Perceptions of energy efficiency consequences of implementation of ISO 50001 in South Africa's pulp and paper industry

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DECLARATION

I, Juanita Kapp, declare that this research report is my own work except as indicated in the reference and acknowledgements. It is submitted in partial fulfillment of the requirements for the Master of Business Administration Degree at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other University.

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Juanita Kapp

Signed at: Rosebery, Tasmania (Australia)

On the 13th day of June 2023.

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ABSTRACT

With loadshedding taking place daily, often more than once a day, businesses suffer financial losses (Maphumulo, 2021). Research findings revealed that SA is only 38% transition ready towards energy efficiency (World Economic Forum, 2020). Adopting and implementing the energy efficiency option holds various benefits and might even create economies of scale for businesses if understood and implemented correctly. Environmental strategies ensuring an increase in efficiency and a decrease in risks to the environment are known characteristics of resource efficiency and cleaner production. The United Nations introduced 17 sustainable development goals (SDGs). Goal 7 refers to affordable and clean energy, which is a topic directly impacted by this research. Other SDGs included in this research are Goal 6 clean water and sanitation; Goal 8 economic growth; Goal 9 industry, innovation, and infrastructure; Goal 12 responsible consumption and production; and Goal 13 climate change. The implementation and maintenance of ISO 50001 serves as a central focus point, although other frameworks and models that could be used for an EES will also be referenced. Benefits and motivators for the transition towards energy efficiency will also be discussed. Another factor highlighted is the geopolitical implications that SA faces and how to better position the country to become more transition ready.

Keywords: ISO 50001, resource efficiency, cleaner production, energy, climate change, sustainable development goals.

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APERC	Asia Pacific Research Centre
BSI	British Standard Institution
EnMS	Energy Management System
ESG	Environmental Social and Governance
EES	Energy Efficiency System
ETI	Energy Transition Index
EPS	Energy Production Signatures
EMWG	Energy Management Working Group
ISO	International Standard Organisation
LSM	Living Standard Measure
MOA	Motivation, Opportunity, and Ability Model
MRR	Material Removal Rate
RECP	Resource Efficiency and Cleaner Production
UNIDO	United Nations Industrial Development Organisation
UNEP	United Nations Environmental Programme

TABLE OF CORRECTIONS

Examiners Feedback	Student Comment	Corrections Page Number
Researcher needs to follow the WBS structure	Noted. Research report layout changed to WBS structure.	The entire report.
Index pages, dedication, table of acronyms – in Roman numbers, Chapter 1 page 1	Noted. Research report headings and numbers changed to WBS structure.	The entire report.
Figure below insert	Noted. All figures have been changed.	The entire report.
Source not note	Noted. Rectified.	The entire report.
Conclusion chapter 1	Noted. As per ARP classes, Chapter 1 does not require a conclusion.	N/A.
Study must be written in 3rd person… see 3.2 3.7 and 4.1	Noted. Rectified.	Please refer to page 31 for 3.2 – page 33 for 3.7 and page 35 for 4.1
References need to be reviewed	Noted. Rectified.	Please refer to page 53.
Corrections to be attend to	Noted. All corrections have been attended to and reviewed by Supervisor	The entire report.

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CHAPTER 1: INTRODUCTION

Perception drives decision, the accuracy of perception hinges on the quality of information presentation and data interpretation. Both factors will influence the outcome (Roy et al., 2020). This research will also indicate the actual outcome and how it will compare to the perception of employees within the pulp and paper industry. Climate change is a popular topic, hugely debated over the past ten years, with many blaming climate change for being disruptive with environmental changes that are becoming out of control (Thakur, 2021). Human behavior and decision-making have a ripple influence on climate change. The Paris Agreement followed the failure of the Kyoto Protocol. The Paris Agreement serves as a universal process, limiting global carbon emissions below two degrees Celsius (Thakur, 2021).

President Molewa signed the Paris Agreement on behalf of South Africa (SA) on 22 April 2016 (Modise, 2016). However, after the agreement has been signed, SA's emissions are set to peak between 2020 and 2025, when they will plateau for roughly a decade before starting to decline (Carbon Brief, 2019). South African emissions, however, will need frequent monitoring and measurement.

SA is a fossil fuel-based country (Stats SA, 2018). SA's high energy intensity accounts for a large percentage of SA's emissions. During 2021, SA was the most polluting country with nearly 436 million metric tons of carbon dioxide (CO2), still much higher than the global average of 6.8 tCO2e (Carbon Brief, 2019).

The World Economic Forum (WEF) 2020 defines energy transition as a transition that provides inclusive, sustainable, and affordable solutions, which will address global energy challenges as well as environmental pressures.

Energy transition should also add value to the organisations and society while reflecting the three elements of the energy triangle demonstrated in Figure 1. The three elements comprising the energy triangle (Figure 1) are (a) energy access and security, (b) environmental sustainability, and (c) economic development and growth,

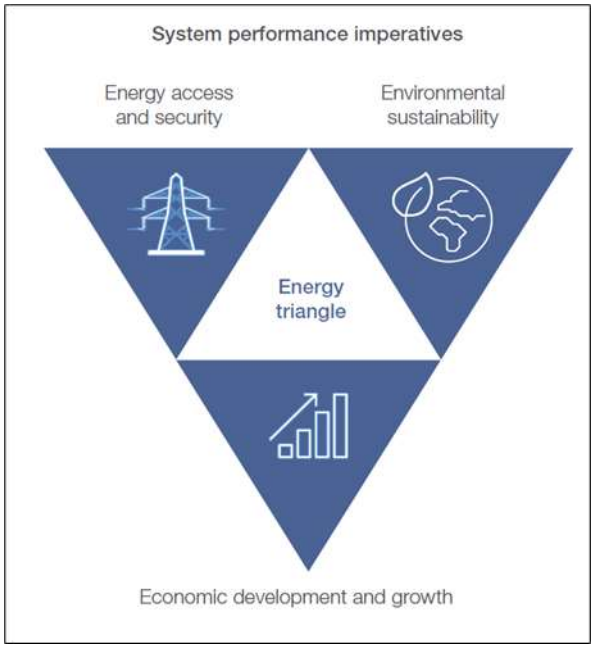

Figure 1: *Energy Transition Index Framework*

Source: This figure is adapted from the World Economic Forum (2020).

Furthermore, *six dimensions* influence a country's energy transition (World Economic Forum, 2020). First, countries need to establish a proper energy system structure (World Economic Forum, 2020). The first dimension is similar to the ISO 50001 system, which requires an organisation to select and implement an energy management team (ISO, 2018). Second, organisations need capital and investment; without the necessary capital and investment, organisations will struggle to become energy efficient (World Economic Forum, 2020). Third, organisations should not ignore the importance of regulations and political commitment (World Economic Forum, 2020).

According to Amusan et al., (2016), there is still a lack of adequate indicators or measures to determine progress against the goals. Institutions and governance (fourth dimension) have an impact on infrastructure and the innovative business world, representing the fifth dimension (World Economic Forum, 2020). Lastly, human capital and consumer participation (sixth dimension) will require the most work, but constant training and awareness could assist with attaining this dimension of the energy transition process (World Economic Forum, 2020). The adoption of the United Nations' (UN) sustainable development goals (SDGs) is just one way of addressing all six dimensions.

In 2018, the WEF created the comprehensive Energy Transition Index (ETI) to track national energy transition progress as demonstrated in Figure 2. Nations measure their ETI score using 39 indicators divided into two categories, namely: the system performance score and the transition readiness score. As illustrated in Figure 2, nations calculate their scores on a scale of 0 to 100. According to the World Economic Forum (2020), the readiness to transition is not a linear process. SA is only at 38% transition readiness, with its 2020 ETI score at 42.7% (World Economic Forum, 2020).

Table 1 shows transition readiness scores for SA's neighboring countries. Compared to four of SA's neighbouring countries, the country with the highest transition readiness towards a more sustainable, affordable, and inclusive energy system, is Namibia with a 53% ETI score (World Economic Forum, 2020). Conversely, the country with the lowest readiness is Mozambique at 37%.

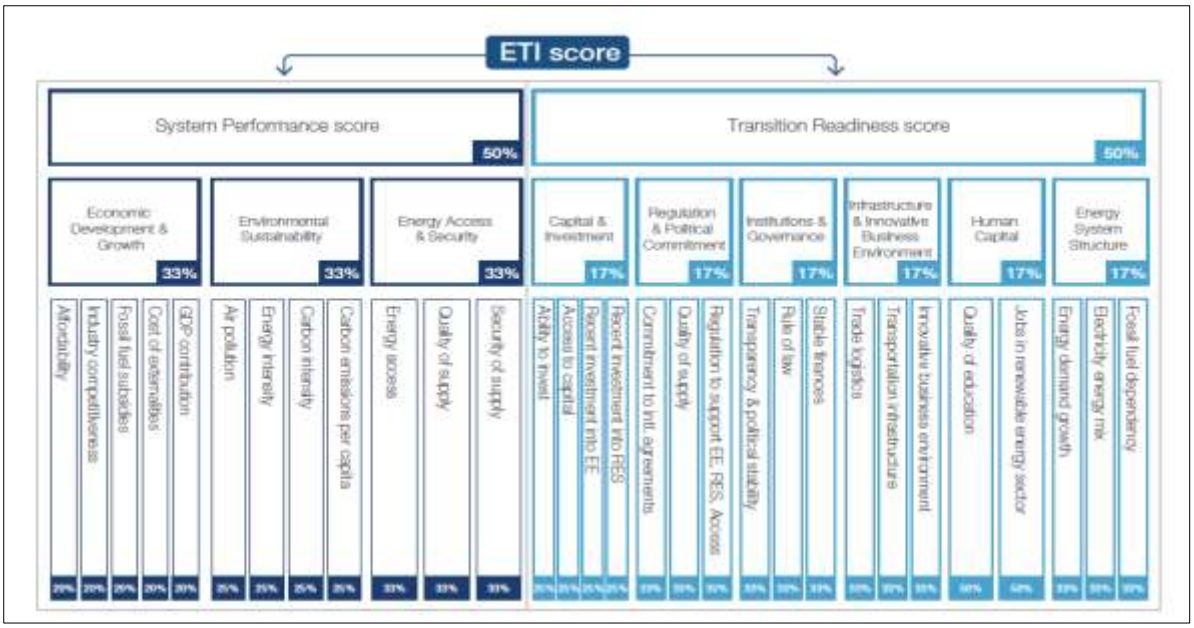

Figure 2: *ETI Score Breakdown*

Source: Figure 2 is an adaptation of the ETI Score Breakdown published by the WEF (World Economic Forum, 2020).

The UN introduced the 17 sustainable development goals (SDGs) during 2015; Figure 3 illustrates the UN's 17 SDGs. Goal 7 refers to affordable and clean energy, which is a topic directly related to this research. According to Szilagyi and Mocan (2018), resource efficiency and cleaner production (RECP) started as a partnership between United Nations Industrial Development Organisation (UNIDO) and the United Nations Environment Programme (UNEP). Environmental strategies that ensure an increase in efficiency and a decrease in risks to the environment are known characteristic of RECP (Szilagyi & Mocan, 2018). RECP impacts on Goal 6 clean water and sanitation; Goal 8 economic growth; Goal 9 industry, innovation, infrastructure; Goal 12 responsible consumption and production; and Goal 13 climate change (van Berkel, 2010).

Table 1

Energy Transition Comparison

Country	Transition Readiness	2020 ETI Score
Zimbabwe	45%	42.6%
Botswana	44%	44.7%
Namibia	53%	53.6%
Mozambique	37%	42.0%

Source: Contents adapted from WEF research (World Economic Forum, 2020).

Figure 3*:* A graphic illustration of the 17 Sustainable Development Goals (SDG's)

Source: UN 17 SDGs, retrieved from https://www.sds.un.org/goals.

1.1 BACKGROUND OF THE STUDY

The ISO 50001 standard outlines the requirements for an energy management system (EnMS), which enables any business to further improve its energy performance sustainably. At the end of 2017, more than 22,000 enterprises around the globe adopted ISO 50001 (ISO, 2018). As organisations start to include energy management into their supplier criteria and corporate sustainability initiatives, it is believed that the use of ISO 50001 is expected to accelerate over the next 20 years (Curkovic & Sroufe, 2011).

The success of EnMS implementation varies based on the commitment from all levels within the organisation, particularly the top management level. Organisational commitment might require cultural shifts from organisations (ISO, 2018).

Democracy, governance, economic conditions, and other related issues in African countries are topics included in Afrobarometer surveys (Selormey et al., 2019). According to an Afrobarometer attitude survey, there is a certain level of awareness of climate change (Selormey et al., 2019). However, four out of ten Africans were unaware of climate change (Selormey et al., 2019). Although reducing energy consumption and efficiency improves productivity and lessens the impact on the environment, the focus of this research will be on resource efficiency and the implementation and maintenance of ISO 50001 certification.

1.2 PROBLEM STATEMENT

The purpose of this research proposal was to gain a better understanding of employee's perceptions of energy efficiency within the organisational context and to understand whether their perceptions influenced their organisational decision-making processes. The aim was to determine why organisations have not tapped into energy efficiency options. With loadshedding taking place daily, sometimes even more than once a day, businesses suffer financial losses (Maphumulo, 2021). Some businesses do not have the necessary tools and equipment to continue operating during loadshedding. Adopting and implementing energy efficiency options holds various benefits and may even create economies of scale for businesses when understood and implemented correctly.

1.3 EMPERICAL QUESTIONS

EQ1: How do employees from different organisational levels differ in their perception of energy efficiency?

EQ2: To what extent do employees perceive the implementation of an ISO 50001 system to reduce the organisation's energy consumption?

EQ3: How can organisations increase and secure energy efficiency?

1.4 RESEARCH OBJECTIVES

The primary objective of this research proposal was to understand employees' perception of energy efficiency and whether their perception affects their organisational decision-making processes.

1.5 INTERVIEW QUESTIONS

RQ1: What is your perception about the type of leadership characteristics that is necessary to implement an effective energy efficiency strategy or system?

RQ2: What is your perception with regards to how management includes energy efficiency as part of their organisational goals?

RQ3: What is your perception about what motivates an organisation to transition towards energy efficiency?

RQ4: What is your perception about the benefits that an organisation can expect when implementing ISO 50001?

RQ5: What perception do you have regarding the changes organisations can anticipate to their bottom-line from investing in energy efficiency?

1.6 SIGNIFICANCE OF THE STUDY

Not only did the demand for energy increase, but so did the price, followed by unpredictable and unreliable supply (Maphumulo, 2021). An increase in demand for energy is a direct result of the depletion of natural resources and an increase in environmental pollution. Organisations can avoid potential environmental hazards while also lowering their monthly energy expenditure by reducing energy usage and purchasing energy efficient equipment, while also averting a climate disaster (Bruce, 2022). Another factor is the geopolitical implications that SA faces and how to better position the country to become more transition ready (Hafner et al., 2020).

The findings of this research study may assist in creating awareness of the organisational benefits of ISO 50001. They might further contribute to more organisational leaders implementing and EnMS system after reading the findings and recommendations of this research study. Additionally, the findings might assist SA in reducing its emissions and improve the quality of living for all.

1.7 RESEARCH METHODOLOGY

This research study followed a qualitative approach, using qualitative data to describe participants' perception of energy efficiency and whether their perception affects their decision-making in the organisational context. In this qualitative single case study, the researcher observed and collected data from an organisation located in South Africa.

In-person observation of the operation assisted with developing a deeper understanding of employees' perceptions of energy efficiency within their organisation, and to what extent the energy efficiency at the organisation affects surrounding communities. The researcher conducted semi-structured interviews with twelve participants from the organisation. Based on the over-arching research questions identified thus far, the interview included technical and non-technical employees, members from the financial department, and the energy forum team.

Peer-reviewed articles took priority over non-peer reviewed articles and sources. As such, the researcher did not discard other creditable sources when they were relevant to the research topic. Secondary data in the form of organisational documents and publicly available information was also used to lend further credibility to the primary data collected.

The researcher recorded and subsequently transcribed the semi-structured interviews and used content analysis for data analysis. Carefully analyzing each interview, in a word-by-word fashion, allowed for the identification of any specific themes or patterns, using atlas_ti version 8. Any notes, observations, and documents collected during secondary data collection were also added to the software for data analysis.

1.8 DELIMITATIONS OF THE STUDY

This research study only focused on one organisation within the pulp and paper industry. Based on the research topic, the researcher was more interested in determining organisational performance; individual performance was delimited from this study. Various frameworks and models are available for the implementation of an effective EES; however, in this study the focus was solely on ISO 50001.

1.9 CHAPTER OUTLINE

This research study consists of six chapters. Chapter 1 included a summary of the proposal, the overarching research questions, and the significance of this study. In Chapter 2, a review of the literature included an overview of the systems and models used for energy efficiency. Also reviewed were the methods and approaches, as well as the benefits of such a system. The literature review further highlighted disparities and debates noted in the literature. The research methodology formed the content of Chapter 3 and included the research design, data types collected, data collection methods, data processing and storage, and data analysis.

Chapter 4 elaborates on preliminary data, discussing evidence obtained and how this pertained to informing the methodology. Further to the preliminary findings, any emerging patterns and themes derived from the data were provided. The statement of limitation, research achievements, potential weaknesses, or alternatives formed Chapter 5, while Chapter 6 served as the conclusion, highlighting any contributions, the importance of the study, and pertinent recommendations.

CHAPTER 2: LITERATURE REVIEW AND MANAGEMENT THEORIES

2.1 INTRODUCTION

The purpose of this literature review was to establish and understand the various aspects pertaining to an energy efficiency system (EES). Some of these aspects included leadership and the role of policymakers, specifically the *plan*, *do*, *check*, and *act* (PDCA) cycle of an ISO 50001 system. Central to the literature review were the benefits and motivators for an energy transition as well as the various frameworks and models companies used to implement an EES, of which ISO 50001 is one example. Finally, the review concluded with the topic of securing and maintaining energy efficiency investments.

2.2 LEADERSHIP AND POLICYMAKERS FOR ENERGY EFFICIENCY

While an ISO 50001 system does not require a specific leadership characteristic, it is to an organisation's advantage if it already has other ISO systems in place because it follows the same approach using the *plan, does, check, and act* cycle (ISO, 2018). As such, management would be familiar with the requirements of the management system as well as the audit intervals required. Figure 4 graphically represents the *plan, do, check, and act* cycle referred to as the PDCA cycle, which is central to the implementation of any ISO management system.

The first phase is known as the *plan* phase; it is the phase of the cycle where management establishes the EnMS. The plan phase requires buy-in from top management. According to the requirements of this system, management must (a) appoint an energy manager, (b) determine their energy policy, (c) sign off on the policy objectives and tasks, and (d) agree and sign off on action plans for achieving their policy commitments (ISO, 2018).

Figure 4: *PDCA Cycle*

Source: This graphical illustration is an adaption from https://www.asq.org/quality-resources/pdca-cycle.

Further, the energy manager must set the organisation's energy planning and energy performance indicators, as well as determine the legal and all other applicable compliance requirements. The energy manager will also review the system under this phase to set up the organisation's baseline. System implementation takes place during the *do* phase where further requirements of system implementation include employee engagement together with as internal and external communication (ISO, 2018). Other responsibilities of the energy manager include documenting and recording the system as well as conducting an audit of the organisation's operations to determine energy designs, equipment, processes, and energy-efficient procurement.

In the *act* phase, an internal audit of the entire system takes place to measure the energy performance indicators. Based on the outcome of the internal audit, the energy manager undertakes corrective and preventive actions to improve the system and minimize reoccurrence of non-conformance (ISO, 2018).

Non-conformance can be from various forms. Either a requirement from the ISO system that was not met or failure to comply with organisational policies and procedures. Legal requirements and by-laws are also taken into consideration when raising a non-conformance.

The *act* phase refers to the energy management review (feedback) to top management. Subsequent to the outcome of the review, top management might decide to amend or draft a new energy policy based on threats, opportunities, and possibilities for improvements identified during the review process (Halis et al., 2016).

Due to environmental pressures and the SDGs, there are various aspects that organisational leadership need to take into consideration when implementing an EES. Most notably, the workforce drives the ISO 50001 system; their habits, mindset, routines, social norms, environmental awareness, and consciousness (perception) must align with the organisation's vision and mission to reduce energy consumption (Halis et al., 2016). If the workforce's perception does not align with the vision and mission to reduce energy consumption, the system might not be as effective as the management team anticipated (Halis et al., 2016). Hewitt (2021) pointed out that organisational leadership could use an EES to reshape their organisational culture and change employees' perception of energy efficiency toward becoming a more environmentally conscious organisation.

Accepting the ISO system requires employees to operate outside of their normal routine and comfort zone; thus, management should expect organisational resistance. Generational diversity will also influence the organisational culture and the ISO system (Hewitt, 2021).

Olukrede et al. (2019) posited that the lack of energy management knowledge combined with the lack of the tools to monitor resources resulted in certain industries hesitance to change to a more energy efficient way of producing products and services. For some industries, such as supermarkets, the ISO system is an unknown world, with only a few companies to compare with or learn from (Fausing, 2019).

Hewitt (2021) proposed that management used the EES as a tool to prime their organisational culture to be more receptive toward embracing and actively maintaining the ISO system. Further, because of the importance of having an ISO 50001 within the organisation, Hewitt (2019) recommended appointing a *gatekeeper* to champion the system. A *gatekeeper* is somebody who oversees the system and ensures its effectiveness and efficiency (Hewitt, 2019).

2.3 BENEFIT AND MOTIVATORS OF ENERGY EFFICIENCY

2.3.1 ISO 50001 BENEFITS

"Financial performance, product market performance, and shareholder return" (Johnson, et al., p. 3, as cited in Halis et al., 2016) represent the three organisational performance categories. In addition to these categories, an ISO 50001 certified system might also bring other elements of organisational performance.

Among the many benefits of implementing a EnMS Halis et al (2016) listed several aspects that were beneficial throughout the organisational value chain. These benefits included (a) an improvement in operational and financial performance, customer satisfaction, employee engagement, profitability, productivity, and export opportunity; (b) a reduction in costs associated with product quality and energy; and (c) products and services with minimal environmental impacts (Rajendran et al., p. 3, as cited in Halis et al., 2016).

Cengel (2011, p. 11) defined energy efficiency as a reduction of usage to the lowest possible while maintaining the current living standard, quality of production, and profit margin. Saving money is a factor of energy efficiency, but not at the expense of product quality (Halis, et al. 2016). Product quality should remain the focus of the organisation. Using an ISO 50001 system could assist organisations with measuring their performance more accurately, and when optimized to its fullest potential, it will indicate continuous improvement in energy performance (ISO, 2018).

Pinero (2009) asserted that with the implementation of an energy management standard, such as IS O50001, industrial facilities could expect to increase energy efficiency by more than 20%. Other benefits are environmental sustainability (reduced greenhouse gas emissions) and enhanced productivity. In this context, productivity refers to output for every unit of input. Higher plant capacity, less downtime, better energy efficiency, or time and resource savings through automating procedures or data collection can all contribute to an increase in product quality (Fuchs et al, 2011).

The British Standard Institution (n.d.) determined five benefit categories associated with implementing an ISO 50001 as illustrated in Figure 5. These categories are (a) management, (b) legal, (c) sales and marketing, (d) operations and facilities, and (e) finance. Coincidentally, these benefits are also motivators for the adoption and implementation of an ISO 50001 system.

In terms of the *management* category, ISO 50001 aids profit maximization by lowering expenditures and expenses thereby ensuring there is always enough funds for energy needs (British Standard Institution, n.d.). Being certified also aids organisations in projecting a green image.

Employees may also be eager to work for a company that is environmentally conscious (British Standard Institution, n.d.). The *legal* category includes incentives; organisations are aware of the incentives issued by government, such as tax subsidies (British Standard Institution, n.d.).

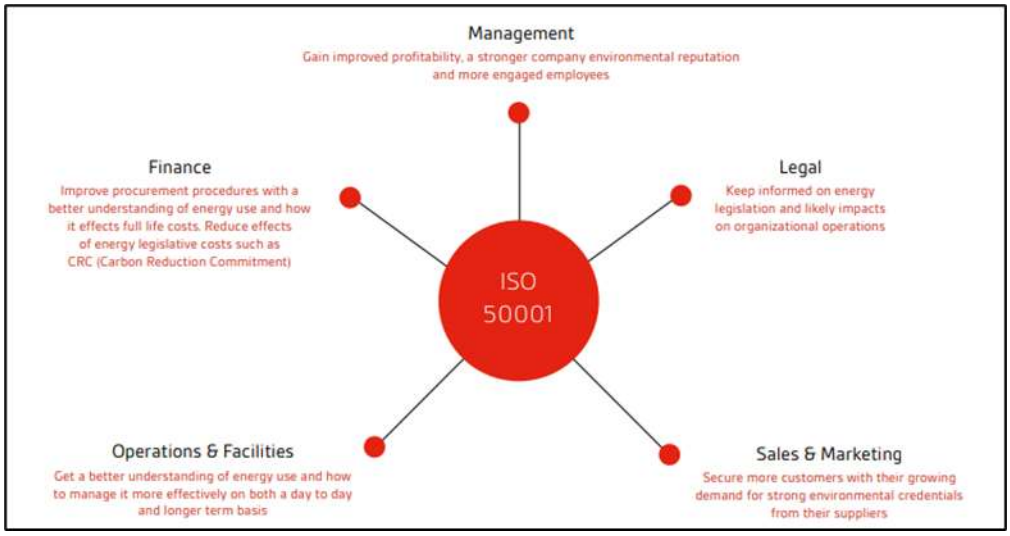

Figure 5: *Benefits of ISO 50001 certification*

Source: Graphical representation of the benefits of the ISO 50001 system adapted from (British Standard Institution n.d.).

Monetary incentives also encourage organisations to transition toward a more energy efficient system. There are various accreditation bodies, such as South African National Accreditation System (SANAS), that will issue compliant organisations with energy performance certificates (Halis et al., 2016). With regards to the *sales and marketing* category, customers or business-to-business relations might have a certain level of environmental consciousness and would rather support products and services projecting the same level of consciousness (British Standard Institution, n.d.).

Any discrepancy in the *operations and facilities* (fourth category) of organisations might result in energy wastage. Hence ISO requires an organisation to synchronize its operational responsibilities (Halis et al., 2016). As a result, ISO aids in the efficiency of organisational activities. Employees will be able to work more efficiently as facilities improve. Under the *financial* category, ISO can assist in the improvement of procurement practices and principles (Halis et al., 2016).

2.3.2 ISO 50001 CO-BENEFITS

Besides the five categories discussed above, the literature review revealed three additional benefits. These benefits are more consistent with the external environment, where the previous five categories referred to the internal environment within an organisation. Ferreira and Almeida (2015) believed that the co-benefits are worth measuring. There might be certain trade-offs that an organisation would have to make, and the return on investments (especially financial) might be more long-term than what investors and organisations originally anticipated (Ferreira & Almeida, 2015). One such trade-off to consider is the cost of implementing a specific energy efficiency plan versus implementing a plan to save energy (Ferreira & Almeida, 2015). It is about more than just lowering the electricity bill; it should also include economic and social benefits (Ferreira & Almeida, 2015). Some organisations might expect to observe immediate changes and returns, while other organisations might understand the bigger picture, appreciating the changes throughout the organisation and the surrounding communities (Jakob, 2006).

Various researchers agreed that a lack of complete information regarding costs, benefits, co-benefits, awareness, and socio-economic impacts are obstacles to organisational leadership agreeing to capital-intensive energy efficiency investments (Ferreira & Almeida, 2015, p. 173; Jakob, 2006).

A review of the literature indicated the cataloging co-benefits of *three* sections, namely, (a) societal and health, (b) environmental, and (c) economic (Davies et al., 2000 as cited in Hasanbeigi et al., 2013). Considered under the *societal and health* section is an increase in job creation through new business opportunities. Energy consumption will decrease, which means the availability of a more stable supply to communities with less exposure to price fluctuations (Kamal et al., 2019). As per the Paris Agreement, countries would be better positioned to reduce their emissions and meet the legislated requirements (Kamal et al., 2019). From an *environmental* perspective, co-benefits might include a positive impact on climate change, air quality with reduced emissions, and waste reduction in the product life cycle (Kamal., 2019). *Economic* co-benefits may result from new business opportunities and technologies, resulting in a higher gross domestic product (GDP) as well as the possible decrease in energy prices due to reduced energy demand (Kamal et al., 2019).

According to the literature, co-benefits have been widely addressed (Kamal et al., 2019). Aunan (2004) published the first article regarding *health* benefits. Researchers believed that all co-benefits should be considered when formulating energy efficiency policies and during decision-making processes (Aunan, 2003); Hasanbeigi et al., 2013; Kamal et al., 2019). Hasanbeigi et al. (2013) opined that co-benefits must be acknowledged. During the data collection procedure, it will emerge whether the pulp and paper industry will impact on all three sections of the co-benefits or whether some sections are more prioritized.

2.4 ENERGY SECURITY AND THE A-FRAMEWORK

To structure their report on energy security, the Asia Pacific Research Centre (APERC) created the A-Framework depicted in Figure 6. The model combines the classic terms *availability* and *affordability* with *acceptability* and *accessibility*. The purpose of the A-Framework is to control and reduce energy.

Availability refers to the energy available and determines whether the energy industry can meet the current demand. Loadshedding has proven the opposite to be true. The *accessibility* of energy refers to the fact that even if the energy is available, it does not automatically mean that it is immediately accessible. *Affordability* is a major problem currently experienced in SA. Energy might be available, readily accessible, but no one considered the impact of affordability (APERC, 2007, p. 10 as cited in Couder 2015). From the literature, it seems the price for this energy and whether it is affordable to all levels of the living standard measure (LSM) or only to the elite group and leading industries, was not considered (APERC, 2007, p. 10 as cited in Couder 2015). This oversight of affordability highlights the importance of transitioning towards a more energy efficient system that is environmentally acceptable and will assist with accessibility and address availability of affordable energy.

Figure 6: The A-framework for Energy Security

Source: Adapted from Asia Pacific Research Centre (APERC, 2007, p. 10. as cited in Couder 2015).

Each energy security model is unique, with certain advantages and disadvantages. The onus is on organisational leadership to decide which model or system to implement for transitioning to more energy efficiency options. For the purpose of this research paper, the ISO 50001 EnMS will be the focus for organisations to become more energy efficient; more specifically, the research was based on an organisation in the SA pulp and paper industry, which has been ISO 50001 certified since 2019.

2.5 THE IMPACT ON THE BOTTOM-LINE OF THE BUSINESS

As most organisations are financially orientated, noticing the change in energy saving is a logical starting point. First, the reduction of the electricity bill is a direct saving to the bottom-line, which also represents a decrease in operational costs (Liebesman, 2010). Impacts of EES on the bottom-line will manifest as tangible finances through the increase in revenue and decrease in expenses, and as intangible

finances when customer and employee satisfaction improve in the form of the associated green image established by the company (Halkos, 2021). Tax incentives might serve as a motivator for transitioning towards ISO 50001 (British Standard Institution, n.d.).

Having an EES not only affords organisations a competitive edge within the market by allowing organisations to operate without energy interruptions, but also ensures compliance with legislative requirements (Halkos, 2021). An implemented effective system allows management to identify risks and implement strategic solutions to prevent such risks with greater ease (Oung, 2016). Specifically, with an ISO 50001 system, management will see continuous improvement in their processes and products (ISO, 2018).

2.6 ENERGY EFFICIENCY FRAMEWORKS: THE GAP

Saldanha et al. (2016) mentioned that certain barriers influenced organisational decision to implement an EES. Research findings suggest there are different frameworks and strategies available to assist industries with the implementation of these EES, including how to address the barriers to implementation (Thollander, 2010). Hasanbeigi et al. (2010) established that the barriers to implementation often initiate as a result of managerial decisions to prioritize production over everything else instead of focusing on energy efficiency. As such, various authors believed that the co-benefits play a vital role and require more recognition (Aunan, 2004; Ferreira & Almeida, 2015; Halis et al., 2016; Hasanbeigi et al., 2013; Jakob, 2006; Kamal et al., 2019; Pinero, 2009).

Minchener (2000) pointed out that organisational management could overcome barriers to implementation by ensuring proper awareness of procedures to support energy efficiency improvements. Chai and Baudelaire (2015) recommended the motivation, opportunity, and ability (MOA) theory, to understand the EES. To determine the best possible framework, various disciplines were consulted and investigated (Chai & Baudelaire, 2015).

Fleiter et al. (2012) investigated the energy efficiency impacts in Germany following the introduction of grants for energy audits by the German Government. For the manufacturing industry, Shui et al. (2015, p.4 as cited in Saldanha et al., 2016) proposed a mathematical method to establish the "energy demand and production frontier and thus evaluate energy efficiency using plant-level production and utility consumption data". Liu et al. (2013 as cited in Saldanha et al., 2016) originally introduced the framework to evaluate building designs for EES, while Miah et al. (2015, as cited in Saldanha et al., 2016) explored heat integration opportunities. Fysikopoulos et al. (2014) proposed another possible framework based on manufacturing levels as four categories, namely, *process*, *machine*, *production line*, and *factory*. Furthermore, energy-production signatures (EPS) as well as the material removal rate (MRR) are also possible frameworks, and Larek et al., (2011) suggested work-specific power profiles as an EES implementation framework.

All frameworks mentioned thus far are indicative of the availability of data and other sources for EES. It further illustrates the complexity of energy efficiency and that there is no clear suggestion for a specific industry. To determine the best framework and model to use, organisations should conduct an exhaustive organisational analysis that considers the potential organisational benefits of investing in the EES. The focus of this research study the ISO 50001 system.

2.7 INCREASING AND SECURING ENERGY EFFICIENCY

Investing in EES is a sensible business move because of the assured long-term profitability and associated expense reductions (Larek et al., 2011). Organisations actively participate in the global energy transition, which continuously places sustainability at the center of economic and social agendas. Renewable energy has become an appealing source of energy due to its low cost and the growing need for corporate sustainability among investors and consumers (Taylor, 2015).

Reaching a balance among environmental, social, and governance (ESG) issues, also adds value toward EES (Henisz, 2019). In essence, ESG assists in *five* aspects through cashflow to improve investments. The first aspect, *top-line growth,* enables the organisation to attract business-to-business and business-to-customers through its more sustainable products (Henisz, 2019). Access to the necessary resources will also be more accessible due to good public relations. The second aspect is *cost reduction* in the form of lowering the energy bill (Henisz, 2019), as alluded to Liebesman (2010). *Legal and regulatory interventions* as it applies to subsidies from government is the third aspect, while the fourth aspect, *productivity uplift*, directly impacts on attracting talent and increasing employee morale (Henisz, 2019). The success of the ESG depends on whether the focus is on short- to medium term, or more long-term commitments (Koller et al., 2019).

Since the vision and mission statements are set by the board members, it will be more beneficial for the organisation if the members consisted of at least one ESG specialist (Koller et al., 2019). If the organisation has a strong ESG focus, it might be easier to raise money for future plant and equipment improvements (Koller et al., 2019).

Stakeholders' interest might also spike knowing that the organisation acknowledges its risks, and instead of ignoring these risks, the organisation has preventative actions in place to mitigate these risks (Koller et al., 2019).

2.8 ISO 50001 DRIVERS, BARRIERS, SUCCESS, AND CHALLENGES

Fuchs et al. (2020) examined the case studies submitted as a part of the yearly Energy Management Leadership Awards program, which provide a diversified mix of data from around the world, coming straight from ISO 50001-certified organisations. The Energy Management Working Group (EMWG), operating under Clean Energy Ministerial, hosted the first annual awards event in May (Fuchs et al, 2020). To be considered for the award, organisations with ISO 50001 certification submitted a written case study using EMWG's required template (Fuchs et al, 2020).

In 2016, 35 organisations submitted case studies; in 2017, 37 organisations participated in the awards (Fuchs et al, 2020). The combined 72 case studies reflected a total energy saving of 53 trillion Btus (56 PJ), across 204 facilities, at a cost savings of $227 million (Fuchs et al, 2020). These facilities reduced CO2 emissions by 6.7 million metric tons, which is equal to the annual emissions of 1.4 million passenger vehicles (Fuchs et al, 2020).

2.8.1 SUCCESS VERSUS BARRIERS

In the case studies Fuchs et al. (2020) reviewed, they identified training as a crucial element to successfully implementing ISO 50001. Training in energy behavior and awareness is available. Top managers, members of the energy team, all employees, and staff members should receive training to ensure organisations establish an energy-awareness culture (Fuchs et al., 2020).

Various organisations identified the cost of training as a barrier to success as it tends to be expensive (Koller et al., 2019 & Fuchs et al., 2020). Another barrier identified is the gathering of sufficient and accurate energy data (Fuchs et al., 2020).

2.8.2 DRIVERS OF ISO 50001

In their analyses, Fuchs et al. (2020) identified critically important drivers of ISO 50001. Included among these drivers were (a) strong management support, (b) the availability of reliable energy data, and (c) working with external parties (e.g., service providers, government, or implementation consultants) in order to obtain efficient technical expertise, energy audits, and training programs (Fuchs et al., 2020). To achieve the best energy efficiency results, organisational management should set well-defined energy policies and targets, avail resources, and remain interested and involved in the ISO 50001 system. Simultaneously, management should maintain a direct link between operational control and monitoring phases, which enables them to make informed decisions based on specific performance indicators (Koller et al., 2019). Cross-functional energy teams consisting of representatives from different departments should have open lines of communication, solid working relationships with the finance divisions, and the ability to share best practices across plants or facilities.

2.8.3 ISO 50001 CHALLENGES

Challenges often experienced by ISO 50001 certified organisations include (a) power meters that aren't accurate, dependable, or connected; (b) difficulties setting up or maintaining an effective monitoring system; (c) issues with the transfer, security, and confidentiality of energy data; and (d) the complexity of identifying and ranking the greatest energy consumers (Fuchs et al, 2020).

Other challenges Fuchs et al. (2020) found organisations faced when implementing ISO 50001 were conducting energy measurement and verification and a lack of prior experience or internal expertise. Furthermore, Fuchs et al. (2020) found that gaps in understanding technical energy management, familiarity with ISO 50001 requirements, and locating an accredited certification body were issues among organisations seeking to implement ISO 50001.

2.9 ISO 50001 PITFALLS: LESSONS FROM PRACTICE

Boiral (2011) reported on 189 semi-structured interviews with participants from ISO 9001, ISO1 4001 and ISO 50001 certified organisations in Canada. Interviewees comprised of 89 managers, 50 environmental and quality specialists, and 50 employees. Several key themes emerged from the semi-structured interviews, representing common pitfalls hampering the implementation of the system:

- **improper or overly extensive documentation:** It frequently requires a lot of time and resources to prepare the paperwork for the ISO management system (Boiral, 2011). Productivity may suffer if employees spend time creating documentation rather than engaging in productive tasks, particularly in small and medium enterprises where organisational size is smaller, pressuring employees into taking on more roles to ensure compliance with ISO requirements.
- **inconsistency in system permanence:** Although many organisations meet the requirements of the ISO system during certification audits, this is not an indication that they always remain so afterwards. Managers assume that ISO systems run mostly on their own. Managers questioned by Boiral (2011) stated that maintaining the ISO system outside of audits and managerial evaluations was one of their top challenges.

- **certification inquiring:** Organisations frequently approach certification as a business problem that acts as a goal itself as opposed to a tool to improve internal processes; this approach emerged as a concern raised by 50 environmental and quality specialists (Boiral, 2011).
- **inadequate resources:** Attempting to speed up the implementation process in response to stakeholder or customer demands often results in issues such as underestimating the time, work, and resources needed to complete the certification process (Boiral, 2011). Employee resistance results from a lack of human and financial resources, particularly when employees struggle to understand the ISO system and the requirements of a successful ISO system (Boiral, 2011).
- **internal versus outsourcing:** Outsourcing system implementation results in a lack of system continuity and no follow-up after the certification process; as such, outsourcing often produces a system that looks perfect on paper, but is ineffective for meeting organisational needs (Boiral, 2011). Involving employees in system creation is crucial because they will continue using the documentation and verifying its implementation.

Figure 7 graphically illustrates the ISO system process, as depicted by Boiral (2011); the grey blocks (top row) represent recommendations, the white blocks (middle row) show the process flow for certification, and the pink blocks (bottom row) refer to the pitfalls of ISO system implementation. Instead of using the system implementation process as a goal itself, organisational leaders should approach ISO 50001 certification as a learning process with its own difficulties and successes.

Organisational leaders should view ISO management systems as tools for improving internal processes based on accepted management principles, as well as a way for promoting social legitimacy and responding to external issues (Boiral, 2011).

2.10 DEBATES FROM THE LITERATURE

Researchers identified several challenges associated with EES models (Ferreira & Almeida, 2015; Halis et al., 2016; Hasanbeigi et al., 2013). Specifically, Hasanbeigi et al. (2013) claimed that the "cost of conserved energy of the fuel-saving model can reduce emissions in both PM_{10} and SO_2" (p. 624); using other fuel-saving models, there is a reduction in on SO_2 only. Hence, it is vital that organisations acknowledge all the factors involved, such as, political, economic, social, environmental, technology, and legal (Halis et al., 2016). Other models focus on financial benefits, while some authors believe the co-benefits of EES should also receive consideration (Ferreira & Almeida, 2015). Decisions about which emissions to reduce depend on organisation preference, followed by an informed decision based on all the factors involved.

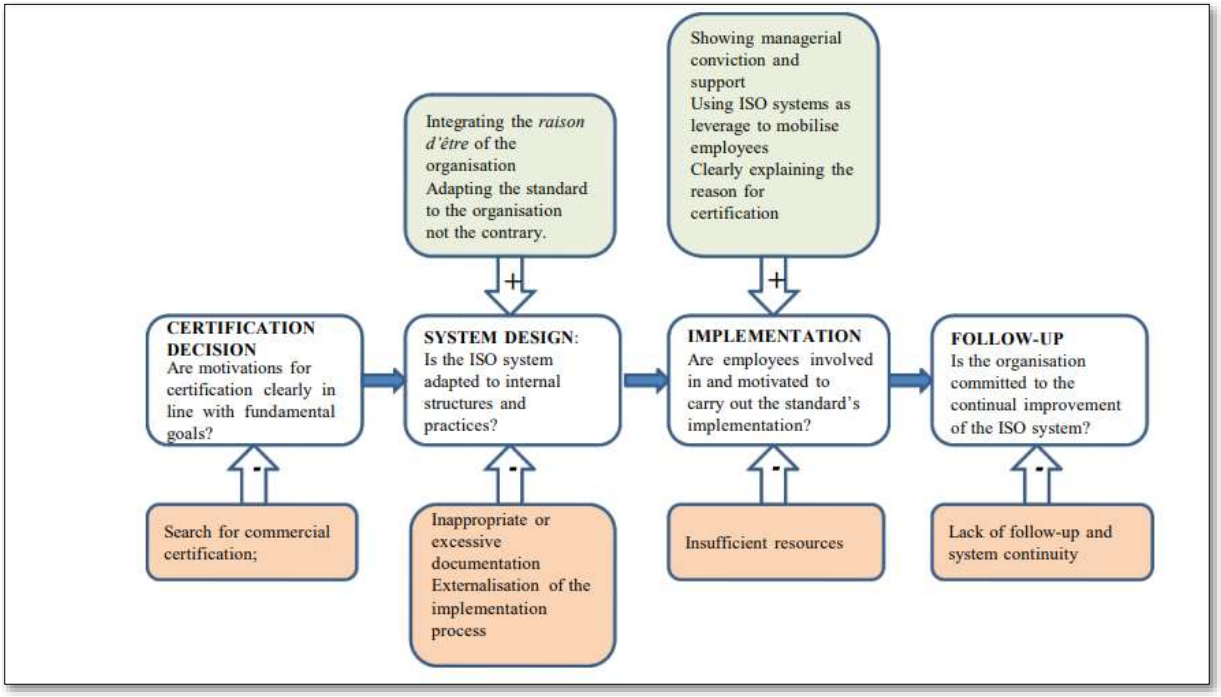

Figure 7: The ISO Systems Implementation Process, Recommendations, and Pitfalls

Source: This figure is adapted from Boiral (2011). Boiral, O. (2011). Managing with ISO systems: lessons from practice. *Long Range Planning, 44*(3), 197-220.

Oates et al. (2018) opined that a holistic approach to the entire manufacturing system is more beneficial towards EES, but instead research only points out either material analysis or energy analysis. Conversely, both Cengel (2011) and Halis et al. (2016) stated that regardless of the model, framework, or system the organisation decides on, it should not affect the product quality; saving on cost, but to losing customers due to unsatisfactory products, does no good.

2.11 CONCLUSION

This chapter provided in-depth knowledge of EES and related variables, namely: barriers, motivators, implementation, and evaluation of an EES. The overview was indicative of the difficult decisions facing organisations, dependent on emissions or energy reduction and potential benefits. Another topic reviewed related to the challenges associated with implementing a reliable, maintainable energy efficient system required for transitioning toward resource efficiency and cleaner production, which stakeholders and investors will support. Each organisation transitioning toward energy efficiency directly addresses the UN's SDG number 13, in which they commit to taking action against climate change. As a framework incorporated into an organisation 's management procedures, ISO 50001 depends heavily on management support. Management support is essential for ensuring that (a) planning and execution procedures are well-resourced, (b) roles and duties on the energy team are clear, and (c) energy management is ingrained into business culture (Fuchs et al, 2020).

CHAPTER 3: RESEARCH METHODOLOGY

3.1 RESEARCH APPROACH

This study followed a qualitative research approach. A qualitative approach is nonnumerical and relies on the iterative process of content analysis (Aspers and Corte, 2019), which suited this research design.

3.2 RESEARCH DESIGN

A non-experimental research design was used for this study. The research design included face-to-face interviews, documentation review, and covert observations. The researcher observed and noted the body language and the physical characteristics of the employees during the mill visit.

The researcher wants to understand EES and has thus chosen a single case study design as it works best to determine the perception of energy efficiency and its role on decision-making processes (Adams & van Manen, 2010). Each interview was analyzed in a word-by-word fashion and then atlas_ti version 8 was utilized to identify any specific themes or patterns through coding. Observation notes were also added to the software to analyze the data for additional themes or patterns.

3.3 DATA COLLECTION METHODS

The data collection method was interviews (face-to-face), documentation review and observations. Unfortunately, data collection during interviews depended on the participants availability and tended to become time consuming. The preferred data collection method is face-to-face interviews, but body language, facial expressions, and attitude observed during the interviews are other data sources (Lavrakas, 2008). The combination of these data sources contributes toward understanding the perception of employees' within their organisation and the impact their perceptions have on decision-making processes (Lavrakas, 2008).

3.4 POPULATION AND SAMPLE

3.4.1 POPULATION

The research population included technical and non-technical employees, employees from the finance department, and the energy forum members from the pulp and paper industry. Data collection took place over a course of three days.

3.4.2 SAMPLE AND SAMPLING METHOD

The sample size of the research study is based on requirements needed to transition towards a more energy efficient system. Non-probability sampling was used to recruit participants at the organisation.

3.5 THE RESEARCH INSTRUMENT

This research study used a single case study. The researcher becomes the research instrument, an insider-researcher in this context (Unluer, 2012). In-person observation of the operation assisted with the development of a deeper understanding of the employees' perceptions of energy efficiency within their organisation. In-person observation also assisted with understanding what extent of the effect that energy efficiency at the organisation had on surrounding communities. Semi-structured interviews were conducted with twelve participants from within the organisation.

3.6 PROCEDURE FOR DATA COLLECTION

The university ethical board granted clearance to proceed with this study using semi-structured interviews as the primary data collection procedure. Permission was obtained to conduct interviews and in-person observation from the pulp and paper industry. The researcher spent three days on-site, within the organisation, and scheduled interviews with participants in accordance with their availability.

3.7 DATA ANALYSIS AND INTERPRETATION

Data was collected using face-to-face interviews, documentation review, and observations. Data analysis consisted of the identification of any specific themes or patterns using atlas_ti version 8 to carefully analyze each interview in a word-by-word fashion. Observations and notes were added to the software analysis.

3.8 LIMITATIONS OF THE STUDY

One of the main constraints was that available literature mostly focused on international organisations situated in developed countries. Most available case studies focus on developed countries such as United States and Europe. This study focused on models and frameworks using a qualitative perspective. Other models, which are more quantitative in nature are also available. In this study, the researcher analyzed data from only one organisation in the SA pulp and paper industry. The findings of this research might provide inspiration for the various other industries, which are also in desperate need of energy efficiency.

3.9 QUALITY ASSURANCE

To ensure *dependability*, the researcher kept notes during interviews and data analysis. The interviews were transcribed using software to ensure the correct recording of data; the transcripts included only what was said. Spending enough time in the field during in-person observation is one way of ensuring the *validity* of the research. The researcher investigated any reoccurring theme or pattern during data analysis. Selecting the appropriate participants based solely on the research questions and the requirements of ISO 50001 (the primary focus point of the research), ensured *credibility*.

Establishing an interview protocol ensured that the researcher remained impartial and objective and contributed toward the *transferability* of this research. The researcher asked each participant the same questions in the same manner ensuring that the conversation flowed thereby obtaining as much data as possible regarding the research topic. Because this research study focused on the employees' perception of EES within their organisation, it is worth noting that the findings might not be *transferable*. It is likely that perceptions would change as operations grow and expand or change geographic location. The researcher demonstrated *confirmability* will be achieved by referencing direct quotations during data analysis or any findings pertaining to data analysis.

3.10 ETHICAL CONSIDERATIONS

Data collection only commenced after receiving ethical clearance from the ethical panel. Prior to starting any interview questions, the researcher informed participants that interviews are recorded. The researcher shared the benefits and risks (if any) of the study with the participants beforehand. The researcher informed participants that they could withdraw from the interview at any stage without stating any reason. The researcher told participants that there was no incentive for participating in the interviews; this applied to the participants and the researcher. To safeguard confidentiality in this perception study, each interviewee received an allocated unique participation number bypassing the need for collecting personal information. This will also ensure that there will be no retribution once the results of this research are published.

CHAPTER 4: DATA ANALYSIS

4.1 INTRODUCTION

After obtaining ethical clearance, the researcher scheduled data collection with the target organisation. Over the course of three days, 12 interviews were conducted to gain a better understanding of people's perceptions of energy efficiency within the organisational context and whether their perceptions influenced their organisational decision-making processes. The three empirical questions formed the basis of the research questions. The human resource conference room served as the interview location.

4.2 LEADERSHIP CHARACTERISTICS REQUIRED FOR SUCCESSFUL IMPLEMENTATION OF ISO 50001

Some participants claimed that the leader needed for a successful ISO 50001 system needs to have technical expertise and know about the latest technologies available. The leader must be able to "wear many hats" as pointed out by participant 001. Energy efficiency is a part of the organisation as a whole, including procurement and training – having an overarching view is vital. Participant 011 stated that the leader for ISO 50001 should lead by example, "it is a lifestyle it's not something that you can drive with a stick". Participant 001 opined that the leadership is "…the beating heart of our energy management system". Some participants appeared enthusiastic toward this research; participants further illustrated a deep understanding of their roles and responsibilities as it relates to EES.

The trend of the leadership characteristics became more apparent, with other participants confirming that the leader must be innovative, "…able to lead others, able to inspire others to follow them, they're able to get us to listen to them, they're able to generate confidence within the team to generate new ideas" (participant 012). This supports the lifestyle aspect mentioned by participant 011. The communication style of a leader is also important, ensuring that the team knows the direction to take and what is expected of them as pointed out by participant 010 and 012. Where participants appeared nervous the interviews were shorter compared to participants that were more at ease.

Vital leader characteristics emerged as data analysis progressed and as evidenced by the corroboration among participant statements from various departments. Being able to have that overarching view and to know how each department influence ISO 50001 became a central theme (participant 001, 007, and 009). Some participants asserted that ISO 50001 and implementing systems do not stand alone (Participants 009 and 006). Participant 003 also mentioned that the leader should be an energetic character. Because ISO 50001 is a newer standard when compared to all the ISO standards, practitioners consider it as *the new kid on the block*. Participant 009 stated that "It's the culture of the organisation, it's not just the environmentalist responsibility, we all carry responsibility at each level within the organisation".

Participant 002 noted that leaders need to inspire employees to be able to think outside the box; the notion corresponds with the perception of participant 007 and 008. For participant 007 felt it was important that the team works together and collaborate, placing emphasis the role of on communication and teamwork. Participant 004 also confirmed that a leader must be open-minded and willing to listen and explore ideas

with their team. Participant 005 supported participant 004, asserting that “I would recommend a leadership whereby it's interactive, a leadership that believes in teamwork”. In contrast, participant 006 stated that “I think the type of leadership doesn't matter”, but rather that it should be someone who is proactive and cannot only plan a project but can also implement and execute it successfully.

From the interviews, across all organisational levels, it emerged that to successfully implement ISO 50001, the leader needs to be a *good communicator*, must be a *team player*, and must be *open-minded to new ideas* (see green section in Figure 8). It did come as a surprise that technical expertise was not a dominant perception from the various employee bands.

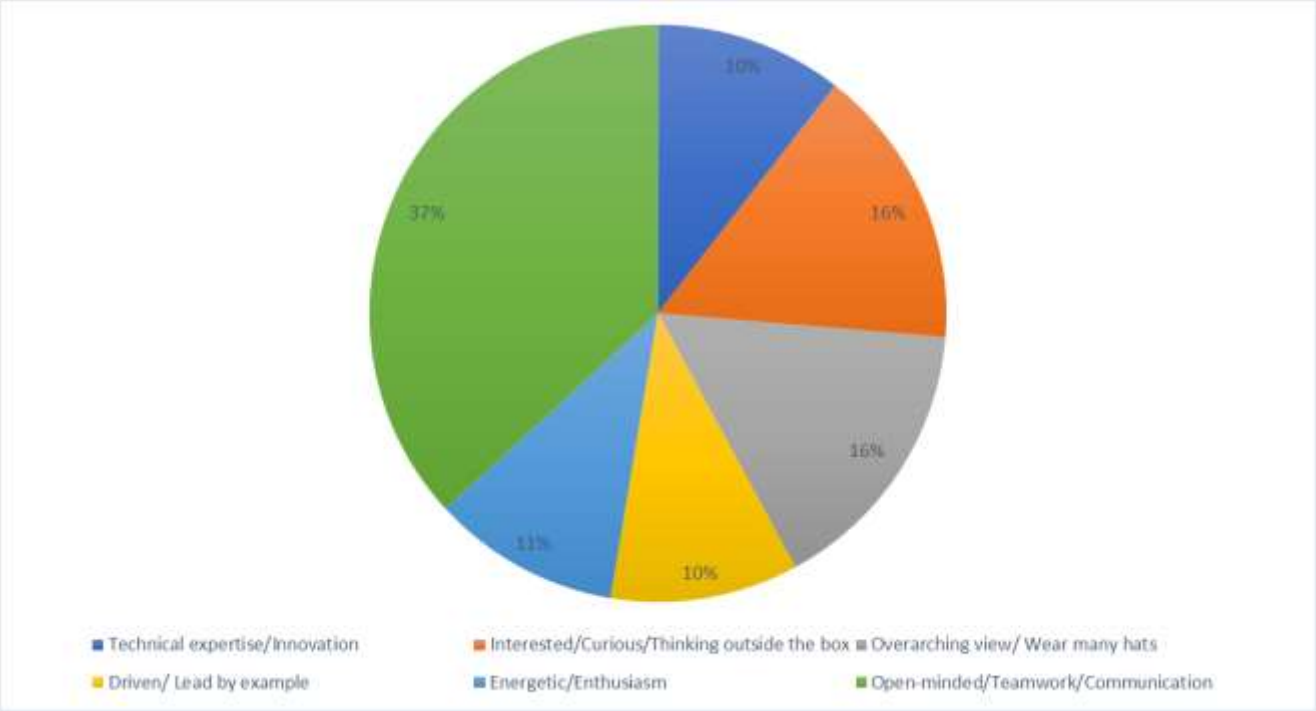

Figure 8: Leader Characteristics According to Responses

Source: Interview responses formed the basis for generating this figure.

4.3 ENERGY EFFICIENCY AND ORGANISATIONAL GOALS

Some participants claimed that the pulp and paper industry is known for their three Ps: *people*, *prosperity*, and *planet*. Participant 011 believed that the three Ps is how the organisation included energy efficiency as part of its organisational goals. In contrast participant 001 argued that energy is not yet part of the existing systems and structures and should be “married” into the various business units. The organisation still focused on SHEQ. Consequently, participant 001 felt the focus should be *SHEQ+E*. “I walked into this one control room you had the environmental policy, you had the quality policy, and you had the health and safety policy right there next to one another in a nice frame, and then you have the energy policy on the other end of the room on a pinboard by itself” (participant 004. The participant suggested that it shows that not all the ISO systems have fully been integrated as yet.

Other participants were unsure and hesitant to answer the interview question relating to how the organisation included energy efficiency in its goals. From these responses it emerged that awareness levels within the organisation fluctuated and that there might be a need for additional awareness training. as demonstrated by their inability to elaborate, give examples, or identify where ISO 50001 feeds into the organisational goals.

In contrast, other participants claimed that there is a strong drive from the top regarding ISO 50001 and that their organisational goals.

Participant 005 and 009 believed that it started on a global level with the SDGs, and other mills from overseas started to adapt the SDGs. International collaboration among the other pulp and paper mills, comparing *notes,* and learning from others' mistakes represent aspects driving support for ISO 50001 and the SDGs. It is not only management that is responsible for setting the organisational goals, the training and development department also feeds into that. Participant 009 confirmed the interdepartmental involvement, noting that:

> What's the interesting part of my role is to work with the teams to put together their objectives so I'm actually sitting with the services and the utilities team next week Thursday we'll look at those high-level objectives we'll break it down so that that team knows what to focus on.

In contrast to the understanding and clarity demonstrated by some participants (002, 007, and 008) about how management includes energy efficiency in the organisational goals, others answered vaguely (010 and 012). There was variation among the three participants' answers, with little overlap in their answers. Participant 002 believed that the organisational goals are included in policies and procedures, allowing employees to work more efficiently. Participant 007 believed that the organisational goals are captured within their objectives and form part of the annual compliance training.

An unexpected finding was that the technical participants also struggled to provide examples or explanations of how the organisation includes energy efficiency in their organisational goals. The technical team has a more hands-on approach, so the assumption was that they would have a deeper understanding of ISO 50001 when compared to nontechnical participants. However, participant responses demonstrated that this was not the case.

Participants responses suggested that their perceptions about organisational goals and energy efficiency were very vague (participants 002, 007 and 008). Participants mention that they believe it is a high focus within the organisation and that the input and output of products are scrutinized (004, 005 and 006). Participant 006 said that “I haven’t done the training yet, but if you don't really know the topic or energy saving you will struggle”. Participant 006 also opined that management is trying by all means possible to get people to go and attend the ISO 50001 training, “to be able to put things in perspective for example waste treatment and energy tracking”.

Figure 9 presents a graphical illustration of the frequency of occurrence of responses during the interviews. *Quarterly reviews and processes analysis* (orange section) was the dominant response to the interview question about energy efficiency and organisational goals, followed by *organisational objectives and targets during the annual training* (green section).

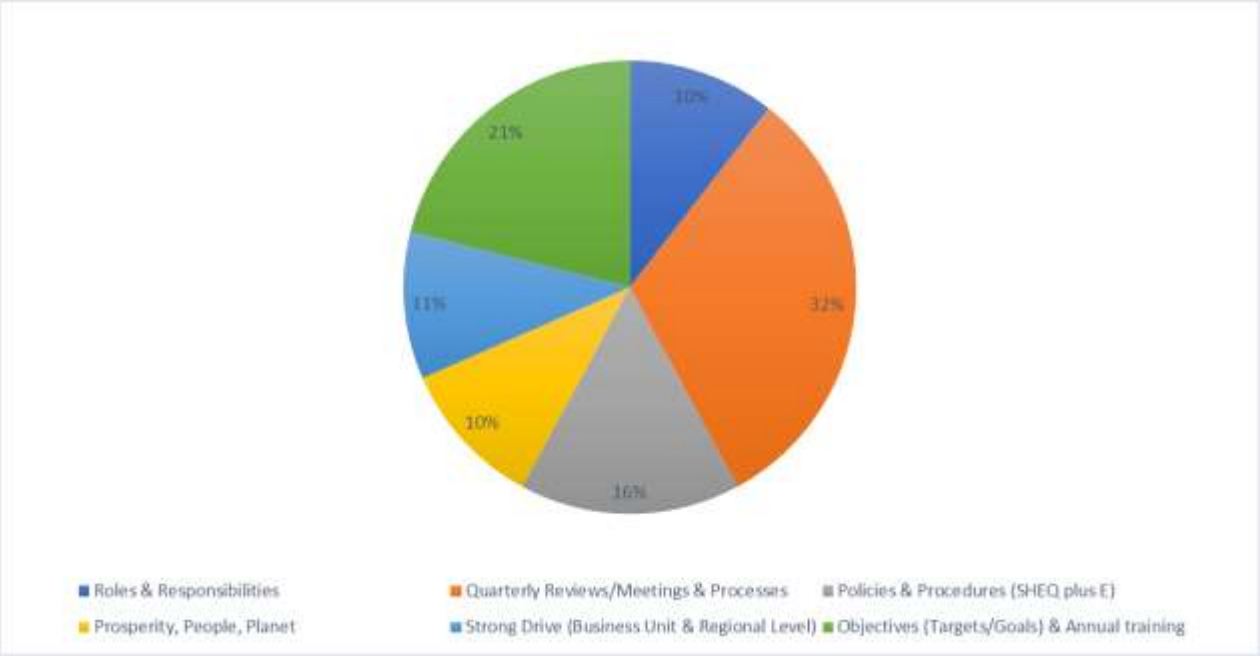

Figure 9: Organisational Goals Responses

Source: Interview responses formed the basis for generating this figure.

4.4 MOTIVATION FOR TRANSITION TOWARDS ISO 50001

Participants directly involved with the implementation of the ISO 50001 system illustrated a deeper understanding regarding the motivation for transition towards an energy efficiency system. Participants 001 and 011 identified the global drive of SDGs, the financial health of the organisation, ensuring continuous improvements, and the perception ISO 50001 distilled with their customers and stakeholders as motivating factors for transitioning to energy efficiency.

Participants 010 and 012 corroborated participants 001 and 011 sentiment identifying sustainability as the motivation to transition towards energy efficiency. The ability to follow a global trend and make a product that is competitive in the market. As participant 012 stated “…for me there's only two drivers it's cost and sustainability”. Elaborating on the motivation for transitioning towards ISO 50001, participants 003 and 009 mentioned cost saving and environmental pressure. Participant 009 noted that “I would think that the major driver is again cost impact and then of course political and probably environmental pressure”. It was the first time in the interviews that political aspects were mentioned.

Some participants (002, 007 and 008) suggested that the motivation for an organisation to transition towards energy efficiency is awareness of their objectives and responsibilities. Participant 002 claimed that “If we don't know the objective you feel like they're dragging you into a river”. This highlights the need for communication; specifically, the communication strategy for introducing ISO 50001 to employees across all levels.

Only one participant identified cost saving and *bragging rights* as motivators; bragging rights relate to the fact that not every organisation can say they comply with an international standard. Participant 008 also stated that people can be incentivized should they work towards being more efficient with their processes. Environmental and global warming was also mentioned as a motivation (participants 004, 005 and 006).

Cost saving (blue section in Figure 10) and *environmental pressure* (yellow section) were the two dominant responses, followed by the *reputation* (grey section) of an organisation for complying with an international standard. The outlier for this question was one participant's perception that politics is a motivator for ISO 50001. In response to a follow up question to elaborate on the perception stated the participant chose not to elaborate. Throughout the course of the interviews, participants never mentioned politics again.

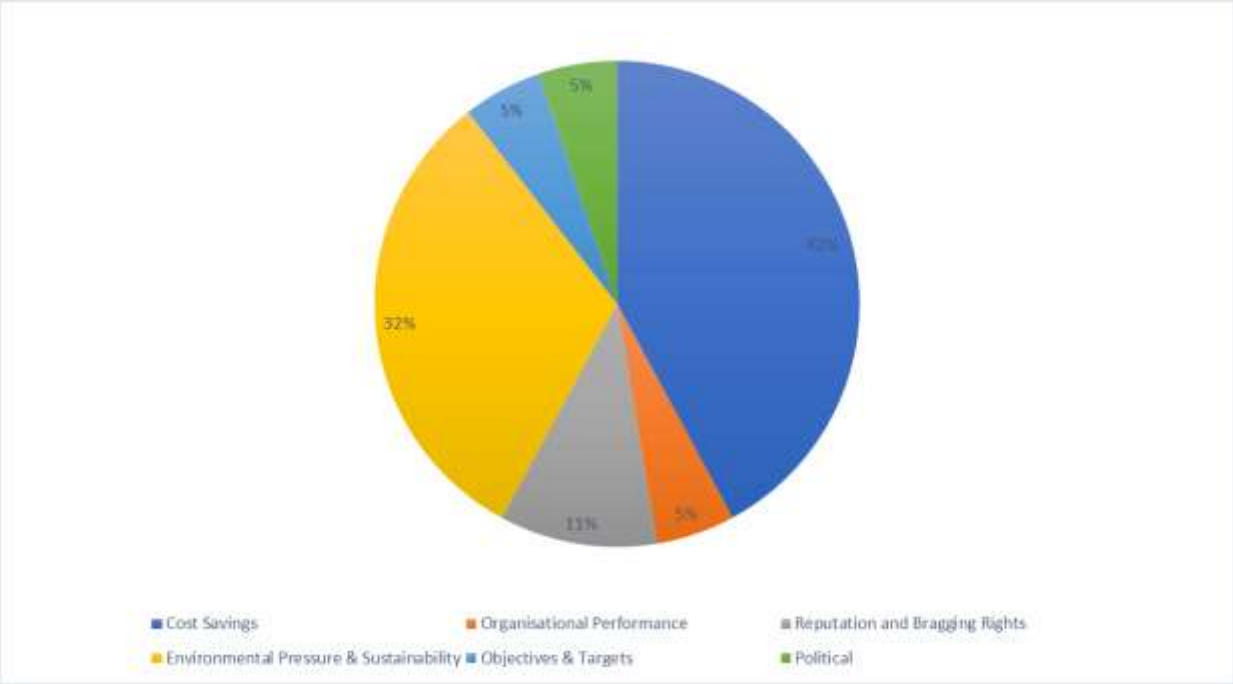

Figure 10: Motivation Responses

Source: Interview responses formed the basis for generating this figure.

4.5 BENEFITS OF ISO 50001

Participants 001 and 011 believe one of the benefits of ISO 50001 is that it's a *'pat on the shoulder'* to comply with an international standard. Marketing purposes, brand awareness, as well as environmental pressures, where the organisation illustrates their commitment towards caring for the planet and its people, also believed to be benefits of ISO 50001. These benefits were also noted by participants 010 and 012, demonstrating a uniform perception of the benefits.

As established in the literature review, implementing an ISO 50001 system also brings co-benefits. Davies et al. (2000, as cited in Hasanbeigi et al., 2013) listed the three categories of co-benefits as (a) societal and health, (b) environmental, and (c) economic benefits. During the interviews, only participant 006 made mention of societal or community health.

Interestingly, some participants (003 and 009) listed financial benefits first, before mentioning social responsibility and environmental compliance. Participant 003 summed it up as:

> "ISO 50001 has a direct impact on the financial component of the organisation. So yes, one can argue that to avoid penalties and staying out of prison in terms of environmental compliance in a similar way health and safety as well".

Other participants noted a wider variety of benefits (participants 002, 007, and 008). They claimed that steam leaks would have been ignored previously, but now with ISO 50001 implemented, employees know what to look out for and will report it as the organisation is losing energy.

Other benefits mentioned included ". . . keeping our promise that we made to our customers, keeping the environment safe, delivering products on time, making sure everything is done in the correct manner so that we don't have a delay or any obstacles". However, it seems that cost savings, return on investment and being able to keep the mill running and job security were also key to employees (participants 004, 005 and 006). Participant 005 stated that: "…you get to decrease on your wastage, and you get to save up on your cost in terms of the amount you spend on raw materials in this case steam and water".

The dominant response was *environmental and sustainability* (orange section illustrated in Figure 11), followed *financial health of the organisation* (dark blue section). The interview question about the benefits of ISO 50001 received the most consistent and corroborating responses. Most participants, irrespective of their department, standing, or technical ability listed the same benefits (figure 11). As per the literature review, it is evident that the paper and pulp industry prioritize all three co-benefits.

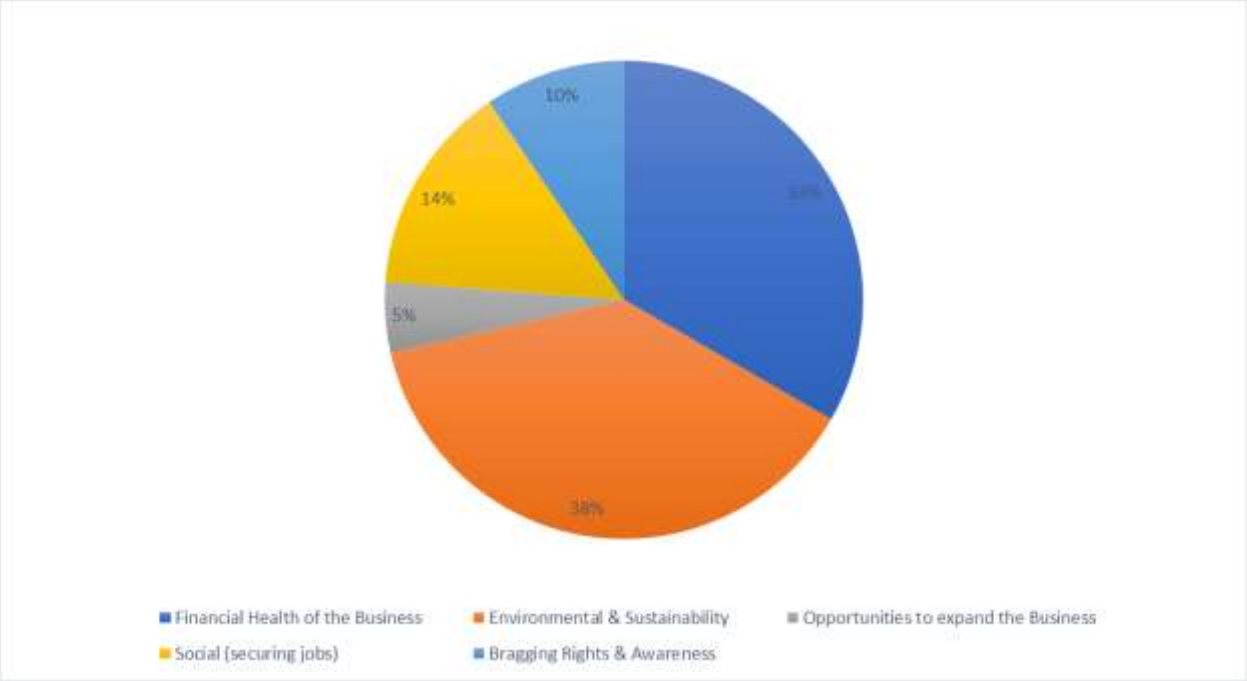

Figure 11: Benefits of ISO 50001

Source: Interview responses formed the basis of generating this figure.

4.6 CHANGES TO THE BOTTOM-LINE

Participant 001 mentioned an indirect impact to the bottom line, meaning environmental pressures are forcing organisations to make changes affecting sustainability targets. The participant said that:

> …one of our sustainability KPI's is how much fossil fuel energy we are putting in to create our product; and again like I explained those sustainability numbers go to our customers and our shareholders, so it does impact your bottom line not really in a direct way as in the one I explained with the pump but sometimes in conjunction with all the other parameters that we have to work with such as environment and effluent (Participant 001).

Participant 011 was involved in a project and noticed a R4.5 million change in the bottom line. According to participant 011 financial changes are the biggest change towards the bottom line. The participant said that “I could physically see the change on the meter on the Eskom [SA’s Electricity supplier] side…” (participant 011).

Some participants stated that changes are noted in the bottom-line (participant 010 and 012). According to participant 010, “It will be a green satisfactory bottom line, the bottom line will be not only environmental but financial as well”. Another aspect that emerged when participants talked about the changes to the bottom-line was the financial health of the organisation (participants 003 and 009). Specific aspects pertaining to the bottom line are reducing variable costs and increasing the profit margins (participants 003 and 009).

Participants 004 and 005 mentioned that the biggest change to the bottom-line is finances and saving money, while participant 006 included environmental changes and not depleting the natural resources.

Participant 009 confidently stated that:

> “. . .we already doing it because we are already committed to that process as an organisation, ISO 50001 just meant we needed to formalize and document everything properly. We spent so much time writing a procedure, now it's about understanding the requirements and the standard”.

Participants 003 and 009 were confident during the interviews and claimed that the organisation was already energy efficient before ISO 50001 was introduced.

Some participants struggled to discuss the effect of ISO 50001 on the bottom-line, as evidenced by the long silence before responding (participants 002 and 007).

Similarly, another participant (004) thought there were no obvious changes to the bottom-line. Participant 004 opined that: “I have seen no change. If there were changes, they might have been so subtle that it is not obvious to me”. This was the first and only instance where a participant was unable to identify changes to the bottom-line. Participant 004 pointed out that, in some areas of the business, it is difficult to cut energy without negatively affecting the quality of the product. This observation corresponds with Halis et al.’s (2016) assertion that regardless of the system the organisation decides to implement, the system should never negatively affect or jeopardize the quality of the product just to claim that the organisation is energy efficient.

Figure 12 represents the different changes to the bottom-line mentioned by participants. Participants mentioned *cost savings* (dark blue section in Figure 12) most often as a change to the bottom-line. *Relief of environmental pressure* (orange section) followed as the second highest response mentioned by the participants. The data suggest that the organisation prioritizes financial benefit as a change to the bottom-line.

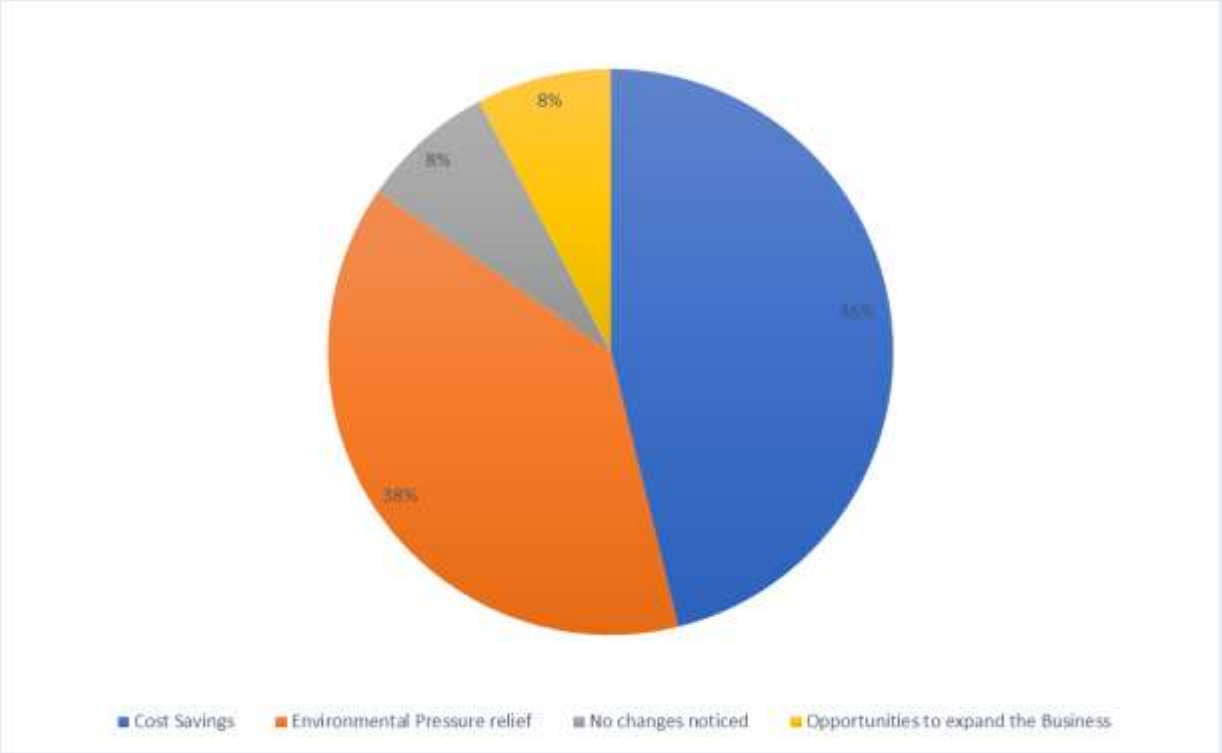

Figure 12: Changes to the Bottom-Line of the Organisation

Source: Interview responses formed the basis of this figure.

4.7 IMPORTANT CATEGORIES AND RELATIONSHIPS

Participants (003 and 009) perceived financial health as a motivator as well as a benefit of ISO 50001. Participant 001 stated that "…the more efficiently you use your energy, and your water, your money input into producing a ton of pulp goes down". Throughout the data collection process financial health of the organisation seemed to be a dominant theme.

Cost, savings, and finance were concepts participants mentioned in almost every question. However, Participant 012 stated that “My perception is that management is more concerned about the cost than they are about the future”. Conversely, other participants pointed out that cost saving placed the organisation in a position to expand and incorporate more business units.

From the data it emerged that participants not directly involved with the implementation of the EnMS struggled to actively participate and provide meaningful responses to the interview questions. This finding may be indicative of a need for additional awareness training, or alternatively, a system that has not been in operation for very long. The longer, more elaborate interviews with some participants directly involved with the implementation of the system support these observations.

Throughout the interviews it appeared as if there is a good understanding of the environmental pressures placed on the company, especially from the SDGs that organisations now adopt. Another recurring response evident throughout the interview process relates to the pride organisations take in complying with an international standard. Another recurring theme observed throughout the data collection and analysis process pertains to organisational members at all levels believing that they should only use the amount of energy they need. Each of this mill’s business processes were analyzed to determine how that specific process can return energy, for example, not losing steam, but being able to turn it into a form of energy.

CHAPTER 5: STATEMENT OF LIMITATIONS

5.1 ALTERNATIVES AND WEAKNESSES

It is important to note that this research study only focused on one mill from the SA pulp and paper industry. Researchers or practitioners might consider drawing comparisons between other mills to test or review these findings. Primary data collection was limited by using only semi-structured interviews. Using semi-structured interviews assisted the researcher with the observation and interpretation of the body language and tone of voice of participants and other employees when speaking about energy efficiency. Depending on the research questions, other methods might also be used. Based on the empirical research questions for this research study, the research instrument was sufficient, and the necessary data obtained. The frameworks listed in this study could also be used for quantitative research methods, depending on the research questions and the study design. Given the objectives and research questions, qualitative research approach was the best option because it allowed the researcher to investigate employees' perceptions of energy efficiency and whether these perceptions impacted their decision-making processes.

5.2 BENEFITS OF THE RESEARCH

The staff at the pulp and paper mill has access to the peer reviewed articles cited in this study by means of the reference list to further understand ISO 50001. The organisation is in a position to obtain recommendations and further exposure on how to grow their systems for continuous improvement purposes. The organisation can be seen as leaders of ISO 50001 management systems by other industries, which might motivate industries to thrive towards cleaner production processes.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

There was some variation in perceptions throughout the twelve interviews, however, it is apparent that the implementation of ISO 50001 created a good balance between financial (33% of the responses) and environmental (38% of the responses) benefits within the organisation. To maximize the effect and to get the full potential of ISO 50001, it is worth noting that ISO 50001 should form a part of the project planning process, as pointed out by participant 001 and 011.

For instance, participant 003 and 009 mentioned that the direction of pumping upstream versus downstream can impact energy usage dramatically. This is also where the success of ISO 50001 implementation comes into effect, as 37% of participants responded that a leader needs to be open-minded, be a team player and able to communicate. If ISO 50001 is part of project planning, the benefits of an EES will be noted early in the process. Importantly, considering ISO 50001 during the planning phase makes it is easier and cheaper to execute a project, instead of changing a mill or plant afterwards to secure and prevent energy losses as pointed out by 42% of the responses, cost savings was the highest motivation to transition towards EES.

It is clear that the managerial and technical staff were aware of energy efficiency long before the introduction of ISO as pointed out by participants 003, 004, 005, 006 and 009. The challenge is to change the organisational culture to cultivate a mindset that includes energy efficiency as part of their daily tasks, to ensure that participant 004 can start to see the potential changes that the EES can cause. Organisations can only achieve success by giving energy efficiency the focus and attention it deserves.

Participant 011 mentioned that they only noticed the first changes after implementing ISO 50001 during the first quarter of the following year. Therefore, based on the responses shared during the interviews, it is advisable that management share the results or benefits of ISO 50001 within the organisation in the form of a quarterly newsletter, allowing employees across all levels within the organisation, knowledge, and awareness of the EES. To ensure that employees' perceptions align with the principles of ISO 50001, management might increase annual and awareness training to a six-monthly activity. Increase training and communication efforts might increase employee awareness and ensure employees become more knowledgeable about ISO 50001, which would further increase the benefits of the EnMS.

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APPENDIX A: ETHICAL CLEARANCE

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School Ethics Committee
Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: W8S/BA2529231/797
This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below)

Project title	Perceptions of energy efficiency consequences of implementation of ISO50001 in South Africa's pulp and paper industry
Investigator / Researcher	Mrs Juanita Kapp
Nature of Project	MBA (Research Article)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	2022/08/25
Expiry date	Date of submission of the project / research report
Chairperson	Prof Anthony Stacey ☎ +27 11 717 3587 +27 82 880 4531 anthony.stacey@wits.ac.za

Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.

Signature

01/09/2022
Date: