inform and give insight into the South African energy sector in dealing with socio-technical transitions to sustainability.

1.5. Purpose statement

This research aims to investigate and explore the impact of renewable energy generation on the strategy of coal mines that supply Eskom power-generating plants with coal. Considering that the energy industry is rapidly quickly, this study will be conducted to ascertain whether these coal mines, from an organisational perspective, are thinking of, currently implementing or will be able to implement strategies that will enable them to go through the transition phase without experiencing pitfalls that come with a transition to sustainability. The purpose is also to identify the factors that will negatively or positively affect these coal mining organisations

and how the study could benefit the sector to remain competitively sustainable. Through understanding how to adapt, adjust, and influence the challenges associated with transitions, this study will assist organisations in planning and strategising whenever there is a possibility of disruption in the industry they operate within.

The specific objective of this research is to:

1. Investigate how the coal mines across South Africa are repositioning their operations to transition to renewable energy.
2. Identify which organisational strategies that drive change will be appropriate in dealing with a transition.
3. Determine skills and competencies that are required to transition to renewable energy.

1.6. Significance of the research

This study focuses on assisting the coal mines affected by the transition from fossil fuels to renewable energy. The study will also help decision-makers in these organisations with strategies to adjust, adapt, learn, lead, and manage change to remain relevant. This research will use literature on organisational adaptation, learning, leading and managing change, and organisational transformation. This study is also essential for coal mining organisations affected directly or indirectly by the transition from fossil fuels to renewable energy sources for clean energy purposes. This study will provide critical insight to the coal mining organisations and their decision-makers to be in a better position when dealing with complexity and unpredictability in their respective organisations. It will equip the decision-makers with appropriate in-depth knowledge of how they should implement organisational adaptation, learning, leading and managing transitions, and organisational transformation and innovation. Furthermore, this study will assist decision-makers in formulating strategies to deal with complex and unpredictable situations. Coal mining organisations and decision-makers will benefit greatly because this study will ensure they use appropriate business models to manage transitions effectively.

1.7. Conclusion

This chapter has put forward the introduction to this study. This chapter underlined the significance of transitions from fossil fuels to a low-carbon economy due to the impact of fossil fuels on the environment. It further highlighted the challenges of technological changes and how the transition could disrupt incumbent organisations.

From this chapter, this research will advance in the following sequence: chapter two will give an overview of the literature regarding socio-technical transitions; chapter three will present the research questions; chapter four will address the methodology and design of the study; chapter five will deliver the results of the semi-structured interviews; chapter six will discuss the results, and chapter seven will present the conclusions and recommendations pertaining to this study.

Chapter 2: Literature Review

2.1. Introduction

This chapter will review the literature related to socio-technical transitions to renewable energy. The chapter starts by providing the literature on the theory of transitions before addressing the theory concerning socio-technical transitions. It further explores organisational learning, adaptation, and leading change literature. It then explores the global context of socio-technical transitions before discussing key lessons learnt, the South African coal mining industry, and a chapter summary.

2.2. Socio-technical transitions to renewable energy theory

According to Schumpeter (1942), transitions can be regarded as the decomposition of well-established practices, procedures and products due to the emergence of the ones that are innovative and disruptive. However, the extent to which a transition can disrupt an industry and market depends on whether the industry and market accept it or not. According to Clark and Abernathy (1985), transitions are identified as technologies that will bring improvements or alternative ways to expected solutions. However, Clark and Abernathy (1985) further indicated that transitions could either sustain or destroy the capabilities of the incumbent technology and interconnectedness in the market. Tushman and Anderson (1986) expressed a difference in how new and existing organisations approach transitions, highlighting that new organisations always try to develop new technologies that will interrupt the current practices.

In contrast, existing organisations develop technologies that reduce unpredictability in the market and industry. For example, Henderson and Clark (1990) looked at the impact of transitions on the structures of the product and components. They indicated that transitions could intensify or disrupt the structure of a product or its components.

Research regarding socio-technical transitions became apparent in the early 2000s as part of innovation studies (Geels et al., 2016). When socio-technical research started, many old case studies regarding transitions were utilised to improve the analysis. This study has since been used to study sustainability transitions, such as renewable energy, biomass heating, electric cars, agricultural systems, and movement in urban settings (Rosenbloom et al., 2016). Smith et al., (2016) indicated that a robust framework in sustainability transitions is the multi-level perspective framework. The multi-level perspective has been the preferred framework regarding sustainability transitions due to its contribution and ability to analyse green

technologies and social innovations such as mobile money, energy in communities, and bike-sharing systems (Kohler et al., 2019).

Although the literature on transitions to sustainability promotes the idea of essential changes regarding systems and structures, several conceptual approaches have been tested in different ways regarding the extent of transformations, types of systems, and understanding of the transition process. Schneidewind and Augenstein (2016) differentiated between cultural, political and technological innovation regarding the extent of transformations. O'Brien (2018) looked at the difference between practical, political, and beliefs regarding the extent of transformations. Regarding the types of systems, Loorbach et al., (2017) looked at three approaches and differentiated between systems that involve energy, mobility, water and waste; systems that involve education, labour and finance; and systems that involve forestry, fisheries and agriculture. Røpke (2016) looked at systems where there is an interaction between nature and society, then socio-technical systems, and then a system that involves goods and services being distributed to the entire population of a country, and a system that consists of the economy of cities and the whole population of the country.

Patterson et al., (2017) differentiated between socio-technical, socio-ecological, sustainability, and transformative adaptations regarding transition processes. Patterson et al., (2017) further indicated that socio-technical transitions and socio-ecological systems are the two most assertive approaches to the path towards a transition. In contrast, sustainability and transformative adaptations lean more towards applying essential views on the reasons for transformations.

According to O'Brien (2018), a multi-level perspective framework focuses more on the practical arena without ignoring the political and cultural arenas. Therefore, it is not true that transition literature tends to ignore politics and culture while focusing on experiments and technologies (Temper et al., 218). However, the multi-level perspective framework prioritises socio-technical transitions and ignores socio-ecological and distribution systems (Røpke I, 2018). According to Jenkins et al. (2018), socio-technological literature does not mention much about issues regarding inequality, poverty, and work conditions, but it says much about environmental sustainability systems. Gillard et al., (2016) stressed that the socio-technical transitions approach is more aligned with understanding the transition processes and that it does not address issues concerning sustainability impacts. The assumption with socio-technical transitions is that green innovations are positive without fully addressing the improvement that comes with sustainability (O'Brien & Signa, 2018).

2.3. Socio-technical transitions to renewable energy and energy regimes

The energy sector is one of the socio-technological regimes consisting of institutions that are developed around certain technologies while encouraging the development and utilisation of such technologies (Smith et al., 2005). Over and above the markets, policies, laws and regulations, socio-technical regimes embrace values, beliefs and what various players such as organisation managers, engineers, politicians, the public and end users benefit from the energy regime's technical services (Geels, 2002). The behaviour of those involved is determined by the energy regime, leading to political and economic interests in the existing regime (Geels & Schot, 2007). According to Rip and Kemp (1998), the notion of a socio-technical regime emphasises that technology and society depend on each other because technology can determine a society's behaviour. In contrast, society can choose which technology to use. According to Hall (1993), the policy paradigm is a crucial aspect of the socio-technical regime because of its ability to encourage the notion of shared beliefs, values, ideas and principles regarding policies and politics on issues that concern the world and specific sectors. Hall (1993) further indicated that the existing paradigm is also responsible for the intellectual, political and organisational frameworks whereby difficulties relating to policy are diagnosed and addressed. Clarifications regarding policy are usually developed in the framework provided due to the existence of the paradigm. However, such clarifications are aligned with the paradigm (Hall, 1993). Policy paradigms are essential for the effective administration of energy due to the political and economic significance of the energy sector (Helm, 2007).

2.4. Social technical-technical transitions and adaptive capacity

According to Engle (2011), for a transition to happen within the timeline proposed by the IPCC, the transition to a low-carbon economy needs speedy and thorough changes to occur in nearly all industrial and industrialising societies. The adaptive capacity of a society is determined by how it handles difficulties caused by changes in its environment, depending on how the society responds to such changes (Engle, 2011). Nationally, adaptive capacity is determined by considering several factors such as society, economy, material resources and infrastructure, information technology and communication systems, human and social capital, and wealth and financial resources (Yohe & Tol, 2002). However, Gupta et al., (2010) indicated that although these factors are essential, the most critical factors that determine adaptive capacity are based on the institutions of governance. According to Geels and Schot (2007), when adaptive capacity is in line with transition management and reflexive government, the chances are that it will be higher in societies with a higher number of actors and institutions that are

independent enough to innovate, which will lead to more significant opportunities for social learning and better systems. Such societies have the ability to allow groups of actors to come up with means to solve problems brought up by emerging challenges without waiting for authorities to deal with the challenges first (Geels & Schot, 2007). However, socio-technical challenges need an approach that simultaneously allows policy learning in the state and throughout society (Smith, 2009).

Communication is essential for learning and adaptation (Onertzeder & Rohracher, 2006). Stern (2014) further indicated that socio-technical transition literature emphasises that the type of communication and the role it plays in policy change is highly dependent on the attributes of the existing institutions and not on the regulations regarding policymaking and their implementation. The duties of society in terms of values and norms are essential in addressing the issues of trust between different actors, consultants and agents who are selling appliances (Stern, 2014). According to OECD (2007), the transition of a regime determines the technology change. However, absorptive capacity is essential for the requirements for the change in technology within an innovative society (World Bank, 2008). The importance of absorptive capacity is that it has the ability to convert new ideas and skills into technological progress. According to Kash (2010), the absence of adaptive capacity negatively affects the distribution of transferred or aboriginally technology produced across a nation. Kash (2010) further indicated that the organisation or society's absorptive capacity plays an essential role in enabling such an organisation or society to identify the importance of new ideas or technologies that will eventually be introduced into the organisation or society and utilised to produce new products and services.

Over and above the required specialities regarding the knowledge and skills for specific duties or fields of work, some parts of society need the knowledge that individuals have gained through their real-life experiences and professional upliftment, leading to broader expertise and capabilities (Kash, 2010). Unfortunately, the knowledge that individuals gain through real-life experiences and competency is not easy to transfer to others through formal means. However, institutional structures that support sharing ideas and information among individuals within a nation's borders and between that particular nation and other nations can intensify absorptive capacity (Sauter & Watson, 2008). This means that a nation's ability to undergo technological innovation depends on its quality of education and learning, values and behaviour (Sauter & Watson, 2008). Additionally, Kash (2010) identified three distinctive attributes essential to determine the extent of innovation in complicated technological fields. In doing so, Kash (2010) further indicated that mutual trust in societies promotes innovation because if there is no mutual trust and collective decision-making within societies, a robust legal system should be in place for innovation to be realised.

2.5. Managing socio-technical transitions to renewable energy

Radical innovations in renewable energy usually come in small parts of technologies at the borders of existing systems due to actions taken by entrepreneurs, new entrants in a market, activists or other relevant stakeholders (Kemp et al., 1998). The degree of disruption is dependent on how much radical innovations differ from the existing systems regarding technical, social, business, and infrastructure (Schot & Geels, 2008). Schot and Geels (2008) further elaborated on how these innovations develop and interact with the socio-technical environment, which covers gradual developments such as diversity, culture, societal concerns, politics, economics, and external impacts, such as the war between countries, recessions and the oil price. However, socio-technical transitions take many years before they can disrupt the existing systems, and they can be categorised into four phases (Sengers et al., 2019). The first phase deals with experiments and learnings through mistakes. The second phase looks at research and development in order to establish a stronghold in the targeted markets. The third is all about empirical experiments while using performance and better technologies to penetrate the mainstream markets. Lastly, the fourth phase involves replacing some old systems with new socio-technical systems (Sengers et al., 2019).

According to Shove and Walker (2007), there is a need for the government to intervene during the transition process by offering guidance and support throughout the transition to renewable energy. However, governments and societies need to implement long-term goals and change their approach to dealing with challenges. The focus should be on changing the whole system and doing away with short-term goals as they always do, regardless of how important the short-term goals might be (Kemp & Loorbach, 2006). Although socio-technical transitions take a long time, there is a need to develop a long-term vision which will help formulate policies and objectives in the interim (Meadowcraft, 2009). However, these long-term goals should not only focus on the number of fuels and emissions, but also on how they will be governed in future. The long-term vision will assist in encouraging the idea of shared ideas in dealing with the challenge brought upon by the transition, leading to better solutions for the identified challenges as a collective (Voss et al., 2009). According to Grin (2006), several ideas regarding transition management have been identified in the reflexive government theory, which encourages the need for experimentation and learning in societies. The reflexive theory indicates a need for government to regulate institutions and lead the experimentation and learning process through individuals capable of making their own decisions without being influenced by external forces. The regulation of institutions and leading the experimentation and learning process by the government will lead to robust long-term economic and social change in behaviours (Hendricks & Grin, 2007). Although transition management and reflexive

governance are critical in coming up with models and frameworks essential for analysing socio-technical transitions to renewable energy, some gaps have been identified when they are used as a guide to action (Kern & Smith, 2008). Political tensions regarding what governments should prioritise to regulate and drive the need for the government to lead and control the socio-technical transition to renewable energy is a significant challenge for transition management and reflexive governments (Kern and Smith, 2008).

2.6. Organisational learning

Andersen (2016) describes organisational learning as a process that encourages decision-makers to embrace and quickly react to transitions to get their work done, including grabbing change and aligning to it. According to Watad (2019), a relationship exists between organisational learning and change because individuals change how they see things due to the vast knowledge gained by learning. The ability to change allows individuals and organisations to learn more (Nadim & Singh, 2019). Mistakes should be considered part of the organisational learning process (Zappa & Robins, 2016). Klingenberg and Rothberg (2020) indicated that gaining knowledge is part of the learning process because the more individuals within an organisation learn, the easier it becomes to adapt to changes. Anselmann and Mulder (2018) also indicated that individuals and organisations must learn from mistakes because, although errors are never welcome, they play a significant role in the learning process. However, organisations should be willing to accept mistakes to learn. Another vital aspect of organisational learning is reporting of errors by individuals to encourage the idea of learning from them (Kalender et al., 2020). According to Mnasri and Papakonstantinidis (2020), the biggest challenge is when individuals within an organisation are in denial regarding mistakes because it harms group thinking and the ability to create knowledge.

2.7. Organisational adaptation

Organisational adaptation is when an organisation has the potential to understand that there is a need to change and take hold of the opportunities in the rapidly changing business environment (Uhl-Bien & Arena, 2018). According to Birkinshaw et al. (2016), the leadership of organisations must focus on the rapidly changing environment to ensure that their organisations are aligned with the change. Dynamic business environments are guided by technological progress, universalisation, and what customers expect from suppliers, which require organisations to be innovative (Jung et al., 2013). However, organisational adaptability depends on how capable an organisation is of adapting to rapidly changing environments and shifting market conditions (Birkinshaw et al., 2016). According to Teece et al., (1997) and Teece (2012), organisations need to sight and evaluate emerging opportunities in order to

take hold of the value that comes with emerging opportunities, which will enable them to restructure their organisations to align with the transition and remain competitively sustainable. According to Lopez-Cabrales et al. (2017), Teece (2012) and Schoemaker (2018), certain leadership actions need to be understood, which are capable of setting the organisation in motion for organisational adaptability in order to achieve long-term organisational goals.

Uhl-Bien and Arena (2018) put forward a model known as leadership for organisational adaptability, which addresses the pressure between the importance of an organisation using its existing core competencies and creating new competencies to ensure that the organisation is successful in the long run. However, these two perspectives need different leadership styles hence Uhl-Bien and Arena (2018) suggested enabling leadership as the appropriate leadership style to address the challenges organisations encounter regarding exploration and exploitation. Uhl-Bien and Arena (2018) further indicated that enabling leaders can bring about an adaptive process within an organisation. Decisions regarding organisational change need to be taken, so that essential factors such as knowledge, competencies, resources and commitment are appropriately handled for an organisation to realise a successful change process (Al-Haddad & Kotnour, 2015). According to Teece (2012), other than organisational structures, management and leadership skills are essential to maintain its ability to integrate rapidly changing environments because dynamic capabilities depend more on the executives than structures within an organisation. The organisation's executives are responsible for sighting new opportunities and ensuring that organisational objectives are realised from identified opportunities (Birkinshaw et al., 2016). Therefore, leadership within an organisation is responsible for ensuring that the organisation is appropriately positioned and capable of adapting to changing business environments to remain competitively sustainable (Schoemaker, 2018).

According to Parry (2011), organisational leaders are expected to scrutinise circumstances and respond appropriately. Regarding enabling leadership and adaptive space, Rosing et al., (2011) indicated that in terms of exploration, enabling leadership entails connecting the task to explore with how the leader behaves by giving people the opportunity to be innovative, creating room for mistakes, and supporting the idea to learn. In terms of exploitation, enabling leadership promotes the objective of adhering to original plans and regulations, and doing things in a fixed order (Rosing et al., 2011). However, enabling leadership promotes the idea of accommodating both exploration and exploitation in order to address the issues of innovation and take hold of identified opportunities to facilitate the organisational change process (Uhl-Bien & Arena, 2018). Enabling leaders clears the way for people to be innovative by providing an environment which creates adaptive space (Uhl-Bien & Arena, 2018). Two significant factors are associated with adaptive space, namely conflicting and connecting.

According to Uhl-Bien and Arena (2018), conflicting elements create tension among individuals with different perspectives to promote innovation, whereas connecting involves forming and maintaining relationships, which are used in the organisational processes. These elements play a significant role in developing solutions for innovation and adaptive challenges encountered by organisations.

2.8. Leading complex change authentically in organisations

In the business environment, some projects and programmes are regarded to be difficult because they are constant, not planned, long-term, disruptive, emergent and need learning during the process of change (Buchanan et al., 2003; Edmondson, Haas, Macomber & Zuzul, 2015; Huy, 1999; Sackmann, Eggenhofer-Rehart & Friesl, 2009). Many people have reiterated the difficulty of change based on continuous development, the ability to learn, and innovation instead of a short anticipated change (Edmondson et al., 2015; Sackmann et al., 2009). Unlike anticipated change based on explained process, known targets, and a top-down leadership style, emergent change is unpredictable (Edmondson et al., 2015). Understanding the leadership's role in a complex change situation is crucial (Herold, Fedor, Caldwell & Liu, 2008). The role of leadership is crucial for addressing organisational change successfully, and the success depends on the leadership behaviour applied to a change process (Herold et al., 2008)

Leadership is a significant factor for organisational change to be successful (Herold et al., 2008). However, authentic leadership is essential for organisations to realise effective change processes for complex change (Avolio et al., 2004; Gardner et al., 2011; Gardner & Schermerhorn, 2004; Luthans & Avolio, 2003). Authentic leaders have the ability to be transparent when they interact with others, leading to prominent authenticity because they know who they are and what they go for and value (Avolio et al., 2004). Authentic leadership allows the followers to learn and be motivated during the change process, which leads to a successful implementation of the change (Bernerth et al., 2007; Battilana et al., 2010; Kotter, 1996; Rafferty et al., 2013). Authentic leadership can change the followers' viewpoint regarding the change, dedication to change, and preparedness for change by ensuring that the followers are in a better state of mind to receive or retain information (Bommer et al., 2005; Dean et al., 1998). May et al., (2003) indicated that authentic leadership has the ability to illustrate the impact of leaders on how people interact within organisations. Authentic leaders know how they think, react, and are open and honest with their followers (Gardner et al., 2011). However, authentic leaders use their capabilities to judge situations instead of trying to imitate how others behave when they interact and learn from others (Shamir & Eilam, 2005).

According to Avolio and Gardner (2005), other leadership styles, such as transformational and change-oriented leadership, can also be augmented by the effect of authentic leadership. When leading change, three essential leadership behaviours should be taken into consideration: communicating the organisational vision to others, encouraging engagement, and encouraging new ways to approach the change (Edmondson et al., 2015). Gardner et al., (2011) further indicated that with authentic leadership, leaders tend to believe in themselves and are consistent regarding their actions due to their values and beliefs. Authenticity is essential in leading change because it encourages leaders responsible for change to interact with their followers openly to gain the required knowledge, which is vital to implement the change in an organisation (Diddams & Chang, 2012). According to Mazutis and Slawinski (2008), when leaders are aware of their weaknesses and lack of knowledge, they may have the courage to engage in dialogue to acquire new ideas that are essential to assist them in dealing with change processes. Authentic leadership encourages working together between leaders, their followers and context instead of relying on a single leader (Ladkin & Spiller, 2013). Morality plays a significant role in authentic leadership regarding change contexts because it has the ability to provide solutions to problems that may arise due to pseudo-transformation leadership in programmes related to change (Gardner et al., 2011). When comparing authentic leadership with charismatic leadership, Nadler and Tushman (1990) indicated that charismatic leadership is essential when leading strategic change because it encourages leaders to bring resources into use and support activities during the change.

Regarding transformational leadership, Bass and Steidlmeier (1999) indicated that the problem is the issue of morality when dealing with change because some leaders may be in favour of the change process. However, followers can view them as unethical leaders due to their self-centred decision-making. Bass and Steidlmeier (1999) further indicated that such leaders should consider authentic leadership instead of transformational leadership to address and overcome the issue of morality. Authentic leadership creates an environment whereby employees within an organisation can be committed to change and also believe that change is necessary, which is essential for complex change due to several difficulties encountered during the complex change processes (Edmondson et al., 2015). Furthermore, Burnes and Jackson (2011) indicated that authentic leadership could provide the connection between the vision for the change and the goals to incorporate the followers' values in such a way that their behaviours are aligned with the change process until it is completed. Burnes and Jackson (2011) also indicated that for change initiatives to be successful, it is essential for the change's value system and the followers involved in the change process in an organisation to be aligned. The alignment of the change's value system and the followers involved in the change

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process will psychologically prepare the followers within an organisation to deal with difficulties and remain focused until the complex change process is completed (Burnes & Jackson, 2011).

2.9. Global context approaches

2.9.1. Brazil

The renewable energy sector in Brazil is dominated by hydropower. However, the over-reliance on the amount of rain and weather conditions will contribute to the overall drop in electricity capacity produced from hydropower in future (Santos et al., 2018). According to ONS (2019), there has been a decline in the overall capacity of hydropower for the last ten years. Child and Breyer (2016) stressed that the greatest challenge in Brazil is reducing the over-reliance on hydropower by increasing the capacity supplied by other renewable sources such as wind and solar PV.

The Energy Resource Office (in Portuguese, EPE, 2019) indicated that 83.3% of the country's overall energy capacity comes from renewable energy sources. Of the renewable sources, hydropower contributed 66.6%, biomass 8.5%, wind power 7.6% and 0.5% came from Solar PV. According to ANEEL (2018), in 2017, hydropower contributed almost 70% of the overall capacity in Brazil. EPE (2017) estimated that by 2026 hydropower contribution to the energy mix would be at 55%. IEA (2016) indicated that by 2040 hydropower will contribute about 45%, followed by gas and wind energy with a 10% contribution each. However, PCE (2015) showed that in 2050 hydropower dominance will drop to 40%, followed by gas at 11%, biomass at 8%, and Solar PV at 10% of the overall capacity. In general, electricity consumption is expected to increase by 300% by 2050 (EPE, 2019).

2.9.2. Australia

Only 6% of the energy mix in Australia comprises renewable energy generation (DEE, 2018). More than 80% of the country's electricity is generated from fossil fuels through coal-fired power plants (Clean Energy Council, 2018). Dependency on coal to generate electricity has resulted in Australia being ranked as one of the highest emitters of unwanted greenhouse gases worldwide (Hua, Oliphant & Hu, 2016). This situation leaves Australia with no choice but to come up with alternative methods to generate clean energy utilising technologies that will not have negative impacts on the environment, as indicated by guidelines in the Paris Climate Agreement, which requires at least a 26% emission reduction by 2030 (Goh, Ang, Su & Wang, 2018).

Australia has embarked on a process to reduce carbon and greenhouse emissions by phasing out some of its old coal-fired power plants. Thus far, 12 coal-fired power stations have been phased out (Burke, Davis & Diffenbaugh, 2018). According to Burke et al. (2018) and Court (2017), eight more power plants from the remaining 22 that are still operational will be phased out before the end of 2022. The process of phasing out the ageing coal-fired power plants has resulted in 5589 MW of electricity being removed from the national grid, which leaves the country with no option but to implement other technologies for generating cleaner energy as a matter of urgency (AER, 2017; Burke et al., 2018). Baldwin (2017) indicates that Australia still uses fossil fuels to generate electricity. Globally, it is still rated as one of the countries with the highest dependency on fossil fuels. The dependence on fossil fuels is evident because renewables contribute only 2.1% of the total energy generation required in Australia. However, renewable energy contributes only 15.1% of the grid regarding electricity generation because that is where renewable technologies are primarily utilised (DEE, 2018). According to DEE (2018), Australia's total renewable energy generation consists of various renewable energy technologies. For example, hydropower accounts for 40%, wind energy contributes 31%, solar energy contributes 20%, and the remaining portion goes to Bioenergy, which contributes approximately 9%, although its contribution has dropped slightly in the last decade.

2.9.3. Spain

The Spanish electricity sector is categorised into two essential periods; the first period was the regime promotion of renewable energy sources, which was from 1997 to 2012 and the second regime, which is the resistance to renewable energy sources, which started in 2012 (REE, 2016a). How Spain manages its electricity system changed in 1997 when control of its electricity sector was liberalised. The liberalisation process of the Spanish electricity sector allowed competition regarding the generation and selling of electricity. In Spain, the transmission of the national electricity system was partly operated by Red Electrica de Espana (REE), and the local distribution was conducted by the association of the five traditional power utilities (UNESA) (Riutort Isern, 2015). The new regime's objective was to improve energy efficiency and encourage electricity generation by renewable energy sources, which have lower carbon emissions. Spain introduced a special regime which included renewable energy sources such as wind power, Solar photovoltaic, Solar CSP, small hydropower and biomass (Romero-Rubio & de Andrés Díaz, 2015). In addition, the independent power producers under the special regime were given incentives to encourage investment in electricity generation through renewable energy sources (Ciarreta et al., 2014). However, although renewable energy sources played a significant role in the energy mix in Spain, hydropower energy was already part of the country's energy mix because it was installed before the special regime process started (Romero-Rubio & de Andrés Díaz, 2015). As a result of the special regime,

the amount of electricity generated by renewable energy sources in Spain increased significantly (REE, 2016a).

According to REE (2016a), since 2000, the amount of electricity generated from wind power has increased significantly, followed by solar energy in 2006. Under the special regime, renewable energy sources reached 30.5% (33MW) regarding electricity generation in Spain, and in 2015 the overall capacity from renewable energy sources reached 27.5% of the energy generated in that year (REE, 2016a). It is further indicated that in 2015, wind energy got as far as 60% of the installed capacity during the special regime (EC, 2007a, 2007b). However, according to Romero-Rubio and de Andrés Díaz (2015), prominent electricity and construction companies supported most renewable energy sources' capacity. During the special regime, no new cooperatives were created for energy generation through renewable energy sources until 2010, when cooperatives were created and allowed to sell electricity in Spain (Romero-Rubio, 2015). Policy measures were reviewed between 2008 and 2012 (Ciarreta et al., 2014; Haas, 2016). According to REE (2016a), when the economic crisis hit the world in 2008, it negatively affected the growth in electricity consumption in Spain, leading to a reduction of about 10% compared to a maximum in 2008. The crisis led to prominent companies in the electricity sector shifting to the GCC instead of renewable energy sources. In the early 2000s, the GCC realised a shoot-up in installed capacity, leading to GCC becoming Spain's highest technology regarding installed capacity by early 2007 (Capellán-Pérez et al., 2014).

As a result, Capellán-Pérez et al., (2014) further indicated that Spain experienced overcapacity in its electricity sector due to low demand and the massive amount of installed capacity. However, due to the electricity market giving preference to electricity generation from the special regime, generation from GCC declined to less than 10% of electricity generation in the country, leading to the GCC being disrupted in the energy generation market (OCE, 2016). Regarding ownership of electric power plants by technology and utility, IRENA db (2018) indicated that in 2015 there were five utilities within UNESA, which made up more than 80% of installed capacity from the ordinary regime. The original regime comprised 100% nuclear, 97% coal, 86% hydro and about 80% GCC, with renewable energy sources forming only 31% (UNESA, 2015). Regarding investment in renewable energy sources, UNESA focused more on wind power, investing about 91% in wind technologies, leading to UNESA owning about 50% of the wind power installed in Spain (IRENA db, 2018). According to AEE (2016), prominent energy companies in Spain have approximately 73% ownership of wind power technology, leading to most individual investors owning the Solar PV sector.

According to Haas (2016) and Riutort (2015), the economic crisis from 2007 indicated that the process of eliminating the electricity sector from government control failed in many ways.

Regardless of law 54/1997 that enforced the division electricity supply chain, utilities from the ordinary regime formed clusters, covering most economic activities in generating and selling electricity to avoid the regulations (Haas, 2016; Ruitort Isern, 2015). In 2013, traditional utilities associated with UNESA contributed 72% of all the electricity generated, 98% of the distribution and 80% of the electricity sold in Spain (UNESA, 2014). Furthermore, utilities within UNESA accused Solar PV renewable energy companies of price fixing, an action which negatively affected Solar PV renewable energy plants, leading to a disastrous situation for the renewable energy sources sector in Spain (UNESA, 2013). As a result of the campaign by utilities within UNESA and the government, the subsidies to install new renewable energy sources were discontinued, leading to renewable energy sources new projects being put to an end in 2014 (Ciarreta et al., 2014; Haas, 2016; Riutort Isern, 2015; Romero-Rubio & de Andrés Díaz, 2015). According to Ciarreta et al. (2014), the subsequent legislation has limitations in such a way that the new renewable energy sources projects will not have economic advantages due to temporary prohibitions and fewer existing incentives.

2.9.4. Canada

In Canada, the importance of the transition to clean and affordable energy, together with attempts to achieve climate change policy goals, goes together with ensuring uninterrupted electricity for the communities situated on the country's northern side (Potvin et al., 2017). Nationally, there are challenges regarding the direction that needs to be taken regarding how strategic-level agreements concerning sustainable development will be implemented and monitored (Doelle & Sinclair, 2019; Gibson et al., 2019). At the provincial level, strategic assessments are crucial for decision-making purposes where government policies have mainly failed regarding energy planning and achieving sustainable development goals (Prebble et al., 2018). However, most provinces in Canada have shown interest in incorporating renewable energy into their electricity mix to transition to renewable energy sources (Harris et al., 2015; Martens, 2015). According to Dvorak (2016), due to pressure from the government pushing for strategies to adopt clean energy, more authorities are now supporting the idea of incorporating renewable energy sources. However, many are still at a junction regarding the reform and renewable energy transition (Beck & Robertson, 2019; Olive, 2019).

2.9.5. Key lessons learnt for South Africa

The case of South Africa is similar to that of Australia because fossil fuels dominate these countries' energy mix due to their dependency on coal-fired power plants for electricity generation. However, Australia has already shown its commitment to renewable energy

sources by embarking on phasing out the majority of the coal-fired power plants to reduce emissions. In South Africa, about 90% of electricity is generated from coal-fired power plants (South Africa National Development Plan, 2017). Eskom, a state-owned enterprise, controls both electricity generation and transmission (Mzolo, 2018). World Energy Council (2014) indicated that the predicament in South Africa is that electricity demand is much higher than the capacity of electricity supplied by Eskom through its coal-fired power plants. However, the biggest challenge is for the country to overcome the electricity demand while incorporating renewable energy into its energy mix (World Energy Council, 2014).

Eskom's crisis of not meeting electricity demand has resulted in a significant shortage in electricity generation, leading to continuous blackouts throughout the nation (Styon, 2015; Bloomberg, 2019; Bloomberg, 2019b; The Times, 2020). According to Jain & Jain (2017), while South Africa and other countries worldwide are committed to getting the better of global climate change, South Africa is experiencing its own electricity crisis. A study conducted by the Council for Scientific and Industrial Research (CSIR) in 2016 indicated that South Africa could incorporate vast amounts of solar and wind energy into its electricity network (CSIR, 2016). The case of Brazil has shown that if clean energy is incorporated into the energy mix, sustainable development goals are achievable. However, countries should learn from Brazil by not depending on a single renewable energy source to generate electricity. The South African energy mix currently consists of 38 GW that Eskom supplies through coal-fired power plants; 1.8 GW from nuclear power, pumped storage contributes 2.7 GW, 1.7 GW hydropower, 3.8 GW from diesel, and 3.7 GW of renewable energy (Integrated Resource Planning, 2019).

The case of Spain indicated that the worldwide mutually connected challenges regarding climate change and depleting fossil fuels need robust policies to encourage a speedy renewable energy sources transition in the coming years across all countries in the world. It also highlighted that fossil fuels dominate the energy mix in most countries, and the resistance to the transition to renewable energy will still be challenging for most countries. However, for most countries, for the renewable energy transition to be transparent and sustainable, renewable energy cooperatives will have to be given a good part to play in the process to ensure that a single organisation does not produce significant energy on its own. According to Kunze and Becker (2014) and REN21 (2016), the model for decentralising power generation is non-existent in most countries, except in a few countries in the north and west of Europe. Furthermore, renewable energy sources cooperatives in Spain have emerged aggressively regarding the state of affairs. However, countries are unique and have regulations, cultures and social circumstances regarding government support in financing, existing utilities, skills, competencies and social involvement.

According to ILO (2013), the strategies implemented by renewable energy source cooperatives in Spain can be applied in other countries, including the South and East of Europe, where these cooperatives are not yet in place. The case of Spain also brings engaging lessons and could help other countries formulate and implement their strategies. It is indicated in the case of Spain that a solid social support base is one of the requirements when a nation embarks on renewable energy cooperatives because robust social support can assist in dealing with aggressive regulations (Johanisova et al., 2014). Liberalising markets in the energy sector is an opportunity for other players to participate in the energy business instead of having only the traditional utilities take advantage of the energy industry (REScoop, 2016). Renewable energy cooperatives also provide opportunities for organisations in the energy sector to be innovative and develop new solutions that will benefit the country in the long run. Renewable energy source cooperatives assist organisations in building and expanding their profiles based on the organisational objectives, leading to financial growth, which will allow them to diversify their operations into other services such as heating, cooling and distribution (REScoop, 2016).

2.10. South African coal mining context

Globally, coal is the main source of electricity generation in coal-fired power plants (IEA, 2010). According to IEA (2018), in 2010, electricity generated by coal-fired power stations was 42% worldwide, 41% in 2013 and 38% in 2017. It is estimated that by 2040, coal-fired power plants will contribute 30% of the energy mix (IEA, 2015). In South Africa, the electricity mix consists of 13 Eskom coal-fired power plants (Eskom, 2016). Coal, the leading resource in these coal-fired power plants, is mined by either opencast or underground mining methods (Zhang, Wang & Feng, 2018). The underground method is mainly for shallow areas and has a recovery rate of about 65% due to pillars left underground as part of the support for safety reasons.

In contrast, the opencast method has a higher extraction rate of around 90% of the coal reserve, but it is more suitable for reserves that are not deeper than 70m in depth. South Africa has one of the largest coal reserves globally, of which the majority is in Mpumalanga Province, where more than 80% of coal mining occurs (Burton et al., 2018a). South Africa is also one of the biggest exporters of steam coal globally (International Energy Agency, 2019a), which is vital for the country's economic income and employment. According to IEA (2016), regarding the world's coal reserves, South Africa makes 3.5% and contributes about 3.3% of coal in production annually. Besides electricity generation, coal is also used in South Africa to produce about 30% of the liquid fuel and is also used in the chemicals and steel-making industries. Coal significantly generates revenue for the country as a commodity because it contributes about 6% to the export market globally (IEA, 2016). IEA (2016) indicated that most

of the coal reserves in South Africa would be depleted in the next century. However, Limpopo Province has the largest coal reserves in the Waterberg coalfield, which will produce coal for electricity generation in the future (Chabedi & Zvarivadza, 2016).

Ramane (2014) further indicated that of the global coal reserves, about 7% of the total is in South Africa, and the country still has more than 66 billion tons of coal in its reserves. Regarding coal transportation, the means of transport depend on the distance between the coal mine and the end user. For shorter distances, the mode of transport is either conveyor belts or side tipper trucks. However, coal for the export market is transported by rail to Richards Bay Coal Terminal (RBCT) in Kwa-Zulu Natal Province, where it is shipped by sea. In Mpumalanga Province, where most Eskom power stations are situated, coal is predominantly transported by side tipper trucks from the mines to Eskom power stations (Eskom, 2016). Coal trucks travel an average of 600 km daily between coal mines and Eskom power stations, transporting more than 100 000 tons of coal on average to different Eskom power stations. Eskom (2016) states that the power utility has more than 50 contracts with local logistics companies to transport coal to its power stations across the country.

Transnet, a state-owned enterprise, operates the rail network responsible for transporting coal from sidings to the Richards Bay coal terminal (IEA, 2016). According to IEA (2016), the Richards Bay coal terminal is the largest globally, with an average capacity of more than 90 million tons per annum. However, the average coal exported at Richards Bay coal terminal per annum is just over 70 million tons. Steam coal is the primary coal traded globally, making up about 76% of the overall trade, followed by coking coal. There are two central regions in the international coal trade market, namely the Atlantic and Pacific. The Atlantic market comprises countries such as the United Kingdom, Germany, and Spain in western Europe (International Energy Agency, 2019a).

In contrast, the Pacific market comprises most developing countries and importers from Asia. The prominent importers in the pacific market are countries such as Japan, Korea and China, leading to the Pacific market importing about 60% of the steam coal globally (IEA, 2018). In 2015, South Africa was ranked fifth in terms of the largest exporters of steam coal globally. South Africa's geographic location places it in a better position to export coal to the Pacific and Atlantic markets. Although the Richards Bay coal terminal has the capacity to export 90 million tons per annum, and currently exports about 70 million tons per annum, smaller volumes of export coal are shipped through the Durban port and Maputo in the neighbouring country of Mozambique (IEA, 2018). Eskom requires more than 90 million tons of coal per annum at its power stations to generate electricity (Eskom, 2016). The coal used by Eskom to generate electricity is of lower quality, with a high ash content and a low calorific value.

However, the newer power stations use higher quality coal ranging from 23 MJ/kg upwards, whereas the older power stations require anything between 21 and 23 MJ/kg (Eskom, 2016). The transition to renewable energy in South Africa is the solution to reducing greenhouse gas emissions. Most coal-fired power stations will be phased out and repurposed to accommodate renewable energy sources by 2030 (Resource plan, 2019). According to Fabricius et al. (2020), five Eskom coal-fired power plants that will be repurposed for renewable energy have already been identified. The future of renewable energy in South Africa looks good.

2.11. Conclusion

In conclusion, the coal sector in South Africa plays a significant role in the socioeconomic landscape of the country (World Bank, 2019; Wright & Calitz, 2020b). Four essential goals are impacting the national energy sector in South Africa, namely energy availability, maintaining the profitability of the coal sector, environmental and climate protection, and reducing inequalities and employment insecurity (IEA, 2020c). South Africa's high dependency on coal for energy generation and urgent social issues, such as inequality and the ever-increasing unemployment rate worsened by the COVID-19 pandemic, are leading to a difficult political and social situation (Hanto et al., 2021). As much as climate change objectives and solutions are essential, they cannot be excluded when dealing with pressing issues concerning low-carbon and energy efficiency because they are interlinked with socioeconomic challenges in South Africa (Jakob et al., 2020). Therefore, according to Jakob et al. (2020), they need to be included in the just transition framework for South Africa. The transition to renewable energy is gradually progressing, considering the challenges regarding climate change mitigation action and the plans to reduce installation costs for renewable energy sources to a level below those of Eskom coal-fired power plants technologies. It is still unclear how long it will take to phase out coal as the primary source of power generation in South Africa; hence, further analysis is needed regarding the complexity of different stakeholders associated with coal and the energy sector (DMRE, 2019; Eskom, 2020b; Ndlovu & Inglesi-Lotz, 2019). An in-depth understanding of the political economy regarding coal in South Africa is required to realise a transparent regulatory environment in order to achieve the vision of a socioeconomic transition to a low-carbon economy. Furthermore, cross-country comparisons to identify the factors and structural similarities for developing essential strategies and policy guidelines are critical for transitioning to a low-carbon economy in South Africa (Jakob et al., 2020). Transitioning to renewable energy sources from coal will create challenges for the coal mining industry and South Africa.

The socio-technical transition to sustainability considers a system change, which ultimately affects many stakeholders. According to Patterson et al. (2017), it is one of the appropriate

approaches to a transition. However, it was realised that there are still gaps in theory regarding the impact that the socio-technical transition to sustainability will have on the coal mining industry in South Africa. The literature does not mention much about issues associated with inequality, poverty and work conditions but focuses more on environmental sustainability systems (Jenkins et al. (2018). Gillard et al., (2016) also indicated that socio-technical transitions look at understanding the actual change processes and not at the transition's impact on organisations and individuals. In theory, this is how the socio-technical transition to sustainability is practicalised. Therefore, an appropriate approach is needed to investigate the impact a transition will have on an organisation and how organisations can adapt, learn, lead, adjust, and manage change.

Regarding the business elements of this study, the key lessons learnt in the cases of Australia, Brazil, Spain, and Canada have indicated that a transition is possible in practice. However, it takes time to replace the old systems completely. Therefore, the business case of this study will focus on assisting the coal mining organisation in South Africa to find the appropriate organisational strategies that will help them adapt, learn and gradually manage change based on practice. The following chapter will put forward the research questions for this study.

Chapter 3: Research Questions

3.1.   Introduction

This chapter presents the research questions that established the foundation of this study. These questions have been developed based on the literature review conducted and introduced in chapter two. These research questions were designed to generate an understanding of the transition from fossil fuels to renewable energy that the energy sector in South Africa is undergoing to realise a low-carbon economy. Furthermore, these questions aim to explore the impact of renewable energy on the strategies of coal mining organisations in South Africa. Finally, this research seeks to find answers to the following research questions.

3.2.   Research question 1

How are coal mines repositioning their strategy for the socio-technical transition to renewable energy?

Research question 1 aims to determine how the coal mines across South Africa affected by the transition to renewable energy are repositioning their operations to remain competitively sustainable. Although research has been conducted on socio-technical transitions to renewable energy, the researcher could not find empirical research that focuses on the coal mines' strategy for socio-technical transition to renewable energy. In chapter two, according to Jenkins et al. (2018), socio-technological literature does not mention much about issues regarding inequality, poverty, and work conditions, but it says much about environmental sustainability systems. This question will assist this study in exploring how coal mining organisations are revisiting their strategies to align with the transition.

3.3.   Research question 2

What practices and strategies have these coal mines put in place?

Research question 2 aims to identify which organisational strategies regarding the change will be appropriate for the coal mines across South Africa in strategising for a transition that will result in Eskom coal-fired power plants being decommissioned and repurposed for renewable energy sources. This question will also attempt to understand what the individuals in these coal mining organisations understand about operational activities and strategies implemented to ensure that their organisations are aligned with socio-technical transitions to renewable energy. This question will further attempt to uncover if there are any plans to implement these practices or alternative approaches to address the transition process. Literature has indicated

that technological changes can significantly disrupt organisations that cannot adapt to the change within such an industry. The only way for organisations to survive technological changes is when they can adapt to the new way of operating in their industry (Christensen, 1998).

3.4. Research question 3

How are these coal mines upskilling their employees with suitable renewable energy skills?

Research question 3 will help determine the skills and competencies required to transition to renewable energy to ensure the affected employees are adequately upskilled. This question considers that emerging renewable energy companies are highly innovative regarding technological innovation compared to incumbent organisations in the coal mining industry. This research question will also attempt to identify any emerging information that may have been overlooked. Watad (2019) indicated a relationship between organisational learning and change because, through education, individuals change how they see things due to the vast knowledge gained.

3.5. Conclusion

This chapter has put forward the three research questions that form the foundation of this research. By answering these three research questions, it is anticipated that this research will provide more profound insights into the impact of renewable energy on the strategies of coal mines in South Africa and a better understanding of the socio-technical transitions to renewable energy. The next chapter will address the proposed research methodology and design.

Chapter 4: Proposed Research Methodology and Design

4.1. Choice of methodology

The research design for this research will be exploratory. According to Saunders and Lewis (2012), a research design of this nature allows the researcher to ask participants open questions to discover what is happening in their environment. It will also help the researcher better understand the impact of renewable energy on coal mines. Since the study's research questions start with 'what' and 'how', the exploratory design will further augment the researcher's ability to explore the phenomenon when asking questions during the data collection phase of this research. This exploratory research will be conducted by reading relevant literature, interviewing experts on the issue, and in-depth interviewing of individuals and focus groups (Saunders & Lewis, 2012). The interviews will be unstructured and dependent on how robust the participants' contributions are. The research is flexible; therefore, it can be adjusted and changed based on the quality of new data and the researcher's intuition.

This study aims to explore the impact of renewable energy on coal mines. Therefore, the research philosophy that will be used is interpretivism. The interpretivism paradigm will help us understand how people interpret and interact within the environment they operate (Saunders, 2012). In this case, the focus will be on people working for the coal mines affected by the new ways of generating energy through renewable energy sources.

The approach selected for this research is the inductive approach. The reason for choosing this approach is that it will allow the researcher to compress data into a summary format and establish the relationship between the research objectives and information obtained from raw data (Saunders & Lewis, 2012).

A multi-method will be used for this research, using more than one technique to collect data and other analytical mechanisms (Saunders et al., 2016). First, the researcher will develop an interview guide comprising standard guiding questions for data collection during interviews. The guide will also be used to identify any new intuition into the problems that are being researched. The interview guide will be followed by open interviews, which will assist in identifying issues that the researcher does not already know.

A narrative strategy will be used for this research. In narrative strategy, individual decision-makers will have the opportunity to provide first-hand experiences of the coal mining organisations they work for in South Africa (Chase, 2011; Maitlis, 2012). According to Lenberg

et al. (2017), the narrative strategy allows the researcher to use other valuable and available means, such as observations, letters, diaries and artefacts, for the data-gathering process. Chase (2011) also indicated that individual-decision makers within coal mining organisations would participate in the study by doing interviews through storytelling. The narrative strategy can also be used to complement other research strategies (Musson, 2004). According to Constant and Roberts (2017), the narrative strategy has a recognisable way of communication that usually takes place during the storytelling by the narrator.

The research will adopt a cross-sectional time horizon study because, due to time constraints, it will be conducted over a short period (Saunders & Lewis, 2012). Due to the research using a narrative strategy, interviewing relevant participants from coal mines affected by renewable energy generation will be conducted over a short period (Saunders & Lewis, 2012).

4.2. Population

This research will target the population of coal mines across South Africa, which the introduction of renewable energy generation has impacted. The coal mines are relevant to this study because the research aims to explore how they are repositioning their strategy for renewable energy generation and whether these coal mines are prepared since the energy generation industry is changing. The primary focus will be on the coal mines that supply Eskom with coal for power generation purposes. However, the study will also consider some of the coal mines that do not supply Eskom to get some insight that will augment the in-depth understanding of this study.

4.3. Unit of analysis

The unit of analysis for this study will be individuals who are decision-makers with different views within coal mines across South Africa.

4.4. Sampling method and size

The population in the research area targeted for sampling is all decision-makers within the coal mines across South Africa. However, to meet the minimum target of the sampling size, at least 14 to 20 interviews will be conducted to ensure saturation is reached (Creswell, 1998). When the interviewees run out of new data to provide to the interviewer, the data will be considered saturated (Morse, 1995). This research will use a non-probability sampling method because it will not be possible to know how many respondents will be interested in participating in the study at the start. Therefore, participation in this regard cannot be confirmed because some respondents may be interested, whereas some may not be interested in being interviewed. For this study, a purposive sampling method will be used to identify suitable

respondents that will give relevant and in-depth data during interviews (Saunders & Lewis, 2018, p.145). The selection of the appropriate coal mines for this study will be determined by convenience, how knowledgeable the researcher is about the mines and using referrals (Merriam, 2002). The list of suitable coal mines to be included in the research will be obtained from the South African Colliery Managers' Association (SACMA) database and the Minerals Council of South Africa. As such, the researcher will get interested research participants from the list. A minimum of 12 interviews will be conducted. However, the study aims to interview as many respondents as possible to reach saturation (Glaser & Strauss, 1967).

4.5. Measurement instrument

The researcher will develop an interview guide questionnaire that will be used when semi-structured interviews are conducted. This interview guide questionnaire will help organise data needed for this research and ensure that the participants stay within the context during the interviews so that they remain relevant to the topic (Rennie, 1992). According to Saunders and Lewis (2018), the questionnaire will also ensure that data is collected from many respondents in interviews using the same questions. This process will lead to collecting data on known themes being tested.

The interviews will be recorded and transcribed to ensure appropriate data analysis and capture of the unstructured part of the interviews. The literature review will direct the questions in the interview guide to assess what is known in the field of the research. It will assist in authenticating what is already known by analysing data collected from questionnaires. The interview guide will aim to answer the research questions to realise the objectives of this research (Saunders & Lewis, 2018, p. 149). However, the questions will not be vague and will be structured so that they are understandable to the respondents to achieve the full benefit of the interviews. A measurement scale will also be utilised for the research with a scale of 1 to 10, whereby 1 represented strongly disagree and 10 strongly agree.

4.6. Data gathering process

An interview guide will be developed to come up with relevant questions for the interview (Mason, 2004; Rubin & Rubin, 2005; RWJF, 2008). A semi-structured interview format will be adopted as it is the most common data collection method in qualitative research (DiCicco-Bloom & Crabtree, 2006). The semi-structured format will allow interaction between the researcher and the individual decision-makers within coal mining organisations across South Africa (Galleta, 2012). Semi-structured interviews will also allow the researcher to ask follow-up questions during the interview (Polit & Beck, 2010). Data will be gathered through face-to-face interviews and virtual interviews. Emails and telephonic communication systems will be

used to set up interviews. The virtual interviews will be conducted via Zoom, Microsoft Teams and Google Meet platforms, and will be recorded. A reliable recording device and a smartphone as a backup will be used to record the face-to-face interviews, and the recordings will then be transferred to a laptop. The interviews will take place at the coal mines and central offices to avoid interference by unwanted guests. Minutes of the interviews will be written in an appropriate diary during the interviews. The researcher will put a system in place to verify the authenticity of the decision-makers identified to participate in the interviews. Data gathering will be utilised to develop evidence for the experience of the issue that is being investigated. The researcher will analyse the evidence provided in the interviews to produce a fundamental interpretation of the experience (McLeod, 2001). Data is vital because it will be the basis of the findings and indicate how the findings were converted from the evidence gathered. During the research report phase, information will be obtained from data to demonstrate the findings and indicate how the results were converted from the evidence. For this study, most of the evidence will be in written texts. However, data that is in written form will be gathered from documents, and data collected in oral form from interviews will be transcribed into written texts.

4.7. Analysis approach

Semi-structured interviews will be conducted with the decision-makers within the coal mines affected by renewable energy generation. A thematic analysis will be applied to identify, organise, and analyse the outcomes of the data collected. Thematic analysis will be utilised for the transcribed interviews to arrange patterns identified and themes in the data set to understand any commonality in the topic so that collective meanings and experiences can be better understood (Braun & Clarke, 2006). Atlas.ti will be utilised for coding and analysing the results of the interviews. The coding and analysing will be achieved by sorting the codes with the interview quotations, whereby central themes and constructs will be placed in isolation to investigate further. The coding will help to assemble, categorise and create a platform that is well-organised for the development of themes. According to Saunders et al. (2018, pp. 1893-1907), data saturation is realised after a process, not a once-off event. When the researcher conducts further interviews but does not get any new themes, it will indicate that saturation has been reached, marking the end of the sample interrogation.

4.8. Quality controls

According to Saunders and Lewis (2012) and Zikmund et al. (2013), validity and reliability are the methods considered adequate when measurements are evaluated. To ensure the reliability of the research, transcripts and recordings will be inspected to identify mistakes

(Gibbs, 2007). Consistency in managing documents regarding procedures and databases will be maintained (Yin, 2012). Regardless of the number of analysts involved, themes or codes developed will be consistent (Miles et al., 2014; Saldana, 2013).

Regarding validity, various types of validity in the field of qualitative research are essential and can be used to understand the accuracy of the findings in different research studies (Altheide & Johnson, 2013). The researcher will use the interview guide questionnaire to ensure validity in interviewing all the individual decision-makers who will partake in the interviews (Saunders & Lewis, 2012; Zikmund et al., 2013). The questionnaire will prevent the researcher from taking sides during interviews. The researcher will do a background check on individual decision-makers from coal mines across South Africa to ensure that relevant individuals are interviewed.

4.9.   Limitations

The qualitative research method does not give statistical representation, and measuring the responses from interviews is impossible. Data specific to an industry can only be collected by someone who knows the industry (Queiros, Faria & Almeida, 2017). Therefore, the researcher must be someone with experience in the particular industry. It might not be possible to collect all the relevant data in one session, leading to multiple sessions for adequate data gathering. It is up to the researcher to ensure that all the vital data is collected. It is impossible to duplicate the results; therefore, it is complicated to verify the data. To date, there is still no method to pinpoint if the conclusion can be applied to suit the whole population (Queiros, Faria, & Almeida, 2017).

Data can be negatively affected by the researcher's unconscious or conscious bias. It is difficult to present data collected from individuals with different perspectives to the general audience because it leads to the collected data being questionable compared to other research methods. The qualitative method requires ample time because every data point is evaluated instinctively and lacks guidelines (Queiros, Faria, & Almeida, 2017). Data cannot entirely be relied on because it can only be relevant at the time of collection.

Secondary data might not be discrete to the researcher's needs because when it was collected in the past, it was for a different reason, thus researchers cannot rely on it. The only way to evaluate whether data is reliable is by investigating how it was collected and analysed. However, it could not be objective towards the person that gathered it. Data might also be outdated because it has been collected in the past. Many organisations and people have access to the same data, so it might not be competitive enough. Even competitors can access the same data.

Focus groups are not economical because some participants expect to be financially rewarded for their participation. Participants feel like they are constantly being watched, leading to limited information. There is no full benefit regarding sensitive topics because outcomes are usually biased. Not everyone is represented because individuals typically express their own opinions, not representing the entire population (Du Bois, 1983). The next chapter will present the results of the semi-structured interviews.

Chapter 5: Presentation of Results

5.1. Introduction

This chapter describes the primary themes and key insights gleaned from the interviews conducted as part of the proposed research and the research questions and objectives stated in Chapter 3. A total of 11 interviews were conducted with industry professionals and specialists in the coal mining industry. The chapter provides a brief description of the interviewees, followed by a discussion of the data collection and measurement techniques employed by the researcher to ensure data confirmability. In addition, the findings on solving emerging alignment towards renewable energy challenges within organisations that deal with fossil fuels are also described. The findings reported in this chapter are addressed and analysed further in Chapter 6.

5.1.1 Description of the interviews

As the researcher did not have access to the entire environment of interest, this study utilised techniques for purposeful sampling. Eleven semi-structured interviews were conducted with experts in the field from the coal mining industry. In addition, several South African (SA) mining company individuals that engage in either open cast or underground coal mining were interviewed. Among the 11 participants interviewed, three were classified as administrative-level professionals with strategic expertise and experience in the coal mining industry, and eight were classified as executive-level management executives with more technical expertise and experience. As referred to previously in chapter four, the study identified participants who are decision-makers with different views within coal mines across South Africa. The details are presented in Table 5.1.

Table 5.1: Summary of participant grouping

Category	Business Professionals	
	Group 1 *Administrative Management*	*Group 2* *Executive Management*
Number of participants	*3*	*8*
Role description	Ultimate source of power and authority. Influential and governance orientated	Directly accountable to administration for the functioning of respective departments. Influential and technically orientated.

With the participants' permission, interviews were recorded and conducted in the order of their availability. In accordance with the nature of qualitative research, interviews were conducted until sufficient new insights were uncovered or until theoretical saturation was reached (Saunders & Lewis, 2012). The implication is that participants' interviews yielded no additional insights or contributions. Participants were sought through the researcher's professional network in the South African mining industry and through recommendations. The interviews were simultaneously analysed, and the identified codes were suitably grouped through the coding procedure.
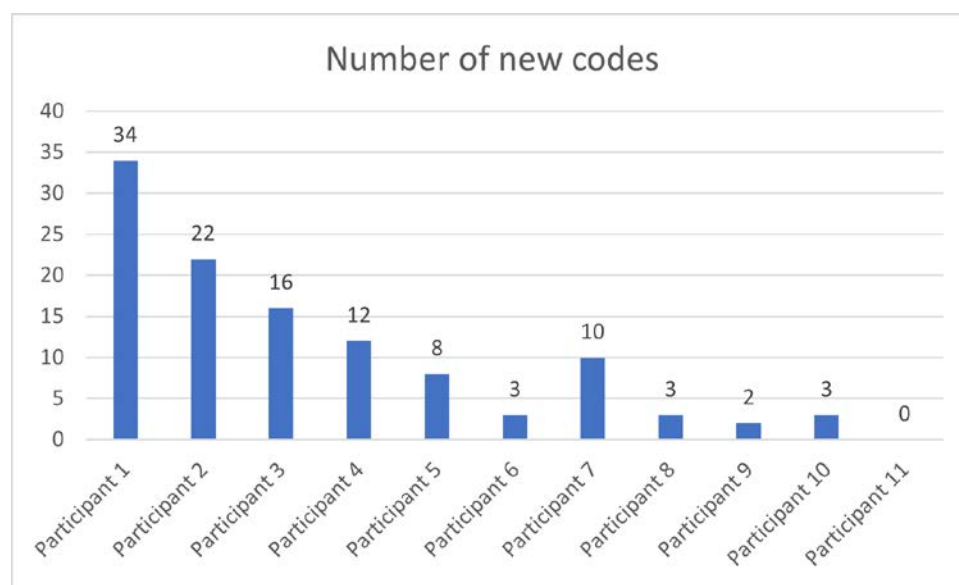
Figure 5.1: Saturation graph

5.2.   The coding processes

Atlas.ti, a software application for qualitative analysis, was used to code the interview data. Before coding, the researcher established set themes based on the themes selected during the interviews to facilitate interpretation. Regular themes were identified as the researcher was acquainted with available literature. To determine the key constructs from the data, absolute frequency counts of the occurrences were used. In rank-ordered tables presented later in this chapter, these frequency counts in relation to participants are presented. It should be noted that not all counts may equate to 11 because only the most relevant and frequent occurrences were considered. The two-step coding method is outlined below:

- Part 1 of the code generation procedure consisted of two inductive stages. The first sequence codes represented the research questions, whereas the second sequence categories represented the various code groups.

- Part 2 followed the deduction procedure. The categories were organised into distinct themes. The themes were then grouped into three key research questions and recorded in the conceptual framework.
- Appendix A contains a detailed code list structured in accordance with the described coding procedure.

5.3. Presentation of results

In accordance with the research questions posed in Chapter 3, the results of the study are presented. Notably, the data were analysed independently for each research subject based on the identified key themes. Using frequency counts of the occurrences, the data was utilised to determine what role it played, i.e., whether it was an indication of a positive or negative effect, or if there was any contribution at all. The researcher separated the analysis according to the sub-questions addressed within each research question for ease of presentation and to ensure that each question was thoroughly researched and analysed. In Chapter 6, only those findings that the researcher deems most significant for answering the three primary research questions will be discussed. As discussed in the interviews, most interviewees preserve the emergence of renewable energy as an opportunity to explore the job market.

The identified constructs were coded in accordance with the research question and sub-questions. For instance, questions related to research question 1, sub-question 2, i.e. "How will this decommissioning and repurposing of coal-fired power plants affect your organisation?" were assigned the number 1.2. This meant that any construct that emerged under any research question was prefixed with the question number. For example, 1.2.2 XXX indicated that XXX was the second unique construct mentioned by participants in response to research question 1.2.

5.4. Coal mine participation in community development

Participants were asked about their company's involvement in community development to gain insight into the participant's role and experience in the coal mining industry and their community influence in relation to community development. The interview evidence is shown in Table 5.2 below.

Table 5.2: Summary of business professionals' involvement in community development

Participant	Position	Involvement in community development	Group
P1	General Manager	*"As per our SLP, social and labour plan. We are giving back to the community, again in compliance with the mining charter too. We are running projects which are meant to grow and develop the local communities in which our operation is operating around."*	2
P2	Assistant General Manager	*"Based on the number of communities around, the allocation of the community development project is based on the number of communities we've got on the doorstep and within the Nkangala district. If I were to average per complex, I would say seven per complex."*	2
P3	Chief Executive Officer	*"Each of the mini mines has their own social and labour programs with their own community development projects. We employ 90% of the people, all coming from local communities. So, we're uplifting them, reskilling them. We've got skilled programs and retraining for the mining industry. They also use the local communities. We develop them in their own businesses. They tell us what their ideas are, or we go out to tender in the local communities. And they tend to start a business, and we assist them with their own businesses."*	1
P4	Director	*"We have a few projects within the two main communities around the mine and mining communities. And we have some projects on the mine, and we also do a lot in that way under our Social and Labour Act, where we have spent quite a bit of money on schools, building schools, classrooms, school halls, etc."*	1
P5	General Manager	*"We are very active in the community in which we operate. Yes, we do get involved either via invitation or through work that we voluntarily choose to do in terms of projects, from a CSI point of view, or projects that we partner with the municipality for local economic development - projects that they take the lead in, and we partner, as well as other projects, which are sort of driven from the community side, where the community comes forward with an idea that they asked us to partner or fund. If it's in line with our values and our aspirations as a company and we see the value of that project to the community."*	2

P6	Chief Executive Officer	*"Over and above, SLP requirements based on our mining right that we are working on… on the project that we are going to be opening in five months, we do a lot of initiatives - we are approached by schools, we are approached by NGOs, we are approached by churches. We do stuff throughout the year. January we'll do uniform, school shoes etc. We do around the food parcels, clothing, blankets, winter, and Mandela Day events. We sponsor trips for sports teams for local communities where we operate. We also buy sanitary towels for the girls, which was our biggest drive for the month of August. And we also train a lot of unemployed people by giving them training; we take them from the novices to being certified - whether it is to operate machines or just having normal driving licenses, and then some we absorb. Those who we cannot absorb; well, at least they can go and look for work because we'd have trained them to get licenses, to get certificates, competency certificates."*	1
P7	Corporate finance and strategy	*"We have maybe six or seven host community municipalities that we service, and each of them has between five and 10 projects will be maybe 50 to 70 projects in a year."*	2
P8	Renewable energy development and strategic implementation	*"Recently, I think there's about between three and four projects that they have. That I'm aware of."*	2
P9	Manager: Underground and open cast	*"We've put in there talking to taxi ranks that we've put in gyms, that we've put in flexi parks that we have there. We have engagements with the municipality, with the local municipality, where we've supported the municipality with fire trucks and vehicles for the traffic department. So those are some of the things that we were involved in as well as community upliftment projects whereby we take up and coming businesspeople to the mines and, and teach them some of the underground work."*	2
P10	General Manager	*"I doubt you'll be able to mine if you are not part of it. It's almost what people refer to as a social license. For you to be accepted as a responsible miner, it's important that you see yourself as part of the community. The people that we*	2

		employ are from this community. A lot of the work that we do goes through this community.”	
P11	Technical Manager	*“We do take on apprentices. We just completed one have an apprenticeship mechanic on the noble president, and he's just qualified recently. We've employed him full-time now. So, at this point, now I'm looking to possibly start up another big training programme. Now mainly on the technical side.”*	2

From the interviewee's perspective, participation in community development projects is crucial. Most community development projects are located within *the "host community"* where mining operations are conducted. Administrative managers and technical managers share the belief that their respective mines should participate in community development programmes that will help build and develop the community*, "uplift them, reskill them,"* and form partnerships with organisations such as *"churches"* and utility entities such as *"municipalities."* Coal mining companies, in collaboration with national and local governments, non-governmental organisations (NGOs), and community leaders, have fulfilled their commitment to improving the lives of host community members through sustainable development initiatives and financial contributions to specific projects. For the coal mining industry to be productive, safe, accountable, and sustainable, it is evident that they co-exist with existing communities. Complex as they may be, the coal mining industry and its host communities benefit from healthy community relations*.*

Coal mining companies participate in these development programmes as part of their *"Social and Labour Plan,"* which is an integral part of their business strategies. According to the participants' sentiments, Social and Labour Plans (SLPs) are used as an empowerment mechanism in the business sector that enables a miner to be granted *"mining rights".* Therefore, Participant 8's assertion that participation in community development is a *"social license"* to be considered a profitable miner and that one cannot *"mine if not a part of it"* is enticing.

5.5.   Methods of coal mining identified in South Africa

This question aimed to determine the views of coal mining organisations about the emergence of renewable energy and how they plan to incorporate it into their business models. Open-cast mines (64%) and mines that use underground and open-cast (36%) produce most of the coal in South Africa. These mining techniques are feasible because *"coal seams are close to*

the surface." When resources are close to the surface, it is *"cheap and affordable"* to recover them.

Below is Figure 5.2, showing the distribution of mining methods used in the coal industry
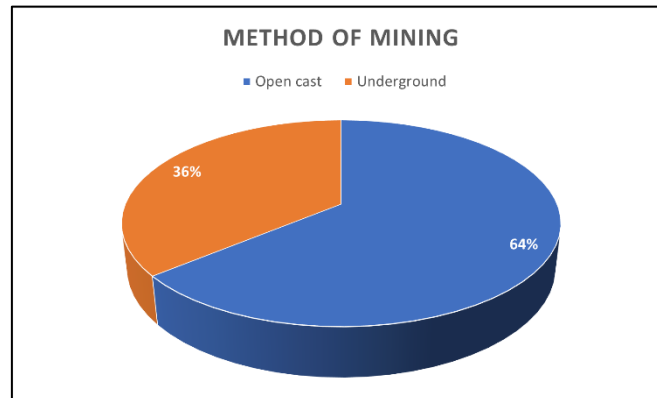
Figure 5.2: Summary of mining methods

Numerous coal beds are close to the surface and can be hundreds of metres deep; therefore, they can be extracted easily and inexpensively using *"truck and shovel equipment."* The overburden covering the coal is then removed using explosives and excavators. When describing mining methods, participants include a subtle consideration of cost-cutting and demand mitigation in relation to the customers served. For example, some participants (Participant 6) imply that the shift from underground to surface mining could be maintained as a cost-cutting measure. Other participants (Participant 5) suggest employing both coal mining methods to reduce demand. These two sentiments emanate from individuals in diverse groups, suggesting that administrative professionals are concerned with cost reduction and savings, while executive professionals are concerned with production and output growth.

Table 5.3: Summary of participant quotes: Methods of coal mining

Group	Participant	Description of Quote
1	P3	*"We are totally doing drill and blast, shovel and truck, and all the equipment is diesel. There's no electric equipment at all."*
2	P5	*"Currently, the mine is an opencast mine, so we use typical truck and shovel operation; surface operation. We are working on plans to go underground you know as of next year, so yeah, it will be a combo combination of both underground and opencast."*
1	P6	*"We predominantly use surface, open-cut mining. We used to play in the underground space; we currently do not play at all. So we are*

		doing opencast mining; currently in the space of predominantly of coal now."
2	P7	*"For opencast mines, we use truck and shovel underground obviously have to use continuous miners and, and, and all the fancy underground equipment, but in open cost, we have a few draglines. I think we have the biggest dragline fleet in the country."*
2	P8	*"So for underground, we use continuous miners with shuttle cars and battery scopes as well. Then they'll use feeder breakers as well. And then opencast mining is mostly going to be your excavators and dump trucks."*

Both methods are identified as utilising *"diesel"*-powered machinery that does not use electricity (Participant 3). Finally, Participant 5 expressed the view that coal consumption is high and that the mining company is contemplating shifting to underground mining to fill the demand gap.

5.6. Findings: Research question 1

The following question was considered first in this research:

RQ 1: How are coal mines repositioning their strategy for the socio-technical transition to renewable energy?

This question aimed to determine how coal mining organisations are repositioning their strategy amongst the emergence of renewable energy and how they plan to incorporate it into their business models. Following reports that countries must drastically reduce carbon dioxide emissions within the next decade to prevent a rise in the global average temperature, there has been an increasing emphasis on deploying clean energy and decarbonising the economy. Considering this, it is essential for the researcher to investigate and gather the sentiments of industry professionals regarding the implementation of renewable energy plans in their business models. Although widespread, rapid decarbonisation is essential, coal-dependent communities are already feeling the effects of the energy and economic transition. Energy experts can clearly give insight into the future of fossil fuels. Energy experts are more capable of explaining the position coal mines are taking to comply with international laws while remaining profitable.

The first research question was subdivided into three interview questions, all contributing to answering the primary research question. Respondents were asked to describe their perceptions of renewable energy to provide context and insight, and set the tone for the

interview with the researcher. The second interview question, which was related to the primary research question, inquired about the effects of the decommissioning and repurposing of coal-fired power plants on organisations.

5.6.1 Perceptions of renewable energy

> **Research sub-Q1: What is your opinion regarding the issue of this renewable energy?**

The study's findings demonstrated that coal mines are aware of the emergence of renewable and clean energy. Moreover, the issue's emotional responses are reflected in the themes that emerged.

Table 5.4: Summary of themes: Perceptions of renewable energy

Rank	Theme	Abs. Frequency	Group 1: Administration	Group 2: Executives
1	Fossil fuels dominant	10	3	7
2	Transition to renewable	8	1	7
3	Responsible mining	4	1	3

5.6.1.1. Fossil fuels still dominant

Participants across all groups highlighted that movement towards renewable energy is possible; however, fossil fuels remain the primary source of sustainable energy. The participant illustrative quotes are presented in Table 5.5 and Table 5.6.

Evidence from Administrative Professionals

Table 5.5: Summary of Administrative professionals' quotes: Fossil fuel dominance

Participant	Description of Quote
P3	*"We don't need renewable energy because of the amount of coal that we've got and the repair that we have to do to the earth before we close anything up."*
P4	*"So, the renewables are a must. It is it has come a long way in the past few year's prices have also come down, fortunately, but it's still a long way to go."*
P6	*"Look, fossil fuels are not infinite, so they will end at some point. But obviously, they do have an impact on the climate and we can see towards all these changes- all the floods; all the sicknesses that people develop around the world that are obviously radiation-caused or such, so renewable energy is necessary. But I personally feel that I don't think fossil fuels should be ditched immediately."*

Analysis of Administrative Professionals

Participant 3 stated, *"We don't need renewable energy because we have so much coal,"* which is said to be finite. However, there is *"still a long way to go"* for the coal industry to completely transition to renewable energy. These perceptions support Participant 6's stance that *"fossil fuels should not be abandoned immediately"* because they are used to power South Africa's base load.

Evidence from Executive Professionals

Table 5.6: Summary of Executive professionals' quotes: Fossil fuel dominance

Participant	Description of Quote
P5	*"Renewable energy should partner or work side by side with fossil fuels. We are not going to walk away overnight from fossil fuels."*
P7	*"In order to create baseload, you need to have a balance between coal-fired power or fossil fuel-generated energy and renewables. And in my mind, you know, in the next 20 years, we'll probably have an energy grid of more than 50% of renewable energy and that is something that we should do. But I think you know; coal has a long term has a longer future to play here."*
P8	*"…Still need coal as a base load…."*
P9	*"Contrary to popular belief, I don't think renewable energy is the silver bullet to the country's energy challenges. I think it's the right thing to do. It's the right strategy to venture into it. It assists in terms of going through the green energy. You are the upscaling of renewable energy will ease the grid a little bit better. But it's not the silver bullet in terms of solving the entire country's energy crisis or energy challenges."*
P10	*"So, your commentators make a lot of noise comparing South Africa to first-world countries, by the way, who are not fully on renewables. You look at Europe, you look at America, you look at all these guys; they've been singing this renewable song for over 20 years, but they are not fully on renewables. The question is, why must we be pushed almost at a button to be fully on renewables?"*
P11	*"I think the speed in which we tried to do it relieves a lot of industry lagging. I don't think renewable energy will evolve for the very near future. 10 to 20 years, I don't think renewable energy will replace the likes of Eskom."*

Analysis of Executive Professionals

As the international community advocates for the transition to renewable energy, Participant 8 asks why coal producers should be *"pushed almost instantly to be fully on renewables."*

Participant 5 suggests that *"Renewable energy should partner or work alongside fossil fuels"* because the coal industry will not easily "*walk away from fossil fuels overnight."* Participant 5 agrees with the sentiment that renewable energy should form partnerships with fossil energy producers. Participant 8 aligns with Participant 10's sentiments, suggesting that the move to renewables, whilst other countries are building power stations is "*the European countries trying to secure their energy for the future."* Participant 9 believes that transitioning to *"green energy*" is the right and acceptable thing to do, *"contrary to popular belief*," however, they view renewable energy as a solution that will *"solve the country's entire energy crisis."* Furthermore, they do not view renewables as a *"silver bullet"* strategy to curb the energy crisis. Economic challenges may also delay the delay to renewable energy. As highlighted by Participant 8, *"Europe depend on Russian gas,"* and the recent sanctions may make Europe reconsider decommissioning fossil-powered power plants.

Comparison of Administrative and Executive Professionals

All participants agreed that fossil fuels would be utilised for longer before renewable energy becomes fully integrated into the energy sector. In addition to time, partnerships are required to integrate fossil energy successfully.

Conclusion

Based on the participants' responses, it is evident that coal producers will need time to fully accept renewable energy to integrate it into their organisations.

5.6.1.2.   Transition to renewable energy

All participants highlighted the viability of transitioning to renewable energy within the business model. However, the transition is partial. Various aspects were raised, including carbon emission control, NetZero, energy localisation and hedging of costs. The illustrative participant quotes are presented in Tables 5.7 and 5.8.

Evidence from Administrative Professionals

Table 5.7: Summary of Administrative professionals' quotes: Transition to renewable energy

Participant	Description of Quote
P6	*"For all these fossil fuels, there's clean technology for extracting energy, and so it's not really that we need to discard them because they're not 'clean'."*

Analysis of Administrative Professionals

Participant 6 argues vehemently that the use of fossil fuels cannot be halted due to pollution because there are proven *"clean technologies"* that can be used to ensure the continued use of coal.

Evidence from Executive Professionals

Table 5.8: Summary of Executive professionals' quotes: Transition to renewable energy

Participant	Description of Quote
P1	*"We are actively engaged in just transitioning to a low carbon economy, and we will leverage new technologies and renewables at our mining operations to achieve this. So, we support just transition. We are not denialists."*
P2	*"We're experiencing too much rain, flooding and too much drought in some areas that are not normal, and there is a real need for international intervention in the reduction of the carbon footprint each and every organisation is emitting into the atmosphere."*
P7	*"The push is to be NetZero sooner, but in my mind, like seeing what all the transition commitments have been, and what the real actions have been, I think probably 2014 to 2050.... I believe that renewable energy is a part of our transition journey and should be considered and invested into heavily, but I do believe that like a just transition is necessary."*
P10	*"So, my interest is more on investing a lot of money in making sure that the coal that you mine you get cleaner; I think we can. So, I'm not opposed to renewables. I think they're good for us, they're going to help us. But perhaps we need to start deliberating on whether you can mine coal cleaner and if there are ways in which you can contribute to emissions reduction.... And you can start simply by looking at the type of diesel that you use."*

Analysis of Executive Professionals

Participants have agreed that they are not renewable energy denialists; however, they view the adoption of renewable energy as *"just a transition"* toward a *"NetZero"* economy that prioritises cleaner energy and low carbon emissions. Participant 7 further suggests that the transition journey *"should be considered and invested into heavily."* Participant 10 stated that partnering with diesel suppliers to reduce carbon emissions jointly and transition to renewable energy is the most effective method for reducing carbon emissions. However, Participant 8 brings in a different perspective, whereby they raise that the traditional grid design was not

"designed to have renewables," thereby making the transition possible. However, a consideration must be made as to how it can be achieved.

Comparison of Administrative and Executive Professionals

Participants agreed that only a transition to renewable energy is required for coal mines. The call to shift to renewables should not be ignored, but embraced.

Conclusion

Based on the participants' responses, it is evident that the transition to renewable energy within the coal industry will be limited to certain business segments.

5.8.1.3. Responsible mining

All participants agreed that responsible mining is essential because it involves and respects all stakeholders, minimises and considers its environmental impact, and prioritises a fair distribution of economic and financial benefits. In addition, governments and affected communities are heavily involved in the stakeholder engagement process. The participant illustrative quotes are displayed in Tables 5.9 and 5.10.

Evidence from Administrative Professionals

Table 5.9: Summary of Administrative professionals' quotes: Responsible mining

Participant	Description of Quote
P6	*"I don't think it needs to be stopped abruptly. Because it's not something that you can stop abruptly because, over and above environmental impact, there's a socioeconomic impact as well. So, I'm fully supportive of that, but I think it needs to be managed responsibly."*

Analysis of Administrative Professionals

Participant 6 emphasises the need for *"responsible management"* of coal production and utilisation. Consequently, some of the participant's proposed management strategies indicate that coal mines will not cease coal production.

Evidence from Executive Professionals

Table 5.10: Summary of Executive professionals' quotes: Responsible mining

Participant	Description of Quote
P1	*"It will take some time. So, the company currently will continue to produce coal while doing so responsibly and going forward, the idea is to then start bridging the gap by starting to build the renewable plant."*
P10	*"Because I think the narrative out there is that coal is bad, coal miners are bad, irresponsible, but contrary to that; we are not. The reality is there's an agreement that there needs to be an energy mix."*

Analysis of Executive Professionals

All energy experts concur that the gap between renewable and fossil energy still exists, and that the general populace views fossil fuel negatively, implying that it is undesirable. Participant 10 highlights the common belief that *"coal is bad, and coal miners are bad and irresponsible,"* but little has been said about the efforts to bridge the gap responsibly. Participant 1 concurs, stating, *"they will continue to produce coal responsibly."*

Comparison of Administrative and Executive Professionals

Administration and executive professionals concur that responsible mining is practicable and can be implemented to ensure the long-term viability of coal-producing mines. However, few efforts are being made by either group to transition to renewable energy completely. On the contrary, there is reluctance coupled with adamant sentiments regarding the continued use of coal.

Conclusion

According to the participants' responses, it is preferred to continue mining responsibly while not fully adopting renewable energy.

5.6.2. Impact of coal-powered power station decommissioning and repositioning on coal mines

Research sub-Q2: How will this decommissioning and repurposing of coal-fired power plants affect your organisation?

Using the research sub-question, this chapter evaluates the total environmental impacts, potential coal resources of the country and internationally, eco-toxicological impacts, and socioeconomic impacts to provide a comprehensive representation of coal miners' views on coal mining and coal-fired power plant activities in South Africa. This question was used alongside sub-question 1 to answer question 1. The findings of the study indicated that coal miners are conscious of the emergence of renewable and clean energy. In addition, the potential effects on operations and functionality are understood. Table 5.11 provides an overview of the themes that emerged from the question.

Table 5.11: RQ 1.1 main themes: Impact of decommissioning and repurposing of coal fired power plants on organisation

Rank	Theme	Abs. Frequency	Group 1: Administration	Group 2: Executives
1	Indirect impact	8	3	5
2	Direct impact	3	0	3

Depending on the operations that coal miners engage in, the answer to the research question was one of two possible outcomes. It was either yes, there is a direct impact on operations, or no, there is no direct impact.

5.6.2.1. Indirect impact of power station decommissioning and repositioning on coal mines

All participants expressed their views regarding the effects of a reduction in the country's coal consumption. Whether or not the coal mines supply Eskom with coal or participate in coal exportation was identified as the primary contributor determining the significance of coal mining in South Africa. The illustrative participant quotes are presented in Tables 5.12 and 5.13.

Evidence from Administrative Professionals

Table 5.12: Summary of Administrative professionals' quotes: Indirect impact of decommissioning and repositioning

Participant	Description of Quote
P3	*"I don't think it's going to affect anybody's organisation in my lifetime. We've got too much vested capital in these massive power stations to be able to change to renewables completely."*
P4	*"No, we don't supply Eskom. We have supplied a power station just outside Johannesburg, Kelvin Power station. We used to supply them. We don't at the moment anymore, but alcohol is of a higher grade than what is required by the power station…. It shouldn't affect our organisation in any way. We're a small user of electricity, you know, look at it. It's very small. And our big thing is to reduce our diesel consumption."*
P6	*"Look, I don't think it's going to affect my organisation such because I'm currently not supplying Eskom at all."*

Analysis of Administrative Professionals

From the administrative point of view, investing in renewable energy is a non-starter as there is *"too much vested capital in these massive power stations to be able to change to renewables completely"* (Participant 3). This would corroborate prior sections whereby the only transition acceptable to participants is a *"just transition."* Participant 6 gave the perspective of their mining operations, suggesting that the impacts would not affect their organisation since they are *"currently not supplying Eskom at all."* Participant 4's sentiments alluded to the effect that the type of coal they produce is *"of a higher grade than what is required by the power stations,"* thereby implying that decommissioning of power stations would have little to no impact on their organisation and organisational strategy.

Evidence from Executive Professionals

Table 5.13: Summary of Executive professionals' quotes: Indirect impact of decommissioning and repositioning

Participant	Description of Quote
P1	*I believe there are about 5 to 6 Eskom power plants that the government is planning to decommission because of age and performance. But I must say the operation and the company I'm working for, fortunately, we are in a position where none of those power stations which are planned to be stopped, none of them is the one that is being supplied by our operation. So I think the decommissioning in my personal*

	capacity for the company does not have a direct impact on the operation I'm working for."
P5	*"I think, first of all, one needs to understand that the decommissioning of the power plants will not happen overnight, to follow a phased approach. So, in the long term, the energy production in this country, the baseload will be supplied from fossil fuels - from coal-fired power stations, and then renewables will complement that or top up that. I think we're quite some time away from renewables becoming the baseload supply for energy in this country."*

Analysis of Executive Professionals

From the analysis of the executives, the participants recognise that renewables are an emerging technology; however, they still believe that renewables would not replace fossil fuels as a source of base load. However, renewables will *"complement"* and *"top-up"* to the country's base load. Participant 5 further suggests that the impact will be that they will be sending coal *"to Eskom-fired power stations which are further or in different directions, but Eskom will continue to consume coal as a fuel source."* This implies operations will still be there; however, the proximity of clientele will be different.

Comparison of Administrative and Executive Professionals

All participants agreed that halting the use of fossil fuels would have operational and functional effects on mine output and revenue in general, but specific to their operations as it was not directly impactful. Participants were oblivious about being a coal supplier to Eskom because they required low-grade coal, as coal is a resource that is still present today. Halting the export of coal poses a threat to business operations.

Conclusion

Participants are aware of the effects decommissioning will have on their operations, but Eskom, one of the country's largest coal consumers, was not a limiting factor. Instead, the effect was more heavily weighted toward exports generated from coal mining.

5.6.2.2. Direct impact of power station decommissioning and repositioning on coal mines

All participants expressed their views regarding the effects of a reduction in the country's coal consumption. The issue was met with both positive and negative sentiments. Community development, job retention, and whether the coal mines supply Eskom with coal or participate in coal exportation were identified as the primary codes that determined the significance of

this theme. It is key to note that only the executive managers alluded to decommissioning power stations influencing their operations. The illustrative participant quotes are presented in Table 5.14.

Evidence from Executive Professionals

Table 5.14: Summary of Administrative professionals' quotes: Direct impact of decommissioning and repositioning

Participant	Description of Quote
P2	*"It means 40% of our profit is gone, but it has to be redirected. And besides the financial losses that we're going to experience, the general communities are going to be affected as most of the current surrounding towns are directly benefiting from the current existing operations."*
P10	*"There will be an impact, but maybe not in the scale that's been described in the media."*

Analysis of Executive Professionals

The impact on coal suppliers is felt from a financial and community engagement perspective. The participants were not worried about completely halting coal production; however, the fear was retrenchments and the financial implication. Participant 2's organisation benefits *"40% of profits"* from supplying coal to Eskom. Amid that, Participant 10 suggests that an impact will be felt; however, it will take time for it to be significant. All participants agreed that halting the use of fossil fuels would have operational and functional effects on mine output and revenue. Furthermore, considering the number of employees at mines, job security concerns also arose when coal mines reduced their capacity.

Conclusion

The effect was more heavily weighted toward financial revenues generated by operations and job retention of employees.

5.6.3. Conclusion of research sub-question 1

The energy crisis in South Africa and the global imperative to decarbonise have left the South African utility with no choice but to transition from coal to renewable energy. However, coal miners have opposed the country's ongoing financial and socioeconomic problems. In their response, the coal miners state that they will acquire additional generation capacity by establishing renewable resources to reduce electricity consumption, and acquire the required

skills and equipment. Furthermore, coal miners say they will support a sustainable initiative by accelerating sustainable projects that adhere to their social labour plans, despite severe threats to their mining licenses. In addition, coal miners pledged to allocate land close to their current operations for investment in renewable energy projects. While acknowledging the merit of the ideas, miners have cautioned that coal *"has a long way to go."* As coal producers and exporters, they believe that coal will continue to contribute to the economy for a long time. They asserted they were not climate change deniers but defended coal as a sustainable resource to maintain the base load.

Miners have insisted that South Africa interpret its own resource ideology regarding coal consumption and not be duped into abandoning coal while the instigators continue to use coal extensively. The prevalent sentiment was to transition to cleaner coal production responsibly only. In addition, sentiments suggest accelerating the transition while allowing it to be grounded.

Despite predictions of coal's inevitable downfall, global demand is said to be stable, and coal is the primary factor driving the base load of electricity. It was deduced that fossil fuels would eventually decline but remain the dominant energy source for several decades. A summary of the major first-order themes across the different groups is provided in Table 5.15 below.

Table 5.15: Summary of sub RQ 1: Perceptions of renewable energy

Rank	Theme	Group 1: Administration	Group 2: Executives
1	Fossil fuels dominant	Frequent	Frequent
2	Transition to renewable	Low	Frequent
3	Responsible mining	Low	High

The key findings for the research question are summarised in Figure 5.3 below.
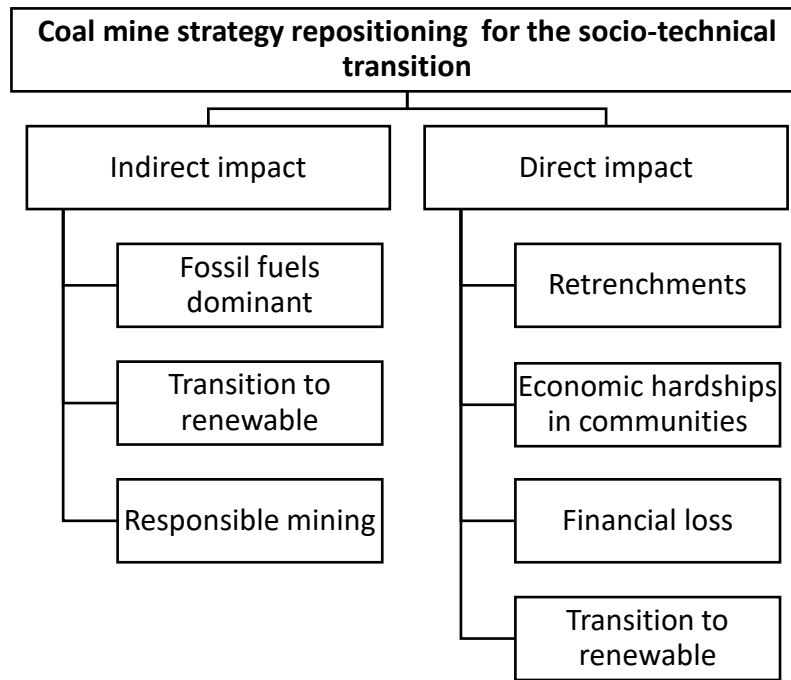
Figure 5.3: Conceptual model of strategy repositioning for transition

5.7.   Findings: Research question 2

The following question was considered first in this research:

RQ 2: What practices and strategies have coal mines put in place?

The objective of the second research question is to determine which organisational strategies regarding change will be appropriate for South African coal mines in strategising for a transition that will result in the decommissioning and repurposing of Eskom coal-fired power plants for renewable energy sources. In this section, the first four themes will be discussed, while the fifth will be discussed with research question 2.4, which speaks to monitoring. The research question was mainly answered by research sub-question 1 from question 2. The other three sub-questions were used to determine how strategies are being managed, measured, and monitored.

5.7.2. Alignment to transition to renewable energy

The following question was considered in this research:

> **RQ sub-question 1: How is your mine aligning itself with the transition to renewable energy?**

Research sub-question 1 sought to understand the alignment within organisations. The focus was on understanding how organisations align their strategies to embrace the transition to renewable energy. Table 5.16 presents the frequency counts for the main themes that emerged.

Table 5.16: Summary of themes: Organisational strategies regarding change appropriate for the coal mines

Rank	Theme	Abs. Frequency	Group 1: Administration	Group 2: Executives
1	Transition to green economy	15	5	10
2	Process improvement and beneficiation	10	6	4
3	Mergers, acquisitions, and partnerships	8	5	3
4	Business alignment	7	0	7
5	Monitoring and control systems	7	2	5

5.7.2.1. Transition to green economy and self-sustainability

Participants agreed that the repositioning strategy for the socio-technical transition to renewable energy could be accomplished by adopting a green economy strategy and a just transition. Key codes that emerged from the study included creating a just transition to a green economy and achieving energy independence from power stations. Tables 5.17 and 5.18 display the illustrative quotations.

Evidence from Administrative Professionals

Table 5.17: Summary of Administrative professionals' quotes: Transition to green economy and self-sustainability

Participant	Description of Quote
P3	*"We've got to bend ourselves away from natural gas and start to move more and more into friendly things like hydrogen, like wind power, solar power."*

P4	*"…climate change and pressure from all over the world to provide cleaner air which is a must. So the renewables is a must."*
P6	*"It's going to happen. That's why we are moving to focus also our energies to industries that that our future-focussed, like battery minerals… like your copper, cobalt, all those things. So we are focusing now predominantly in the Northern Cape as well as the Northwest, Limpopo, which is where the minerals of the future are… of renewables, batteries, electric cars - all the things that will be needed in the future for a clean environment."*

Analysis of Administrative Professionals

Participant 3 stated that it was crucial to transition away from fossil fuels and toward environmentally-friendly alternatives such as hydrogen, wind power, and solar power, and that the transition to clean energy was essential. This reasoning alluded to the climate change aspect raised by Participant 4, who emphasised the importance of clean air. However, the participant notes, *"It has come a long way in recent years, and prices have also decreased, but there is still a long way to go."* This explains why the participants' organisation has not implemented any renewable energy initiatives, as *"The renewable energy that was available to us at that time was extremely limited." Costs were extremely high. Thus, no action regarding renewables was taken."* Participant 6 is optimistic and emphasises that the transition to renewable energy will occur, and "*That is why they are shifting their focus to future-focused industries."* Based on the analysis, participants agreed that fossil fuels will continue to dominate; however, the adoption of renewable energy is subjective.

Evidence from Executive Professionals

Table 5.18: Summary of Executive professionals' quotes: Transition to green economy and self-sustainability

Participant	Description of Quote
P1	*"The easiest thing to do is to work out how to capture the carbon and how to utilise the carbon."*
P5	*"We would like to build a wind farm or a solar farm. And then we'll use that to offset our carbon footprint."*
P10	*"Through the process of ESG, it's a big thing as well. We've started looking at sustainable projects like we're going to start an underground soon. And one of the things that we're looking at is how do you power that. So we require about 10 MW for the underground mini mine. And we've also now started looking at what type of renewable setup can you put to run this underground?"*
P11	*"We are currently after getting pricing to convert some aspects."*

Analysis of Executive Professionals

This group speaks more about adopting a green economy that specialises in enhancing the quality of coal. The first participant discusses carbon capture and utilisation. The executives agree that renewable energy should be embraced. Participants demonstrate intent, and some have already begun preparations. Participant 10 provides an example of a future project they plan to undertake and suggests they are investigating *"what type of renewable setup they can implement to power this underground operation."* The fifth participant discusses the transition in terms of *"offset carbon footprint."* Participant 5 implies that coal mining companies are currently soliciting bids for renewable energy projects. Participant 1 counters, "*maybe the internet writes a whole lot of nonsense, but a single volcanic eruption is equivalent to two years' worth of all the carbon that humans use on earth."* This was intended to justify why organisations may be reluctant to switch to renewable energy sources.

Comparison of Administrative and Executive Professionals

Both professional organisations shared the view that renewable energy should be embraced. However, some administrative professionals acknowledged that they were aware of the necessary changes, but their organisations did not adopt and align with any renewable strategy because it was not required.

Conclusion

The transition to a green economy and self-sufficiency is feasible, and businesses are realigning to comply with the emergence. Therefore, the first research sub-question aimed to comprehend how organisations align their strategies. From the findings, it can be concluded that organisations view renewable energy alignment as a core component of their organisational strategy, which significantly impacts the extent of implementation. As the results suggest, this may indicate the need for enterprise-wide business integration to achieve objectives. Table 19 summarises the major first-order themes across the various groups.

Table 5.19: Summary of Sub-question 1: Organisational alignment towards renewable energy transition.

Rank	Theme	Group 1: Administration	Group 2: Executives
1	Transition to green economy	High	Frequent
2	Process improvement and beneficiation	Frequent	High
3	Mergers, acquisitions, and partnerships	High	High

| 4 | Business alignment | Low | Frequent |
| 5 | Monitoring and control systems | Low | Frequent |

The key findings for the research question are summarised in Figure 5.4 below:
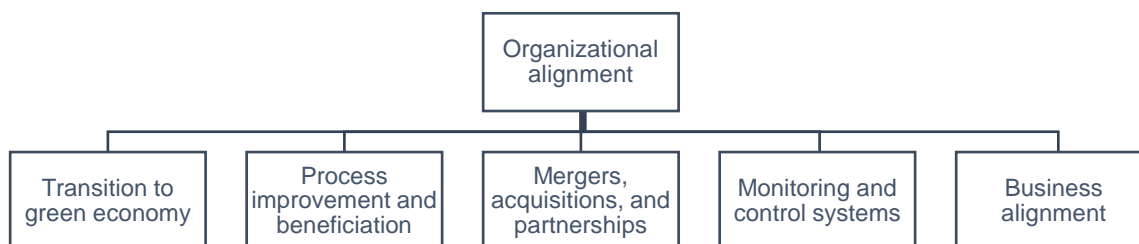
Figure 5.4: Organisational alignment to transition to renewable energy

5.7.2.2.   Process improvement and beneficiation

Participants agreed that process improvement and waste product beneficiation were crucial to the success of the strategy. Among the key codes identified in the study were producers seeking to engage in responsible coal production that would result in higher-quality coal. In addition, product beneficiation was identified as a crucial component of the strategy. Tables 5.20 and 5.21 display the illustrative quotes.

Evidence from Administrative Professionals

Table 5.20: Summary of Administrative professionals' quotes: Process improvement and beneficiation

Participant	Description of Quote
P3	*"However, there are also upsides to this whole fossil fuel thing. As an example, the power stations produce a huge amount of ash. That ash is very basic. The water inside the coal mines is very acidic. When you mix it, we've been doing experiments for four years with Eskom now, and they're now ready to roll out. When you mix the acid mine water with the fly ash, it creates pure water. No metals, no salts, nothing.*

	Out comes pure water. And the pulp is low-grade cement, so we can go and build housing with the low-grade cement. So we've been working on this project, and that is sustainable because these ash dumps are so massive, and we've got so much acid water in the Witbank area that we can continually do this, and we can build a lot of high-density housing. We can build roads with thick concrete because it's just fly ash. It's just a waste product."
P4	*"But what we are doing…a big, big thing at the moment is that we are producing higher grade coal that we are exporting to Europe because of the shortage of electricity, of power in Europe, the result of them not getting enough gas from Russia or being cut off."*

Analysis of Administrative Professionals

Beneficiation of waste has emerged as the dominant theme among administrative professionals. They appear to be more concerned with continuous coal utilisation while simultaneously enhancing processing and waste beneficiation. Participant 3 proposes using waste as a raw material for manufacturing new products. An example was pure water production by combining fly ash and acidic water. The second example was the production of cement precursors from fly ash. Participant 4 further highlights the importance of improved processing as they are exporting their products overseas, which can be perceived that their product is of high quality and is preferable.

Evidence from Executive Professionals

Table 5.21: Summary of Executive professionals' quotes: Process improvement and beneficiation

Participant	Description of Quote
P1	*"So, like I said, coal is currently our business, but we are responsible. We understand that the future is renewable."*
P2	*"We have upped our coal beneficiation in terms of crushing and washing of coal that we're specifically sending to Eskom for the power station electric generation, and we're trying to have a good quality coal sent to Eskom to reduce their own impact to the environment or to the atmosphere."*

Analysis of Executive Professionals

Participants at the executive level discuss beneficiation and responsible production. The second participant describes their coal beneficiation process in terms of coal crushing and washing. This aids Eskom in reducing waste and carbon emissions. Participant 1 indicates

that they are *"responsible"* and that *"the future is regenerative*." Their perceptions influence the subsequent theme of forming mergers and acquisitions.

Comparison of Administrative and Executive Professionals

Beneficiation is essential for both parties. The executives were focused on product processing for compliance and end-user convenience. However, as identified, the administration was also concerned with the organisations' financial gain from exporting coal to foreign countries.

Conclusion

Coal beneficiation and process improvement are essential for increasing the acceptability of coal to end users, thereby ensuring the longevity of coal usage and the survival of businesses.

5.7.2.3. Mergers, acquisitions, and partnerships

As coal mines transition from fossil fuels to renewable energy, their strategic objectives include mergers, acquisitions, and partnerships to ensure a seamless transition. These were the sentiments shared by all the participants. Tables 5.22 and 5.23 display the illustrative quotations.

Evidence from Administrative Professionals

Table 5.22: Summary of Administrative professionals' quotes: Mergers, acquisitions, and partnerships

Participant	Description of Quote
P3	*"It is part of our strategy. I've taken it up with business rescue practitioners and with Eskom, and tomorrow morning, Eskom is coming out to see their first pilot site, which is on a mine called TMBB in Witbank. And the head of the research division will be with all the scientists. We're using the University of the Western Cape. They've been developing the technology together with the Swedes and the Finns and things like that. So we're right in front of this race."*

Analysis of Administrative Professionals

Participant 3 provides comprehensive insights that speak to all codes associated with this theme. In addition, they emphasise the significance of leadership buy-in, as the *"head of the research division"* is actively engaged in processes. In addition, Eskom is portrayed as an active participant in the efforts of coal mines. Additionally, *"business rescue"* teams are engaged in the efforts*.*

Evidence from Executive Professionals

Table 5.23: Summary of Executive professionals' quotes: Mergers, acquisitions, and partnerships

Participant	Description of Quote
P1	*"We understand that the future is renewable. So what we have done strategically, the company has acquired a business. The company has actually done mergers and acquisitions. They sort of acquired a business which is already in the pipeline. It's got some projects in the country and in Africa. The project is meant to really produce green energy. So the company understands that coal will not be there for long. In the process, what the company is doing is making sure that it's setting itself for the future."*

Analysis of Executive Professionals

Coal mines are interested in Participant 1's business mergers and acquisitions, which will be widespread across international borders. The size of the investment is a result of *"the company's understanding that coal will not be available for long."* Therefore, this serves as a cushion for the future*.*

Comparison of Administrative and Executive Professionals

Both groups are involved in the formation of mergers and acquisitions. As a result, there is consistency between their statements and objectives.

Conclusion

Coal mines are aligning with the adoption of renewable energy through the formation of partnerships, mergers, and acquisitions, as demonstrated by the theme. In addition, this theme can be utilised to introduce the concept of business alignment.

5.7.2.4.   Business alignment

With the above-outlined strategies identified by participants, strategically viewing renewable energy as a business was an alignment that participants identified. The group that outlined the aspect of business alignment was the executives (Group 2). Table 5.24 displays the illustrative quotes.

Evidence from Administrative Professionals

Table 5.24: Summary of Executive professionals' quotes: Business alignment

Participant	Description of Quote
P1	*"The idea is to acquire this company so that the company can self-produce electricity. That electricity will be used by the mines. The excess electricity will then be sold to the private users and back to Eskom. So that's how the company is aligning itself so that it's not extinct going forward. Supplying coal now and aligning the future into renewables, the company is going into the renewable space as a business."*
P5	*"The other way is, you know, there's regulatory approval that's required and an agreed pricing mechanism, where we can generate power and then use some for ourselves and sell the excess into the grid or at an agreed or an agreeable selling price that makes sense for us, as well as energy producers, as well as the energy supplier, which is Eskom at an agreed price."*
P7	*"So in our mind, we think the Adjust transition is allocating capital from coal into renewable energy and owning the story, right, because I think I think it's important for the people who are incumbent in Mpumalanga to be the ones to bring the province forward. And in my mind, I see Mpumalanga as the energy hub of the country. Right? There's reticulation infrastructure there. There's grid access; there is wind and solar power in abundance."*
P8	*"Obviously, you don't want to also do this thing while it's not making economic sense because then you've also killed in the business. So we have to, I think, be quite strategic in how we implement this and when implemented as well."*
P9	*And however, the business is not delusional to say, look, this is not an area that we are not supposed to focus into. It's an area that we are now starting to try and venture into. And we lost power plant will be the first one that we will be trialling and transitioning into renewable energy."*

Analysis of Executive Professionals

Participants are aligning their businesses strategically, geographically, and financially. Participant 7 demonstrates how they have invested in Mpumalanga Province as a potential growth area due to the region's "*reticulation infrastructure,"* which will facilitate a seamless transition to renewables. Participant 9 agrees that it is not delusional for a business to assert, *"This is not an area where we are supposed to focus,"* indicating an intent to experiment with renewables. Participant 8 argues, however, that for the process to be feasible and acceptable, it must "*make economic sense; otherwise, you've also killed the business."* Participant 5 suggests that *"one cannot reinvent the wheel"* and that one should learn from those who have already attempted the process.

<u>*Comparison of Administrative and Executive Professionals*</u>

The participants were of the view that organisations are aligning their businesses to make the future easier and avoid becoming obsolete by adapting to the times.

<u>*Conclusion*</u>

The importance of business alignment is acknowledged, but it must make financial sense before being considered.

5.7.3. Change management within the organisation

RQ sub-question 2: How will you manage the transition to renewable energy?

Research sub-question 2 sought to understand strategy management within organisations. The focus was on understanding how organisations manage their strategies to embrace the transition to renewable energy. Table 5.25 displays the frequency counts for the main themes that emerged.

Table 5.25: Summary of themes: Organisational strategies regarding change appropriate for the coal mines

Rank	Theme	Abs. Frequency	Group 1: Administration	Group 2: Executives
1	Employee inclusion	16	0	16
2	Monitoring and evaluation of strategic change	8	3	5
3	Business integration	2	0	2

5.7.3.1. Employee inclusion

Participants agreed that process improvement and waste product beneficiation were crucial to the strategy's success. Among the key codes identified in the study were producers seeking to engage in responsible coal production that would result in higher-quality coal. In addition, product beneficiation was identified as a crucial component of the strategy. Table 5.26 displays the illustrative quotations.

Evidence from Executive Professionals

Table 5.26: Summary of Executive professionals' quotes: Employee Inclusion

Participant	Description of Quote
P2	*"We're not going to replace all people that leave the organisation, and we'll start by multi-skilling the operators. But instead of having more people or hiring more people, that is going to have an effect when they get laid off. We actually give multiple licenses to the current people we've got so that we can reduce or try and retain skilled people in the organisation that can operate different kinds of machinery, and in that when some of the Section 189s kick in retrenchment, it doesn't affect a huge number of people."*
P7	*"How we plan to manage this is to start building renewable energy assets, and actually potentially starting to repurpose some jobs in the coal industry into renewable energy either through construction maintenance, management of these renewable energy assets, and, and to really try and come up with a formula of how you rescale people in the coal industry to be also custodians of renewable energy."*
P11	*"It'll start off with having to educate and train employees to understand the alternatives. What the benefits are occasion of these alternative energies, be it solar vs hydrogen I think it's really one rootstock was actually educating and training employees on his own renewable sources of energy. Any I think any organisation will be able to do that."*

Analysis of Executive Professionals

Participant 2 describes the planning for change management within their organisation. Instead of hiring additional employees, they plan to improve the skills of their current workforce. Participants 7 and 11 both expressed identical sentiments. Moreover, Participant 11 emphasises the significance of sensing. Therefore, the training identified employee education as a crucial component.

Conclusion

A knowledgeable employee is deemed crucial to the planning stages of change management. Since the employees already exist, the strategy includes educating, training, upskilling, and empowering them to become self-reliant.

5.7.3.2.   Business integration

Evidence from Executive Professionals

Table 5.27: Summary of Executive professionals' quotes: Business Integration

Participant	Description of Quote
P1	*"That skill will be brought into the company, then with the resources that the company has got; we are going to be integrating the business with some of the processes. So we will acquire the skills and integrate those skills with the current company resource just to make it a full company."*
P5	*"The other way is to partner with companies from, say Europe, who are way down this technology curve, and then we become the local partners. And then we install the renewable energy infrastructure here, which then generates energy that we can put into the grid and use for ourselves."*

Analysis of Executive Professionals

Participants 1 and 5 emphasise the significance of business partnership and integration in implementing change management. Through partnerships, Participant 1 suggests a process of business-to-business transfer of skills, whereas Participant 5 identifies a sharing of resources, particularly *"technology,"* which will be utilised as *"renewable energy infrastructure."*

Conclusion

To embrace renewable energy technologies and infrastructure, coal mining companies are considering implementing business integration and partnerships. Participants imply that this process will facilitate the transfer of skills and the sharing of resources.

5.7.3.3.   Monitoring and evaluation of strategic change

Using monitoring and evaluation, organisations can track the changes within the organisation. This theme was intended to highlight the monitoring strategies that coal mining industries employ to monitor and assess their strategies. Tables 5.28 and 5.29 display the participant themes.

Evidence from Administrative Professionals

Table 5.28: Summary of Administrative professionals' quotes: Monitoring and evaluation of strategy

Participant	Description of Quote
P4	*"The only change that would be is that you would be producing higher-grade coal. It's not that different areas that we are going to mine. It is just that the beneficiation of the product."*

Analysis of Administrative Professionals

Administrative participants identify the monitoring of final products as a key performance indicator. If they are *"producing higher grade coal"* following the completion of the beneficiation process, then they will know that their process is operating effectively.

Evidence from Executive Professionals

Table 5.29: Summary of Executive professionals' quotes: Monitoring and evaluation of strategy

Participant	Description of Quote
P7	*"How we plan to manage this is to start building renewable energy assets, and actually potentially starting to repurpose some jobs in the coal industry into renewable energy either through construction maintenance, management of these renewable energy assets, and to really try and come up with a formula of how you rescale people in the coal industry to be also custodians of renewable energy."*
P9	*"So what's new come out of that risk assessment or that strategy will be able to enable us to to be able to manage the change that will come with the scaling up of renewable energy."*

Analysis of Executive Professionals

Executive professionals have identified multiple aspects of monitoring and evaluation. Risk management, waste management, and resource utilisation were important monitoring and evaluation components. The ninth participant alludes to sentiments that suggest risk assessment. The plan's second phase of monitoring progress is the construction of renewable energy assets. Through the monitoring process, it is hypothesised that they will learn how to *"upskill individuals in the coal industry to be stewards of renewable energy."*

Comparison of Administrative and Executive Professionals

According to the identified sentiments, administrative professionals are more concerned with enhancing output, whereas executive professionals emphasise monitoring the early stages of implementation.

Conclusion

Both administrative and executive professionals refer to monitoring and evaluating change as a means of sensing information that will be used to develop or modify a strategy.

5.7.4. Assessment tools for outcomes

The following question was considered in this research

> **RQ sub-question 3: How are you planning to measure the transition to renewable energy?**

Research sub-question 3 sought to understand the assessment of strategy within organisations. The focus was on understanding how organisations are aligning, measuring and assessing their strategies to embrace the transition to renewable energy. The following table presents the frequency counts for the main themes that emerged.

Table 5.30: Summary of themes: Organisational measurement of transition to renewable energy

Rank	Theme	Abs. Frequency	Group 1: Administration	Group 2: Executives
1	Financial metrices	13	3	10
2	Process performance metrices	10	2	8
3	Staffing and human capital KPIs	8	1	5

5.7.4.1. Financial metrices

The findings from the study reveal that financial KPIs are the most dominant. Participants' findings pertain to business survival, cost management, revenue generation, and creating a cost-effective business. However, all participants acknowledge that the organisations are engaged in coal mining for profit.

Evidence from Administrative Professionals

Table 5.31: Summary of Administrative professionals' quotes: Financial metrices

Participant	Description of Quote
P4	*"I think the main thing is to stay alive- that you can keep on operating."*

Analysis of Administrative Professionals

Participant 4 elucidated that the company's top priority is to *"stay alive so they can continue operating." Whether* a company adopts renewable energy or not, the decision must make business sense.

Evidence from Executive Professionals

Table 5.32: Summary of Executive professionals' quotes: Financial metrices

Participant	Description of Quote
P5	*"I think what we must not forget is renewable energy businesses and energy businesses. At the end of the day. Yes, that's correct. Yeah, it's due you must not allow yourself to be confused by the fact that says renewable energy is here to generate energy. You need to be efficient at what you do."*
P7	*"You're in the business to make money. So your IRR are important. So it's going to be an intense journey of trying to build out a robust portfolio."*
P9	*"For a mine, the biggest KPI would be say I think it should be savings on the power costs, you know, that will conserve in the amount of pay off of their monthly pay for for for for for electricity bill on their on their on their on a monthly basis."*
P10	*"You might think I'm being controversial, the same thing as health and safety in the mines. Without the mine, there's no health and safety system, but the mine is a business. So foremost people get into business to make money. And we cannot shy away from that. The question is what type of money are we making? Yes, we want green money, we want money that is sustainable. Money must not have blood; money must be environmentally okay. Money must stay within the confines of what is acceptable within commercial law, but it must still make money. And anyone who says otherwise, I think they're taking a chance. We're not an NGO; we're a business."*

Analysis of Executive Professionals

Participant 5 alludes to the need to remember the energy and renewable energy businesses. They reaffirm that the organisation will only consider renewable energy if it makes sound business sense and *"the business must generate profits."* Participant 7 concurs and adds that

they are in business *"to make money,"* and that the process of making money will be their KPI. As part of making money and maintaining profits, KPI Participant 9 reduces energy costs. Participants 10 emphasise that they *"can't just be you've got renewables, so you've kept the greenies quiet. No, it's an overall business structure for me."*

Comparison of Administrative and Executive Professionals

Comparing the sentiments expressed by both groups reveals that all participants concur that the coal mining industry exists to generate income and profits. The only business ideas that a company will adopt are those that make economic and business sense.

Conclusion

Financial KPI I is a business metric used to evaluate their performance and viability.

5.7.4.2. Process performance metrices

Participants identify process KPIs as a means of monitoring progress within a process. In addition, it is implied that process monitoring is also occurring.

Evidence from Administrative Professionals

Table 5.33: Summary of Administrative professionals' quotes: Process performance metrices

Participant	Description of Quote
P6	*"Currently, we do not have any renewable energy goals, but at some point, we will get to a point where we'll have to check our carbon emissions."*

Analysis of Administrative Professionals

Carbon emission monitoring is one of the key priority process KPIs that can be used to measure a process's sustainability, according to Participant 6. They also suggest that they *"will have to do all those related things and try to move more toward battery-operated vehicles,"* therefore, diesel levels, diesel consumption, and related emissions must be monitored.

Evidence from Executive Professionals

Table 5.34: Summary of Executive professionals' quotes: Monitoring and evaluation of strategy

Participant	Description of Quote
P2	*"We currently have community development departments that conduct audits on each and every implemented project to the community by visiting the communities*

	and measure the relevance of the different projects that we introduced into the community and also the effectiveness or the interest of the community members into the project."
P5	*"I think what we must not forget is renewable energy businesses and energy businesses. At the end of the day. Yes, that's correct. Yeah, it's due; you must not allow yourself to be confused by the fact that says renewable energy is here to generate energy. You need to be efficient at what you do."*
P7	*"Our first big KPI is how many gigawatts of power can you put on the grid in a couple of years? So we plan to build two and a half gigawatts in the next 10 years."*
P10	*"Like I said, with how we view this whole renewables issue, the big issue is around your emissions. So people are talking about cleaner energy. So it starts there. So you now need to look at what is it that you're emitting, which is not one thing at least accepted socially. So that, for me, would be an indicator to say your carbon emissions, if you are sitting at 20, you need to have a scale to say at a particular point I need to be sitting at five. So for me, you need to have a physical measure and for me it's the emissions. So all types of emissions need to be put up there to say this is where I am."*

Analysis of Executive Professionals

Among the most important process parameters identified by executive professionals are the implementation of internal audits and continuous progress monitoring. Compliance, adherence to project deadlines, and efficiency measure process performance. Participant 2 indicates that their organisation participates in a community development project and constantly monitors the project through audits, using this as a performance metric. Participant 7 states that the amount of *"gigawatts that they produce"* is used as a performance metric. Consistent with the transition process, Participant 10 states that emissions are also used to measure process performance.

Comparison of Administrative and Executive Professionals

Regarding process performance KPIs, both groups share identical sentiments.

Conclusion

Within an organisation, process performance KPIs are crucial to the organisation's viability.

5.7.4.3. Staffing and human capital metrices

This theme seeks to investigate how organisations measure KPIs pertaining to personnel and human capital. This topic has gained significance because it will highlight how organisations support their employees during the transition from fossil fuels to renewable energy. Various aspects were discussed, including job creation, training, community engagement, knowledge sharing, and measuring community satisfaction. Table 5.35 and 5.36 corresponds to the identified themes.

Evidence from Administrative Professionals

Table 5.35: Summary of Administrative professionals' quotes: Staffing and human capital metrices

Participant	Description of Quote
P6	*"It needs to be a collective effort, from big corporates to small corporates, to households. We need to start getting households to be non-reliant on fossil fuels. We know that the upfront capital is too much, but at a certain point, people need to understand that everyone needs to do their bit. So, at your house, you need to do a bit. At corporate level, you need to do a bit."*

Analysis of Administrative Professionals

Participants' KPIs were evaluated based on their level of engagement with the communities surrounding them. This also entailed sensing and educating the members of the communities. To realise the benefits of adopting renewable energy, however, participation is required from both the community and corporations operating in the renewable energy sector.

Table 5.36: Summary of Administrative professionals' quotes: Staffing and human capital metrices

Participant	Description of Quote
P2	*"As we mentioned that one of our processes is the up-skilling of employees to prepare them for the unfortunate process of Section 189 retrenchment processes, should there be a reduction in the volume due to the closure of the existing contracts with Eskom."*
P7	*"For us and our biggest KPIs, capital deployment, job creation, capacity factors, because that's also a black box, right?"*

Analysis of Executive Professionals

Participant 7 identifies "*capital deployment, job creation, and capacity factors*" as key KPIs. Participant 2 supports the sentiments of Participant 6 by stating, *"introduce different ways of the lifestyles of the community people by educating them in water-saving projects and should*

there be any water problems from the norm by creating boreholes that are solar powered rather than electrically powered." These sentiments speak towards knowledge sharing.

<u>*Comparison of Administrative and Executive Professionals*</u>

Engagement with both employee and community affairs is an indispensable component of the strategy that must also be measured. Currently, measurement procedures exist for the themes expressed.

<u>*Conclusion*</u>

Staffing and human capital metrics are deemed essential.

5.7.5. Monitoring and evaluation

The following question was considered in this research

> **RQ sub-question 4: How are you planning to monitor the transition to renewable energy?**

Research sub-question 4 sought to understand the monitoring process within organisations. The focus was on understanding how organisations monitor their strategies to embrace the transition to renewable energy. The following table presents the frequency counts for the main themes that emerged.

Table 5.37: Summary of themes: Monitoring and evaluation

Rank	Theme	Abs. Frequency	Group 1: Administration	Group 2: Executives
1	Monitoring systems and diesel usage	20	5	15
2	Leadership buy-in for monitoring projects	2	0	2
3	Employees buy-in for monitoring projects	2	0	2

5.7.5.1. Monitoring systems and diesel usage

This section suggests themes that will be used to identify the monitoring of processes. Diesel consumption reduction was one of the key outstanding themes. Participants identify diesel use

as one of the leading contributors to carbon emissions, alongside coal pyrolysis. The themes that emerged from the research question are presented in Tables 5.37 and 5.38.

Evidence from Administrative Professionals

Table 5.37: Summary of Administrative professionals' quotes: Monitoring systems and diesel usage

Participant	Description of Quote
P4	*"The only way we would be able to do it is to see, you know, look at how much energy you are using, where you can reduce, and that sort of thing."*
P6	*"We'll have milestones to say that we will put up this initiative to make our contribution into the renewable energy effort of the country."*

Analysis of Administrative Professionals

The adoption of renewable energy within the organisation is gradual, according to Participant 6. These stages are regarded as *"milestones"* and a method for tracking progress. Participate 4 explores the concept of utilising monitoring to develop a strategy. As they suggest, understanding their energy consumption will help them determine where to reduce or optimise. *"Power factor correction equipment,"* which can be used to monitor electricity consumption, is one of the machines proposed.

Evidence from Executive Professionals

Table 5.38: Summary of Executive professionals' quotes: Monitoring systems and diesel usage

Participant	Description of Quote
P5	*"We monitor our carbon footprints; we also procure from carbon clever businesses. And then also, we are very careful to make sure that our businesses don't fall behind."*
P8	*"Myself and that a colleague of mine we keep track of that to ensure that all the projects we developing are in line with that tokenisation of lines and on track, and we develop them in the budget as well."*
P10	*"I think firstly when you know there's two components to it. There's the productivity component, and then there's the profitability component and profitability one we'd have to compare the bottom line to during before the transition and during the transition whereby we initially all the bulk of our energy costs are diesel. And once the transition starts, one will then have to monitor the cost of running the equipment with alternative energies."*
P11	*"I think firstly when you know there's two components to it. There's the productivity component, and then there's the profitability component and the profitability one we'd have to compare the bottom line to during before the transition and during the*

	transition whereby we initially all the bulk of our energy" costs are diesel. And once the transition starts one will then have to monitor the cost of running the equipment with alternative energies."

Analysis of Executive Professionals

Participant 5 demonstrates that their organisation is acutely aware of the emergence of renewable energy and has vowed not to *"fall behind."* Participant 11 adds that *"it is essential to monitor… I believe initially when you realise there are two components to it."* There is both a productivity component and a profitability component. Since coal mines are in the mining industry for economic reasons, these are regarded as KPIs. Participant 10 introduces the concept of using *"OEMs."* Since it is believed that renewable energy must utilise lithium-powered batteries, it was suggested that battery performance and storage capacity be consistently monitored. Participant 9 identifies gaining people's support for implementing renewable energy as one of these milestones. They suggest that they are still "in an infantile state at present. *"The business has not yet been intentional enough towards moving towards renewable energy. I think the cost of growing or going solar completely will outweigh any business costs. I think this is more expensive."* In addition to contributing to *"tokenism,"* Participant 8 emphasises the importance of monitoring when preparing a budget.

Comparison of Administrative and Executive Professionals

The perspectives expressed by both groups are consistent. Monitoring is essential, as is monitoring diesel consumption. Monitoring diesel consumption is deemed essential because it will be utilised when businesses adopt renewable energy (reducing carbon emissions).

Conclusion

Each group identifies usage and productivity monitoring as crucial monitoring and control system components. Through this monitoring activity, budgets and strategies can be developed.

5.7.5.2.   Leadership buy-in for monitoring projects

Evidence from Executive Professionals

Table 5.39: Summary of Executive professionals' quotes: Leadership buy-in

Participant	Description of Quote
P1	*"It's not the first time that the company went into mergers and acquisitions. Our leadership team, they've got a lot of experience with regards to acquiring businesses. The company acquired Anglo American; they've recently acquired the SIAC."*
P8	*"I would say that is probably lacking because there isn't a person dedicated to doing that, an M.D., I would say, is because we are a young team."*

Analysis of Executive Professionals

A crucial aspect of monitoring the performance and development of a project is the involvement of leadership in its execution. As Participant 1 highlighted, leadership brings experience. This experience can be utilised to identify areas of advancement or concern. As the project is still in its infancy, Participant 11 echoed these sentiments, stating that monitoring experience is lacking and no one with relevant experience is available to serve as the project's steward.

Conclusion

It has been determined that leadership participation is essential when monitoring a project.

5.7.5.3.   Employees buy-in for monitoring projects

Monitoring the company's skills is also identified as a theme supporting the research question. This monitoring will also inform the company of the end-proficiency users in interpreting and operating the equipment.

Evidence from Executive Professionals

Table 5.40: Summary of Executive professionals' quotes: Employees' buy-in

Participant	Description of Quote
P1	*"So the intention is to leverage on the skills that the company has with regards to the mergers and acquisitions. Already the company has got processes, and they've got key deliverables that they've got in place to measure the success and to monitor."*

P10	*"The other monitoring point is through this feedback where the guy that utilises this thing is also a monitor because he's going to tell you that, you know what, you said this much, it's not we need to look at this. This is the consumer; this is the user. So, you need both these people to help you to monitor the whole thing. Because monitoring doesn't mean that I've designed the car. I know how it works. No, I'm the driver of the car and that will probably be the most important feedback that you require or the most important monitoring point. Because they must face it. They can tell you if there's any other dips, what causes the dip, if it's too cold, what happens to your supply, how long can this battery run?"*

Analysis of Executive Professionals

Participant 1 identifies skills transfer via acquisitions and mergers as crucial to adopting renewable energy. Furthermore, as alluded to, the organisation already possesses *"key performance deliverables"* that will be employed to *"measure the success"* of implementation. These sentiments further support Participant 10's assertion that equipment operators can be utilised as performance monitors. Overall, this would highlight the significance of workforce upskilling. With this sentiment in mind, the third research question explores how the organisation intends to implement an inclusive strategy for its employees.

Conclusion

Employee involvement is identified to be essential when monitoring a project is involved.

5.7.6. Conclusion of research question 2

As far as business alignment is concerned, most coal industry organisations are still in their infancy. The research questions under research question 2 reveal that the strategy alignment process begins with a brainstorming phase, with the intent and willingness to implement. This phase is followed by the implementation phase, which involves top-down management and implementation of the strategy. There are stages of measuring success and monitoring it after deployment. The distinctive feature of the described strategies is that all stages are interconnected. Yes, in stages, but none can function without reference to the preceding stages, which is part of the realignment and reshaping of strategies process. This would imply that the initial goal was to adopt 100% renewable energy, but feasibility studies and the availability of resources prompted coal miners to shift their focus to a *"just transition"* because there is an abundance of coal and the possibility of obtaining *"clean emissions."* The absence of *"battery storage"* capabilities also contributed to the realignment. As demonstrated below, a conceptual block diagram can be used to generate a conceptual model.

The key findings for research sub Q2: enablers are summarised in Figure 5.4.

Table 5.41: Summary of themes: Strategies put in place by coal mines

Rank	Theme	Group 1: Administration	Group 2: Executives
1	Transition to green economy	Medium	Frequent
2	Process improvement and beneficiation	Frequent	Medium
3	Mergers, acquisitions, and partnerships	Medium	Medium
4	Business alignment	Low	Frequent
5	Monitoring and control systems	Low	Medium

The key findings for the research question are summarised in Figure 5.4 below:
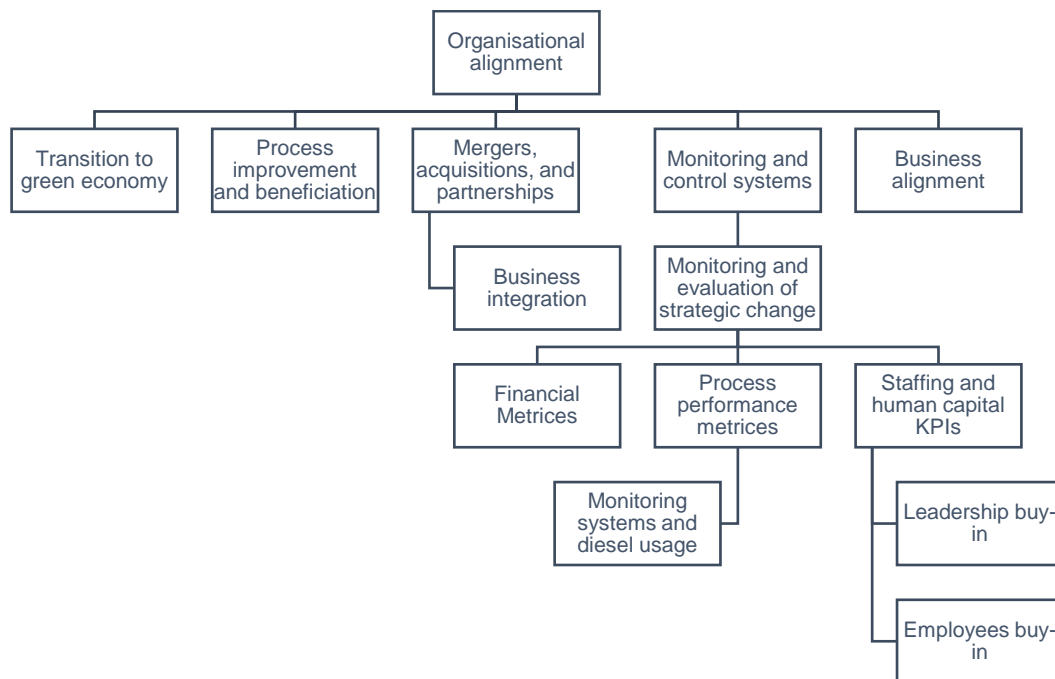

Figure 5.4: Organisational alignment to transition to renewable energy

It is evident from the diagram that monitoring and measuring KPIs will be crucial for good alignment. In addition, business integration will be required for a seamless transition to renewable energy technologies and skills transfer.

5.8. Findings: Research question 3

The following question was considered first in this research:

RQ 3: How are these coal mines upskilling their employees with suitable renewable energy skills?

The third research question would assist in identifying the necessary skills and competencies for transitioning to renewable energy to ensure that the affected employees are appropriately upskilled. Mining firms face a challenge in keeping up with the rapid pace of technological advancement in renewable energy sources. While technology creates powerful business opportunities, it also creates skills gaps, where skilled workers are in short supply, and certain skills may become redundant. This research question addresses the issue and determines how coal miners intend to increase their workforce's skill level. Improving current employee skills and acquiring new skill sets while integrating across functions are themes that emerged in response to this question and are central to organisational strategy.

The participants described the extent to which disruption in the energy generation sector will impact coal producers and how producers intend to mitigate the difficulty of addressing the skills gap while retaining their current workforce. According to the identified themes, an organisation's ability to upskill, or its capacity for training and developing its employees to expand their skill sets, creates a significant competitive advantage in its industry. Significant findings are presented in the sections that follow.

Table 5.42: Summary of themes: Research question 3

Rank	Theme	Abs. Frequency	Group 1: Administration	Group 2: Executives
1	Knowledge sharing and advancement	7	1	6
2	Employment creation and outsourcing	5	1	4
3	Training	5	2	3
4	Business integration and skills transfer	2	1	1

5.8.1. Knowledge sharing and advancement

All participants agreed that the adoption of renewable energy would necessitate the creation of knowledgeable employees and the enhancement of existing skills within the organisation and community. The illustrative participant quotes are presented in Tables 5.43 and 5.44.

Evidence from Administrative Professionals

Table 5.43: Summary of Administrative professionals' quotes: Knowledge sharing and advancement

Participant	Description of Quote
P4	*"That is part of your mining rights, as well as your mining license. If you've got a Social and labour plan, and one of the things in there is that you must upskill your people."*

Analysis of Administrative Professionals

Participant 4 emphasises the administrative necessity of upskilling employees as a requirement of their *"Social and labour plan."* As they perceive it, empowering the workforce with improved and expanded knowledge is crucial. This theme resonates with the views of Participant 5, who elaborates on the importance of creating knowledgeable workers.

Evidence from Executive Professionals

Table 5.44: Summary of Executive professionals' quotes: Knowledge sharing and advancement

Participant	Description of Quote
P5	*"So, we cannot emphasise change if there is no involvement of employees; they also need to understand why we need to go green."*
P9	*"We want to upskill a select few. Look, I think renewable energy will not necessarily bring thousands and thousands of jobs."*
P10	*"We want people that can read and write, notwithstanding that we are busy trying to assist people to get to the Matric level, including the ones that are employed now. So as we speak, there are guys that do not have Matric, but we are busy through the process to get them to that. It's important that people learn how to read and write. Once that is done."*

Analysis of Executive Professionals

Participant 5 discusses the necessity of producing knowledgeable workers. They reiterate that employees must *"understand why we need to go green"* and why the company is transitioning to a greener business model. As Participant 10 alluded to, various qualifications are

considered part of the upskilling process, i.e., *"Matric level".* The participant emphasised, *"it's important that people learn how to read and write."* Participant 5 suggested a procedure that can be comprehended by well-equipped employees. In addition, it demonstrates that the organisations are transitioning to hiring knowledgeable individuals and assisting current employees, as Participant 10 explains that they are *"busy trying to assist people to get to the Matric level, including the ones that are employed now."* Participant 8 highlighted one of the primary reasons for upskilling, stating that they need *"skilled workers"* as they venture into *"green energy"* and *"pyrolysis"* projects, which have few practitioners. Participant 7 highlighted how they would *"start in the development and construction of renewable energy assets"* in their mitigation plan. According to their perception, there are *"massive opportunities for synergies"* where scarce *"engineering skills"* can be outsourced. The transition of jobs from coal to renewable energy can be assisted by the same engineers in the coal mining industry by *"using the artisans with skills in construction and development to help."* From an outsourcing perspective discussed in the next section, Participant 10 gave an example of how they outsource skills and services to upskill their workforce, *"had to take five control room ladies with no Matric"* and the *"first challenge was to get them to a Matric, which they've done. Now, these guys were never exposed to a computer. So the second challenge was to get them through a computer course, which they've done."* The aim was to say to the ladies, *"here's the programme; you need to interpret it."* From their sentiments, creating a knowledgeable employee benefits not only with upskilling but also with reduced decision-making time as all parties involved understand what needs to be done.

Comparison of Administrative and Executive Professionals

To adhere to predetermined laws, regulations, and organisational plans, administrative professionals engage in upskilling and educating employees. Similarly, executive professionals view creating knowledgeable workers as enhancing employees' soft skills for future job opportunities, whether within or in a different organisation.

Conclusion

There is synergy between the sentiments of the two groups of professionals that there is a need to create a knowledgeable employee with adequate or superior skills for the position. This would benefit both organisational compliance and employee participation via individual development.

5.8.2. Employment creation, training and outsourcing of skills

To upskill employees, it has been determined that skills, typically acquired through education or experience, are vital. As identified by the participants, these include soft skills such as communication and hard or technical skills such as computer programming. It is recommended that individuals acquire skills to perform their job duties competently and assume other positions within the industry. This can be accomplished through practice, dedication, and the pursuit of an apprenticeship or internship, on-the-job training, reading relevant books, and attending classes. In Tables 5.45 and 5.46, illustrative participant quotes are presented.

Evidence from Administrative Professionals

Table 5.45: Summary of Administrative professionals' quotes: Employee creation, training, and outsourcing

Participant	Description of Quote
P3	*"For employees, going forward, the companies need to get into a position with maybe a bit of help from the government in installing more and more and more of these solar systems because solar in Mpumalanga seems to be the right way."*
P6	*"We do training. We have outsourced quite a bit of the training as well. And our people trained in other things you could be; they could be like bricklaying, painting, safety, health and safety, and environmental skills. They can go into that. And then also farming - use subsystems farming. There are quite a few other things that they can do when the mining comes to an end. So yes, there's upskilling."*

Analysis of Administrative Professionals

Administrative experts have emphasised the significance and necessity of outsourcing necessary skills. Participant 6 views outsourcing as the acquisition of individuals who train employees on soft skills and equip them with talents they can use outside the workplace. *"Bricklaying, painting, safety, health and safety, and environmental skills"* are highlighted as some of the skills. Additionally, the community benefits from these outsourced skills, as some training may result in the creation of employment opportunities not only for mine employees but also for community members. Participant 6 provides the example of *"farming,"* which will be used as a community development strategy and employment creation vehicle. Participant 3 corroborates these sentiments by suggesting that collaborative efforts and government partnerships can be utilised to increase employment opportunities.

Evidence from Executive Professionals

Table 5.46: Summary of Executive professionals' quotes: Employee creation, training, and outsourcing

Participant	Description of Quote
P1	*"We will be acquiring skills, but the plan is also to integrate the new business with the current resources."*
P5	*"And then the others we will have to, like I mentioned, if we are buying into an already existing renewable energy business, it comes inherently with the skill set."*
P7	*"There are host communities live there. And we really want to be part of that transition story in the province that we operate in. So our skills are going to be procured from the province and we intend to use people in local communities to help us build this business."*
P9	*"I think from a mining perspective, the biggest thing that probably a mine can do when it comes to upskilling the employees, it will be probably on training and to be able to hire to to to deal with these solar plants or any other renewable energy strategy that we may come with."*
P10	*"So already what we've done is in the past, we never specify in terms of absorption of people in the business at the level of qualification. So what we are doing now, your minimum entry to the mine is a Matric. And we do that because we want people that can read and write."*

Analysis of Executive Professionals

Executive professionals have highlighted the importance of training. Participant 1 describes the purpose of training. In addition to acquiring new skills, they intend to integrate the new business with their existing resources. This demonstrates an awareness of business integration, resource sharing for training purposes, and utilisation of current resources. The ninth participant concurs with the sentiments. They elaborate on how this training plan and business acquisition is part of their organisation's *"other renewable energy strategy."* A portion of the training, excluding that which is outsourced, is proposed to be provided by combining current fossil energy employees with acquired renewable energy business employees. They suggest, *"if we acquire an already-established renewable energy business, the requisite skill set is included."* This would facilitate the transfer of skills.

Comparison of Administrative and Executive Professionals

Both groups agree that the same training programmes are strategically adaptable for their respective organisations. Therefore, employees' outsourcing, training, and upskilling are deemed essential to achieving their strategic objectives.

Conclusion

It is suggested that employees acquire valuable industry skills to help them succeed in their current and future roles. In addition to having the knowledge necessary to perform your job duties, developing a specific skill set can be crucial for achieving higher performance levels. Developing an effective plan for acquiring new abilities and advancing one's career can be facilitated by understanding how to acquire skills. This research theme discussed the significance of acquired skills, provided examples for various industries, and outlined how to acquire skills.

5.8.3. Collaborative learning and skills transfer

The concept of collaborative learning and skills transfer frequently appeared in the findings. Participants addressing this theme alluded to the fact that upskilling employees does not necessarily necessitate a change in the business model; rather, a process of business integration and collaborative learning can be used to absorb existing skills in the renewable energy space and channel them towards empowering employees. Tables 5.47 and 5.48 contain quotations for illustrative purposes.

Evidence from Administrative Professionals

Table 5.47: Summary of Administrative professionals' quotes: Collaborative learning and skills transfer evaluation of strategy

Participant	Description of Quote
P6	*"The bulk of our employees should be able to open to other commodities because it's a simple, straightforward, opencast mining. And that's what we are doing currently. So they should be able to move across."*

Analysis of Administrative Professionals

The sixth participant describes the current roles of mining employees and introduces the idea that similar modes of operation will not prevent their migration to renewable energy because

they should be *"able to move across."* They also emphasise that *"the methods are essentially the same"* and that *"the transition will be difficult for them."*

Evidence from Executive Professionals

Table 5.48: Summary of Executive professionals' quotes: Collaborative learning and skills transfer evaluation of strategy

Participant	Description of Quote
P1	*"The plan is also to integrate the new business with the current resources."*
P1	*"Some of our employees will be introduced into the new company so that the current guys with skills can transfer their skills to the current employees. So as the business grows, the idea is to transfer, as time goes, transfer the current skills to the new company."*

Analysis of Executive Professionals

Participant 1 suggests that some of their *"employees will be introduced into the new company so that the current skilled men can transfer their skills to the current employees."* In addition, as a method of continuous improvement and growth, as the business expands, the current skills will be transferred to the new company as time passes. These were sentiments to solidify their intent to integrate the new business.

Comparison of Administrative and Executive Professionals

Collaborative learning and the transfer of skills were mentioned across all participant groups as a factor that determines how upskilling will be implemented.

Conclusion

Overall, the findings indicated that the focus on collaborative learning and the transfer of skills was one organisations seek to upskill their employees when it comes to adopting renewable energy.

5.8.4. Conclusion of research question 3

Improved qualifications will help the mining industry address current and future workforce challenges. Organisations identify talent searching and improvement as important to survive in the face of increasing ambiguity. In other words, as highlighted, they require employee skill

development. To thrive, businesses must unlock the power and potential of all talent, including women, socioeconomic backgrounds, and those with varying physical and cognitive abilities. That is, they require inclusion. According to the findings, there is no hierarchical relationship between the three themes; one cannot exist without the other.

The objective of the third research question was to determine how companies upskill their employees. From the findings, it can be concluded that the organisations' attitude toward incorporating employees into their strategy, i.e., whether the adoption of renewable energy is viewed as a core component of the organisation's strategy or not, plays a crucial role in determining the extent to which employees are incorporated. In addition, appropriate leadership motivation and buy-in are required. Furthermore, a shared value perspective and progressive approach are required. Based on the results, this may suggest the integration of functions across the organisation to achieve organisational objectives and the upskilling and training of employees. As identified, everything can be accomplished using a top-down model, whereby leadership will trickle down to the employees. Figure 5.5 shows a conceptual model used to answer research question 3

Table 5.41: Summary of themes: Employee inclusion mechanisms

Rank	Theme	Group 1: Administration	Group 2: Executives
1	Knowledge sharing and advancement	Low	Frequent
2	Employment creation and outsourcing	Low	Medium
3	Training	Low	Medium
4	Business integration and skills transfer	Low	Low

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│                                         │
│      Employee upskilling mechanisms     │
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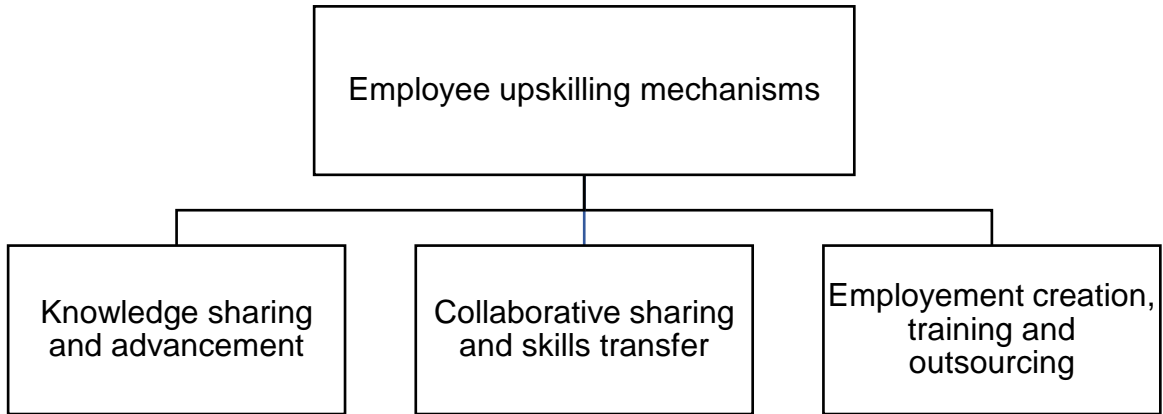| Knowledge sharing and advancement | Collaborative sharing and skills transfer | Employement creation, training and outsourcing |

Figure 5.5: Conceptual model of employee upskilling mechanisms

The next chapter will discuss the results of the study.

Chapter 6: Discussion of Results

6.1. Introduction

In chapter 6, the research findings will be discussed in depth from the analysis of the semi-structured interviews presented and analysed in chapter five. The enlightenment acquired through the investigation analysis is presented in this chapter, compared and set off against the concepts and constructs presented in the literature review in chapter two. The results will be discussed concerning each research question to gain an accurate and deep understanding of the impact of renewable energy on the strategies of coal mines in South Africa and offer new insights that are not yet explored in the literature review. The relevance of the results and the literature concerning this study are reviewed in the following sections.

6.2. Discussion of results for research question 1

How are coal mines repositioning their strategies for the socio-technical transition to renewable energy?

Research question 1 sought to identify how the participants understood coal mines' strategies to align their operations with the transition to renewable energy. Although research has been conducted on socio-technical transitions to renewable energy, the researcher could not find empirical research that precisely focused on the coal mines' strategy for socio-technical transition to renewable energy. This research will therefore expand this area of the literature. The research question is discussed subject to the themes that emerged through the analysis of the results.

6.2.1. How coal mines are repositioning their strategies for the socio-technical transition to renewable energy

6.2.1.1. Fossil fuels still dominant

All participants spoke about the movement towards renewable energy and highlighted that it is possible; however, fossil fuels remain the primary source of sustainable energy. One participant stated, *"We don't need renewable energy because we have so much coal,"* which is said to be finite. However, there is *"still a long way to go"* for the coal industry to completely transition to renewable energy. This is in line with the literature on transitions that states that socio-technical transitions take many years before they can disrupt the existing systems (Sengers et al., 2019). Another participant supported the statement and stated, *"fossil fuels should not be abandoned immediately"* because they are used to power South Africa's base

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load. One participant expressed that the international community advocated for the transition to renewable energy and asked why coal producers should be pushed almost instantly to be fully on renewables. The literature refutes that sentiment because it suggests that cross-country comparisons to identify the factors and structural similarities for developing essential strategies and policy guidelines are critical for transitioning to a low-carbon economy in South Africa (Jakob et al., 2020). One participant stated, *"renewable energy should partner or work alongside fossil fuels"* because the coal industry will not easily "*walk away from fossil fuels overnight."* Another participant agreed with the sentiment that renewable energy should form partnerships with fossil energy producers. The literature supports the view because it suggests that the coal sector in South Africa plays a significant role in the socioeconomic landscape of the country (World Bank, 2019; Wright & Calitz, 2020b). Another participant also aligned with the previous participant's views and suggested that the move to renewables, whilst other countries are building power stations is *"the European countries trying to secure their energy for the future."* One participant believed that transitioning to *"green energy"* was the appropriate and good thing to do, *"contrary to popular belief,"* however, they viewed renewable energy as a solution that would *"solve the country's entire energy crisis."* In addition, they expressed that they did not consider renewables a *"silver bullet"* strategy to curb the energy crisis. Furthermore, they highlighted that economic challenges might also be the delay in renewable energy. This confirms the literature, which suggests that as much as climate change objectives and solutions are essential, they cannot be excluded when dealing with pressing issues concerning low-carbon and energy efficiency because they are interlinked with socioeconomic challenges in South Africa (Jakob et al., 2020).

6.2.1.2. Transition to renewable energy

As already pointed out above, participants under study in every case sought to identify that there was a market need with their current business models. One essential factor in determining new opportunities was strategically viewing renewable energy sources as a business. This reinforced the findings of Uhl-Bien and Arena (2018), who indicated that organisational adaptation is when an organisation has the potential to understand that there is a need to change and take hold of the opportunities in the rapidly changing business environment. The majority of participants also indicated that as part of the transition to renewable energy, they plan to install renewable energy facilities such as Solar PV and Wind farms, which they would use to generate electricity to supply their coal mining operations and sell the excess electricity to private users. Participants further highlighted that their businesses are not delusional and that renewable energy is not an area they are not supposed to focus on; therefore, they have already started to venture into the renewable energy business.

This supports the idea that the organisation's leaders must focus on the rapidly changing environment to ensure that their organisations are aligned with the change (Birkinshaw et al., 2016). The participants expressed that as part of leadership in their respective organisations, they felt the need to initiate ideas and shift the focus to the renewable energy market in order to ensure that their coal mining organisations are aligned with the transition to renewable energy. This idea is in line with the literature because organisations need to sight and evaluate emerging opportunities in order to take hold of the value that comes with emerging opportunities, which will then enable the organisations to restructure their organisations to align them with the transition and remain competitively sustainable (Teece et al., 1997; Teece, 2012).

In five of the cases, the participants ensured that employees and different departments in their coal mining organisations clearly understood the decision to strategically view renewable energy as a business within their organisations before they could venture into the renewable energy space to ensure the long-term organisational objectives were realised. The literature supports their perspective because several authors indicated that certain leadership actions need to be understood to set the organisation in motion for organisational adaptability to achieve long-term organisational goals (Lopez-Cabrales et al., 2017; Schoemaker et al., 2018; Teece, 2012).

6.2.1.3.   Responsible mining

All participants agreed on the issue of responsible mining because it accommodates and respects all the parties involved in terms of stakeholders and reduction of environmental impact and recognises equal distribution of economic benefits. This is in line with the literature of an author who addressed different types of systems. The author looked at systems where there is an interaction between nature and society, then socio-technical systems, and then a system that involves goods and services being distributed to the entire population of a country and a system that consists of the economy of cities and the whole population of the country (Røpke, 2016). The participants also indicated that the government and affected communities are involved in a just transition process which promotes stakeholder engagement. This supports O'Brien's (2018) emphasis that a multi-level perspective framework focuses more on the practical arena without ignoring the political and cultural arenas.

Furthermore, the participants spoke about monitoring the production activities and installing systems that would monitor unnecessary idling of the production machines in order to reduce carbon emissions from diesel-operated mining machines. This supports the literature stating that socio-technological literature does not mention much about inequality, poverty, and work conditions, but it says much about environmental sustainability systems (Jenkins et al., 2018).

One participant stated, *"we only operate the machines for the volumes that we want to produce, and all the other machines must be switched off and parked if they are not going to contribute to the production."* Participants agreed that there is a gap between renewable energy sources and fossil fuels, and that the general perception of fossil fuels is that fossil fuels are harmful. Another participant stated, *"because I think the narrative out there is that coal is bad, coal miners are bad, irresponsible, but contrary to that, we are not. The reality is there is an agreement that there needs to be an energy mix."*

6.2.2. Summary of the discussion of research question 1

Research question 1 focused on how the coal mines are repositioning their strategies for the socio-technical transition to renewable energy sources in South Africa. The research findings illustrated that there is a common understanding in the coal mines regarding repositioning strategies for change to renewable energy sources. A mutual agreement was acknowledged, which incorporated the idea that a socio-technical transition to renewable energy is necessary due to the impact of fossil fuels on the environment, the fact that different phases of implementation are necessary, and the significance of long-term vision and communication. Many ideas surfaced through the data analysis indicating common perspectives from different individuals; hence, most of the arguments about repositioning strategies for socio-technical transition supported the current literature. This supports the views of Engle (2011), who indicated that for a transition to happen within the timeline proposed by the IPCC, the transition to a low-carbon economy needs speedy and thorough changes to occur in nearly all industrial and industrialising societies.

6.3. Discussion of results for research question 2

6.3.1. What practices and strategies have these coal mines put in place?

This research question attempted to identify what individuals understood about the practices and strategies that the coal mines in South Africa have implemented to align their organisations with the socio-technical transition to renewable energy. Research has been conducted on transitions to renewable energy. However, the researcher could not find research that accurately focuses on the practices implemented by coal mines to align their strategies with socio-technical transitions to renewable energy. Therefore, the discussion of this research question will be based on the themes that emerged during data analysis in chapter five.

6.3.2. What practices and strategies have the coal mines put in place

6.3.2.1. Transition to green economy

Participants agreed that it was possible to revisit their strategies and align them with the transition by considering low-carbon economy initiatives. This is in line with the views of Uhl-Bien and Arena (2018), who indicated that organisational adaptation is when an organisation has the potential to understand that there is a need to change and take hold of the opportunities in the rapidly changing business environment. They stated that moving towards renewable energy sources was essential to achieve environmental sustainability, which is good for everyone. One participant highlighted the issue of clean air as a significant aspect to consider. However, the participants highlighted the high cost of installing renewable energy facilities. They reiterated that the costs were extremely high and agreed that fossil fuels would still dominate the energy sector for many years. Participants also spoke about cleaner coal as an essential factor that should be considered. It was also mentioned that some mines had already started preparations for green energy projects in the pipeline. However, some participants were reluctant to move away from coal.

6.3.2.2. Process improvement and beneficiation

Using waste material to manufacture new products emerged as one aspect that some participants were willing to consider for their organisations. One participant mentioned water production as a suitable example for the proposal. Improved processing at coal washing plants was essential because the export market demanded high-quality products for their coal-fired power plants in Europe. Participants also spoke about the responsible production of coal to reduce carbon emissions on their mining pieces of equipment. One participant brought up the issue of improved technology at their coal beneficiation plant in order to improve the quality and achieve cleaner coal. The literature supports this view because the importance of absorptive capacity is that it has the ability to convert new ideas and skills into technological progress (Kash, 2010).

6.3.2.3. Mergers and acquisitions

Several participants spoke about the issue of mergers and acquisitions in supplying mining operations with renewable energy. The participants indicated that they could use mergers and acquisitions to offset their carbon footprints and sell the excess power they generate back into the grid. This points to the view of several authors who indicated that the organisation's executives are responsible for sighting new opportunities and ensuring that organisational objectives are realised from identified opportunities (Birkinshaw et al., 2016). One participant expressed their organisation had already acquired a three-and-a-half GW pipeline of

renewable energy assets to build wind and solar PV facilities in Mpumalanga Province, where most of their operations are situated, and also due to the availability of reticulation infrastructure and several Eskom coal-fired power stations already in place, which will make access to the grid easy. This supports the view of Uhl-Bien and Arena (2018), who indicated that enabling leaders can bring about an adaptive process within an organisation.

Three participants spoke about acquiring existing businesses that have already gone through the learning curve and learning with them as they are already in the implementation phase. One participant even shared, "*we want to partner with companies from Europe, who are way down this technology curve, to become the local partners. There are already companies that are further down, that have been in the renewable space for twenty to thirty years.*" This is in line with what some authors expressed because the literature suggests that decisions regarding organisational change need to be taken, so that essential factors such as knowledge, competencies, resources and commitment are appropriately handled for an organisation to realise a successful change process (Al-Haddad & Kotnour, 2015). The participant's notion that the coal mining organisation must merge or acquire companies that are already in the renewable energy space was further supported by another participant, who stated, *"they are further down the curve in terms of having some intellectual property in the renewable energy space, and we can participate in that space from an African clean energy production space and tap in as their local partners."* The other participant also supported the idea and frequently expressed *"we need to enter into power purchasing agreements with independent power producers, especially wind power to increase the capacity factor of renewable energy sources into operations."* This literature supports this notion because the organisation's leaders are responsible for ensuring that the organisation is appropriately positioned and capable of adapting to changing business environments to remain competitively sustainable (Schoemaker, 2018).

6.3.2.4. Business alignment

Participants spoke about aligning their businesses with the transition so that factors such as strategy, geography and finances are covered. This supports the views of two authors who indicated that nationally, adaptive capacity is determined by considering several factors such as society, economy, material resources and infrastructure, information technology and communication systems, human and social capital, and wealth and financial resources (Yohe & Tol, 2002). One participant indicated that Mpumalanga Province was the ideal province for their strategy due to its geographical location and the energy sector's infrastructure. The participants expressed the growth potential in the province as a factor that would come in handy. Furthermore, they indicated that it would be easier to connect to the national grid in

Mpumalanga, given the number of Eskom power stations in the area. This is in line with the literature because leadership within an organisation is responsible for ensuring that the organisation is appropriately positioned and capable of adapting to changing business environments to remain competitively sustainable (Schoemaker, 2018). All participants acknowledged the idea of aligning their businesses with the transition. However, they highlighted that the business part should never be forgotten because the organisations should still generate revenue.

6.3.3. Summary of the discussion of research question 2

Different participants expressed mutual understanding regarding the issue of viewing renewable energy sources as a business, although they had different strategies. Alignment of the organisations with dynamic market environments was also common among the individuals. It was in line with the views Uhl-Bien and Arena (2018) expressed in the current literature. Furthermore, the findings concerning mergers and acquisitions supported the literature that organisations should be appropriately positioned and capable of adapting to dynamic business environments to remain competitively sustainable.

6.4. Discussion of Results for research question 3

6.4.1. How are these coal mines upskilling their employees with suitable renewable energy skills?

This research question sought to assist in identifying the necessary skills and competencies for transitioning to renewable energy to ensure that the affected employees are appropriately upskilled. Coal mining organisations face a challenge in keeping up with the rapid pace of technological advancement in renewable energy sources. While technology creates powerful business opportunities, it also creates skills gaps, where skilled workers are in short supply, and certain skills may become largely redundant. This research question sought to address the issue and determine how coal miners intend to increase their workforce's skill level, improving current employee skills and acquiring new skill sets while integrating across functions. The research question is discussed subject to the themes that emerged through analysing the results in chapter five.

6.4.2. Knowledge sharing and advancement

All participants agreed that the adoption of renewable energy would necessitate the creation of knowledgeable employees and the enhancement of existing skills within the organisation and community. This notion supported the view of Watad (2019), who indicated a relationship between organisational learning and change because, by learning, individuals change how they see things due to the vast knowledge gained. A director emphasised the administrative

necessity of upskilling employees as a requirement of their *"social and labour plan."* In their view, empowering the workforce with improved and expanded knowledge is crucial. This notion resonated with the views of one participant, who elaborated on the importance of creating knowledgeable workers. This is in line with the literature by Klingenberg and Rothberg (2020). They expressed that gaining knowledge is part of the learning process because the more individuals within an organisation learn, the easier it becomes to adapt to changes. The participants reiterated that employees must *"understand why we need to go green"* and why the company is transitioning to a greener business model. This points to the view of Kash (2010), who indicated that the organisation or society's absorptive capacity plays an essential role in enabling such an organisation or society to identify the importance of new ideas or technologies that will eventually be introduced into the organisation or society, and utilised to produce new products and services.

A participant hinted that various qualifications are considered part of the upskilling process, i.e., *"matric level".* Another emphasised, *"it's important that people learn how to read and write."* The participant again suggested a procedure that can be comprehended by properly equipped employees. The participants demonstrated that the organisations are transitioning to hiring knowledgeable individuals and assisting current employees. It was explained that they are *"busy trying to assist people to get to the Matric level, including the ones that are employed now."* The literature supports the views of the participants because authentic leadership allows the followers to learn and be motivated during the change process, which leads to a successful implementation of the change (Bernerth et al., 2007; Battilana et al., 2010; Kotter, 1996; Rafferty et al., 2013). The renewable energy development and strategic implementation executive highlighted one of the primary reasons for upskilling, stating that they needed *"skilled workers"* as they venture into *"green energy"* and *"pyrolysis"* projects, which have a few practitioners. A participant highlighted how they would *"start developing and constructing renewable energy assets"* in their mitigation plan. According to their perception, there were *"massive opportunities for synergies"* where scarce *"engineering skills"* could be outsourced. The majority of participants expressed that the same engineers in the coal mining industry can assist the transition of jobs from coal to renewable energy by *"using the artisans with skills in construction and development to help."* This further confirms the notion that over and above the markets, policies, laws and regulations, socio-technical regimes embrace values, beliefs and what various players such as organisation managers, engineers, politicians, the public and end users benefit from the energy regime's technical services (Geels, 2002).

One participant gave an example of how they outsourced skills and services to upskill their workforce by saying they "*had to take five control room ladies with no matric*" and the *"first challenge was to get them to a matric, which they've done. Now, these guys were never exposed to a computer. So the second challenge was to get them through a computer course, which they've done."* The aim was to say to the ladies, "*here's the programme; you need to interpret it."* From their sentiments, creating a knowledgeable employee benefits upskilling and reduces decision-making time as all parties understand what needs to be done.

6.4.2.1. Employment creation, training and outsourcing of skills

Participants spoke about the significance and necessity of outsourcing necessary skills. Outsourcing was viewed as acquiring individuals who train employees on soft skills and equip them with talents they can use outside the workplace. *"Bricklaying, painting, safety, health and safety, and environmental skills"* were some of the skills highlighted. This supports the view that over and above the required specialities regarding the knowledge and skills for specific duties or fields of work, some portions of society need the knowledge that individuals have gained through their real-life experiences and professional upliftment, leading to broader expertise and capabilities (Kash, 2010). It was further elaborated that the community benefits from these outsourced skills, as some training may result in the creation of employment opportunities not only for mine employees, but also for community members. This confirms the literature by Grin (2006), who expressed that several ideas regarding transition management have been identified in the reflexive government theory, which encourages the need for experimentation and learning in societies. The participants also provided the example of *"farming,"* which would be used as a community development strategy and employment creation vehicle. Another participant supported these sentiments and suggested that collaborative efforts and government partnerships can increase employment opportunities. This is in line with the literature because the regulation of institutions and the government's experimentation and learning process will lead to robust long-term economic and social change in behaviours (Hendricks & Grin, 2007).

Eight participants spoke about the importance of training. One participant described the purpose of training and expressed that they intended to integrate the new business with their existing resources and acquire new skills. This supports Klingenberg and Rothberg's (2020) view, who concurred that gaining knowledge is part of the learning process because the more individuals within an organisation learn, the easier it becomes to adapt to changes. This demonstrated an awareness of business integration, resource sharing for training purposes, and utilising current resources. The other participants concurred with the sentiments. They

elaborated on how this training plan and business acquisition is part of their organisation's *"other renewable energy strategy."* A portion of the training, excluding what is outsourced, is proposed to be provided by combining current fossil energy employees with acquired renewable energy business employees. They suggested, *"if we acquire an already-established renewable energy business, the requisite skill set is included."* This would facilitate the transfer of skills.

6.4.2.2. Collaborative learning and skills transfer

Participants mentioned that upskilling employees does not necessarily necessitate a change in the business model; instead, business integration and a collaborative learning process can be used to absorb existing skills in the renewable energy space and channel them towards empowering employees. This further confirms that decisions regarding organisational change must be taken so that essential factors such as knowledge, competencies, resources and commitment are appropriately handled for an organisation to realise a successful change process (Al-Haddad & Kotnour, 2015). One participant described the current roles of mining employees and introduced the idea that similar modes of operation would not prevent their migration to renewable energy because they should be *"able to move across."* They also emphasised that *"the methods are essentially the same"* and that *"the transition will be difficult for them."* Another participant suggested that some of their *"employees will be introduced into the new company so that the current skilled men can transfer their skills to the current employees."* As a method of continuous improvement and growth, as the business expands, the current skills will be transferred to the new company as time passes. These were sentiments to solidify their intent to integrate the new business. This points to literature because the ability to change allows individuals and organisations to learn more (Nadim & Singh, 2019).

6.4.3. Summary of the discussion of research question 3

Research question 3 identified the necessary skills and competencies for transitioning to renewable energy to ensure that employees are appropriately upskilled. The discussions indicated mutual perceptions among the participants concerning the issue of upskilling the employees to align them with the transition to renewable energy technologies. This supports the literature because the ability to change allows individuals and organisations to learn more (Nadim & Singh, 2019). It was evident during the discussion that coal mining operations are prepared to develop their employees and the surrounding community members. This concurred with the views of several authors who expressed that authentic leadership affords the followers an opportunity to learn and be motivated during the change process, which leads to a successful implementation of the change (Bernerth et al., 2007; Battilana et al., 2010;

Kotter, 1996; Rafferty et al., 2013). Participants played a significant role in ensuring that the socioeconomic challenges were addressed for the benefit of everyone, which is in line with the views of Klingenberg and Rothberg (2020), who concurred that gaining knowledge is part of the learning process because the more individuals within an organisation learn, the easier it becomes to adapt to changes. The next chapter presents the conclusions and recommendations pertaining to the study.

Chapter 7: Conclusion and Recommendations

7.1. Introduction

This study explores renewable energy's impact on the strategies of coal mines in South Africa. The study conducted this in the context of the coal mining industry in which coal mining organisations operate. As put forward in chapter one, regarding socio-technical transitions, the focus is more on the environmental sustainability systems and not on the issues that concern the challenges that come with inequality, poverty and working conditions (Jenkins et al., 2018). A literature review was presented in chapter two, where a multi-level perspective was identified as the preferred framework to address socio-technical transitions to renewable energy (Smith et al., 2016). In chapter three, research questions and objectives were developed with the aim of finding answers for this study. In chapter four, the exploratory research design was identified as the appropriate method for this study due to its ability to allow the researcher to conduct semi-structured interviews with individual participants (Saunders & Lewis, 2012).

Furthermore, in chapter four, a multi-method to collect data through semi-structured interviews was identified as the appropriate method for this study (Saunders et al., 2016). Finally, in chapter five, results from the semi-structured interviews were analysed using Atlas.ti software to get the primary themes and key insights obtained from the interviews before discussing the findings in chapter six.

This chapter will present the conclusions to this study by summarising the research findings, presenting the implications for theory and business, underlining the study's limitations and suggesting areas for future research.

7.2. Principal findings

7.2.1. How are coal mines repositioning their strategy for the socio-technical transition to renewable energy?

Due to the energy crisis in South Africa, together with the pressure to tackle climate change, South Africa is forced to invest in sustainable development initiatives by transitioning from fossil fuels to renewable energy sources. However, South African coal producers are reluctant to move away from coal, stating the country is experiencing financial and socioeconomic challenges. Instead, they are opting to reduce their electricity usage by incorporating renewable energy sources into their electricity systems through acquisitions, installing their own renewable energy facilities at their operations to supplement the grid, and acquiring the

necessary expertise in the renewable space. Coal miners in South Africa believe that the future of coal is bright due to the coal reserves at their disposal and their contribution to the economy through the export market. Furthermore, coal miners believe that coal is the only energy source capable of maintaining the base load compared to renewable energy sources. Therefore, the coal miners are not happy about European countries pushing for South Africa to abandon using coal to generate electricity while reopening some of their old coal-fired power plants in their countries. However, coal miners are open to using renewable energy side-by-side with coal.

### 7.2.2. What practices and strategies have the coal mines put in place

Coal miners have realised that transitioning to a low-carbon economy is possible, and organisations are realigning their strategies to comply with the change. They view renewable energy as a significant aspect of their strategy and are working on integrating it into their businesses to achieve organisational objectives. Coal miners are also improving their coal processing plants to achieve cleaner coal products, increasing the yield and sustaining their organisation for decades. They have accepted that there is a need to align their organisations with the transition to renewable energy, but reiterated that the alignment should make business sense since coal mines are also businesses. Some coal mining organisations have already started acquiring businesses in the renewable energy space and are initiating mergers and partnerships to realise their organisational objectives.

7.2.3. How are these coal mines upskilling their employees with suitable renewable energy skills?

Coal miners believe that qualified and competent employees are essential to help the mining industry to remain competitively sustainable. Coal mining organisations view employee skills development as necessary to address the issue of the talent search. They believe their organisations must invest in talent, including women in mining and people living with disabilities, to realise organisational goals. The coal mining organisations regard the upskilling of employees as an essential matter that is part of their strategies for the transition to renewable energy. They indicated that authentic leadership plays a significant role in motivating employees and aligning them with complex changes in the industry. The idea of a shared value approach is undertaken to ensure that even the surrounding communities benefit in the process of upskilling and training employees.

7.3. Conceptual framework

This section presents a proposed model for transitioning from fossil fuels to renewable energy sources based on the more profound insights from this study. The below diagram is a conceptual framework for a transition to renewable energy.
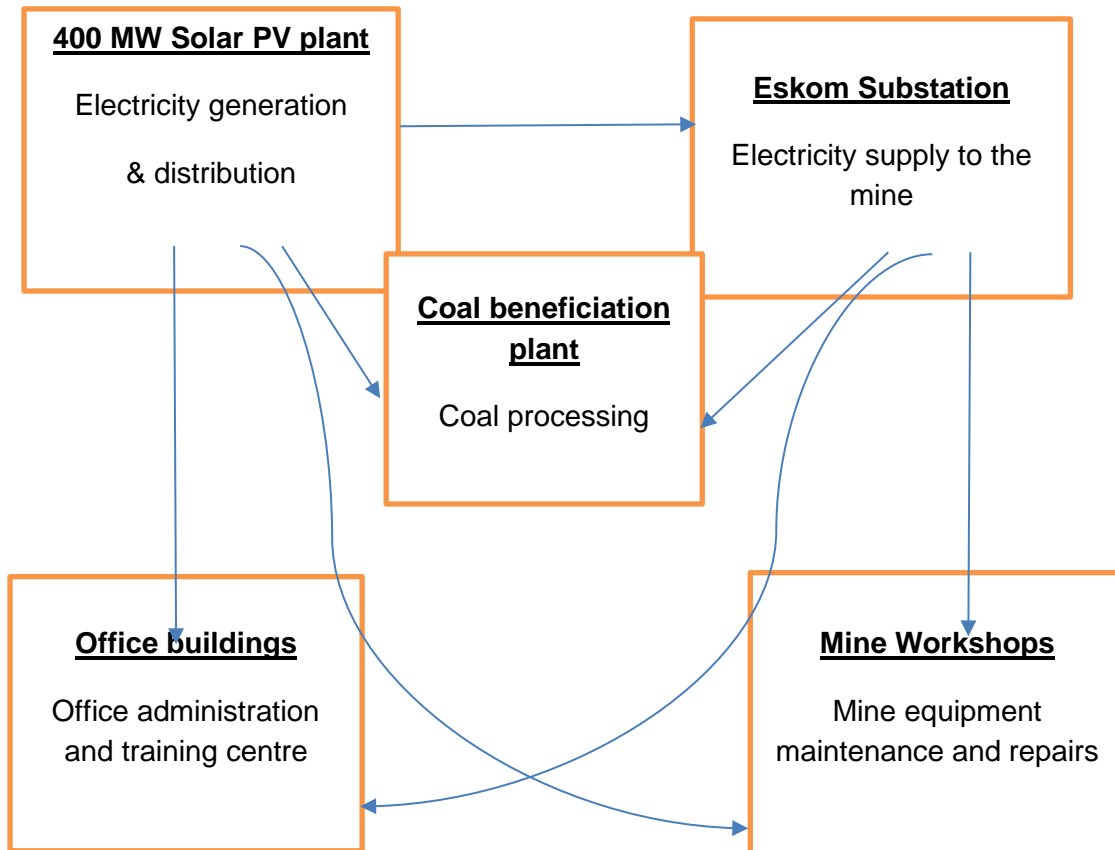
It will be challenging to measure the positive impact this study will have on a larger group of organisations due to the limitations of a qualitative research study (Queiros, Faria, & Almeida, 2017). However, when considering the sample size used to analyse the data collected, this study aimed to determine how the insights gained can be practically applied by other coal mining organisations in a similar situation (Queiros, Faria, & Almeida, 2017). Based on more profound insights the researcher gained into the socio-technical transition to renewable energy sources, coupled with an analysis of different strategies coal mining organisations can incorporate to remain competitively sustainable during the transition to a low-carbon economy, this model provides a framework for installing a 4 Megawatt Solar PV facility to complement electricity supplied by Eskom through coal-fired power plants to coal mining organisations.

The diagram above indicates how a 4 Megawatt Solar PV facility should be incorporated into the existing electricity system in the mines. The model illustrates that in order for coal mines

to gain a competitive advantage and realise a return on investment, this facility should be utilised with electricity supplied by Eskom to the coal beneficiation plant, office buildings and workshops. However, the Solar PV facility should be used during day time only and switched back to the Eskom grid during night-time when Eskom tariffs are not high. Furthermore, this model will assist coal mining organisations in contributing towards local economic development obligations by incorporating small and medium enterprises from the surrounding communities into the maintenance of the Solar PV facility by cleaning the solar panels and providing security services around the facility. Excess electricity from the Solar PV plant can be sold to Eskom or the private sector. Although this model is for a Solar PV facility, other renewable energy sources such as wind power, hydropower, and bio-waste can also be utilised based on the geographic location of the coal mine.

7.4. Implications for business

This study has contributed practical ways for managers to conceptually interpret the strategies and alignment of their coal mining organisations to remain competitively sustainable. Furthermore, this study contributes insights for business professionals:

- The study identified a need for cross-country comparisons to identify similar trends, which may be crucial for managers in developing strategies and policies regarding the complex change in their business environment (Jacob et al., 2020). Therefore, managers should not be biased when dealing with issues that can assist them in decision-making.

- Organisations must embrace emerging complex challenges to adapt to the changing business environment and take advantage of the opportunities that come with change (Uhl-Bien & Arena, 2018). Therefore, managers should focus on the changing business environment and identify opportunities to sustain their businesses.

- The study identified that organisations must intensify their core competencies through innovation to remain relevant in their business environments (Al-Haddad & Kotnour, 2015). Therefore managers should create an environment that allows employees to be innovative.

- This study also identified that organisations should not be comfortable in how they operate in the market environment without considering the impact that the environment can have on their systems and business environment (Schoemaker, 2018). Therefore managers should always align themselves with the environment outside their industries, which might indirectly impact their industry.

- It was identified during this study that technology plays a significant role in ensuring the survival of an organisation during complex changes in its business environment (Klingenberg & Rothberg, 2020). Therefore, managers should always strive to have access to relevant expertise and skills for the new setting to align their technological systems with the change.

- This study also identified that organisations must diversify and unlock other business opportunities that complement their core competencies (Birkinshaw et al., 2016). Managers should prioritise the issue of effective leadership by ensuring that they have effective and competent leaders who can adapt to new environments.

- It was identified that although the environment is essential, any required change to the organisation should make business sense (Yohe & Tol, 2002). In all the decisions that managers make, they should never forget that the organisation is a business, and revenue must be generated to sustain it.

- The study further identified that organisations should invest in their human capital due to its impact on their strategies (Nadim & Singh, 2019). Therefore, managers should always strive to develop employees within their organisations.

7.5.   Limitations

The limitations of the study are:

- The qualitative research method did not give statistical representation.
- To collect data, the researcher needed to know and understand the industry.
- The time allocated for semi-structured interviews was insufficient for the researcher to collect all the required data.
- Some participants did not show up for scheduled interviews.
- There was no guarantee that the conclusion application would suit the whole population.
- The qualitative method required ample time to avoid multiple sessions.
- Collected data cannot be relied on because it can only be relevant at the time of collection.
- If the researcher was biased, the research might be affected.
- Qualitative data can be questionable when compared to other research methods.
- It is difficult to present data collected from individuals with different perspectives.

7.6. Suggestions for future research

Based on the insights gained from this research, these are suggestions for future research:

- Explore the impact of renewable energy on the strategies of the manufacturing industry.
- Analysis assessment should to determine which renewable energy source works better with the coal mining industry.
- Explore other strategies that could be used to incorporate surrounding communities into the transition process apart from training.
- A study to determine if producing cleaner coal is a long-term solution for transitioning from fossil fuels to renewable energy.
- Explore if renewable energy sources can supply a mining operation with uninterrupted energy.

7.7. Conclusion

This research has provided new insights into the strategies that directors, chief executive officers and managers can implement in their coal mining organisations to remain competitively sustainable and aligned with the transition to renewable energy sources. Through exploratory, semi-structured qualitative interviews with 11 individuals who are decionmakers with different views within coal mines across South Africa, deeper insights were extracted and analysed to add verifiable insights to the literature on dealing with complex changes in the business environment. The study dealt with challenges brought by transitions in the strategies of coal mining organisations due to the impact of renewable energy. Fossil fuels, transition to a low-carbon economy, responsible mining, mergers and acquisitions, knowledge sharing and advancement emerged as significant factors for coal mines in order to reposition their strategies for the socio-technical transition to renewable energy and to align their organisations with the transition process. It is believed that this research will provide managers in organisations with more profound insights that they can utilise to lead effectively.

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Appendices

Appendix 1: Consent Form

INFORMED CONSENT LETTER

Exploring the impact of renewable energy on the strategies of South African coal mines.

Dear Sir/Madam,

My name is Takalani Sandani. I am researching the impact of renewable energy on the strategies of coal mines in South Africa. I aim to learn more about the strategies that coal mining operations in South Africa are implementing to remain competitively sustainable during the transition to renewable energy sources. The knowledge gained during the interview will help me better understand the concepts of organisational adaptation, organisational learning, leading, and managing change.

The time estimated for the interview is approximately 45 minutes and 1 hour. **Your participation is voluntary, and you can withdraw at any time without penalty. Please be advised that the recording of the interview session is not compulsory**. Your name and organisation will be anonymous and will not be mentioned in the report. No data will be kept with identifiers; therefore, confidentiality is guaranteed.

Please contact my supervisor or myself if you have any queries. Our details are provided below.

Researcher Name: Takalani Sandani   Research supervisor: Dr Ngwako Sefoko

Email: 21818933@mygibs.co.za   Email: nsefoko@gmail.com

Phone: 073 181 9540   Phone: 072 368 4415

Signature of participant: _____

Date: _____ 2022

Signature of researcher: _____

Date: _____ 2022

Appendix 2: Interview Guide

INTERVIEW GUIDE

Exploring the impact of renewable energy on the strategies of South African coal mines.

Place of interview: _____

Time of interview: _____

Section 1: Individual details

1. What is your designation/role in the mine?

_____

2. How long have you been working for this mine?

_____

Section 2: Organisational details

3. How many permanent employees does your mining organisation have?

_____

4. What is the life of your mining organisation?

_____

5. Does your mining organisation participate in community development projects?

_____

6. If yes, how many?

_____

7. Which method of mining does your organisation use?
    a) What type of equipment do you use to mine?
    b) What type of technology is installed in your equipment?
    c) What is your monthly production volume?

_____
_____
_____
_____

Section 3: Renewable energy process questions

8. What is your opinion regarding the issue of renewable energy?

_____

9. Since your mine supplies Eskom with coal, how will the decommissioning and repurposing of coal-fired power plants affect your organisation?

_____

_____

_____

10. How is your mine aligning itself with the transition to renewable energy?

_____

_____

11. How are you planning to manage the change?

_____

_____

12. How are you planning to accommodate the employees in the process?
    a) Are there plans to upskill them?

_____

_____

_____

_____

13. What are/would be the KPIs for renewable energy for your organisation to measure its success against?

_____

_____

14. How is your mining organisation planning to monitor and evaluate the renewable energy transition process?

_____

_____

_____

Appendix 3: Ethical Clearance

Gordon Institute of Business Science
University of Pretoria

Ethical Clearance Approved

Dear Takalani Sandani,

Please be advised that your application for Ethical Clearance has been approved.
You are therefore allowed to continue collecting your data.
We wish you everything of the best for the rest of the project.

Ethical Clearance Form

Kind Regards

Appendix 4: Atlas.ti Codebook

Research question 1

1.1.1 Fossil fuels dominant	1.1.1.1 Fossil fuels dominant	
	1.1.1.2 Low carbon economy	
	1.1.1.3 NetZero	
1.1.2 Transition to renewable	1.1.2.1 Transition journey	
	1.1.2.2 Energy localisation	
	1.1.2.3 Hedging rising costs	
1.1.3 Responsible mining	1.1.3.1 Responsible mining	
1.2.2 Direct impact	1.2.2.1 Decreased Community support	
	1.2.2.1 Disinvestment	
	1.2.2.2 Economic hardships	
	1.2.2.3 Financial loss	
	1.2.2.4 Retrenchments	

1.2.1 Indirect impact	1.2.1.1 No direct impact	1.2.1.1.1 No supply to Eskom

Research question 2

	2.1.1.1 Green economy	
2.1.1 Transition to green economy	2.1.1.2 Transitioning	
	2.1.1.3 Self-reliance	
	2.1.1.4 Self produce electricity	
2.1.2 Process improvement and beneficiation	2.1.2.1 Responsible production	
	2.1.2.2 Beneficiation	2.1.2.2.1 Improved coal quality
		2.1.2.2.2 Beneficiation
2.1.3 Mergers, acquisitions and partnerships	2.1.3.1 Mergers and acquisitions	
	2.1.3.2 Strategic partnerships	2.1.3.2.1 Strategic partnerships
		2.1.3.2.2 Forming partnerships and research
2.1.4 Business alignment	2.1.4.1 Strategically view renewable energy as a business 7	
2.1.5 Monitoring and control systems	2.1.5.1 Monitoring systems	

	2.1.5.2 Usage control	
	2.1.5.3 Controlled diesel usage	
	2.1.5.4 Reduce electricity consumption	
2.2.2 Employee inclusion	2.2.2.2 Employee retention at brink of retrenchment	
	2.2.1.1 Employee soft skills empowerment	2.2.1.1.1 Training
		2.2.1.1.2 Upskilling
	2.2.2.3 Skills outsourcing	2.2.1.1.3 skills outsourcing
		2.2.1.1.4 New skill sets
	2.2.1.3 Empower community	
	2.2.1.4 Sensitising employees	
2.2.3 Business integration	2.2.3.1 Integration	
	2.2.3.2 Partnerships	
2.2.4 Monitoring and evaluation of strategic change	2.2.4.1 Risk assessment	
	2.2.4.2 Waste management	
	2.2.4.3 Resource utilisation	

Financial Metrices	2.3.1.1 Business survival	
	2.3.1.2 Manage costs	
	2.3.1.3 Revenue generation	
	2.3.1.4 Cost effective	
Process performance metrices	2.3.2.1 Internal audits	
	2.3.2.2 Efficiency monitoring	
Staffing and human capital KPIs	2.3.3.1 Job creation	
	2.3.3.2 Training ROI	
	2.3.3.3 Community engagement	
	2.3.3.4 Knowledge sharing	
	2.3.3.5 Community satisfaction	
2.4.1 Monitoring usage and diesel usage	2.4.1.1 Monitor milestones	
	2.4.1.2 Monitoring usage	
	2.4.1.3 Reduce diesel usage	
2.4.2 Leadership buy-in	2.4.2.1 Leadership involvement	

2.4.3 Employee buy-in	2.4.3.1 Skills transfer	

Research question 3

	3.1.1.1 Upskilling
3.1.1 Knowledge sharing and advancement	3.1.1.2 Creating knowledgeable employee
	3.1.1.3 Skills transfer
3.1.2 Employment creation and outsourcing	3.1.2.1 Employment creation
	3.1.2.2 Acquiring skills
3.1.3 Training	3.1.3.1 Training
3.1.4 Business integration and skills transfer	3.1.4.1 Business unit integration