



University of Kwa-Zulu Natal

**Examining the Role of Digital Transformation Within Coca-Cola Beverages South
Africa's Manufacturing Facilities**

by

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of

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Abstract

This study examines the impact of digital transformation on operational efficiency, employee productivity, and job satisfaction within Coca-Cola Beverages South Africa's (CCBSA) manufacturing facilities. The research examines the economic, social, legal, and environmental implications of adopting digital technologies in the fast-moving consumer goods (FMCG) manufacturing sector. Using a quantitative research approach, structured surveys were administered at four key manufacturing sites: Phoenix, Premier, Elgin, and Lakeside. Stratified random sampling ensured representation from frontline workers, managers, and control and automation specialists. Data were analysed using descriptive statistics, Cronbach's alpha for internal reliability, and correlation analysis to determine key relationships between digitisation and performance indicators.

The findings reveal that digital transformation at CCBSA has led to significant operational improvements, including enhanced workflow, reduced production downtime, and increased employee satisfaction. Respondents noted that digital tools streamlined operations, enhanced communication, and improved consistency across manufacturing processes. A moderate positive correlation was found between the costs of implementing digital systems and long-term cost savings, supporting the economic viability of digitisation investments.

However, the study also identifies critical challenges, particularly concerns over job displacement due to automation and the need for ongoing upskilling to manage more complex digital systems. These insights underscore the importance of human-centred change management strategies, including comprehensive training, transparent communication, and incentives to support workforce adaptability.

The study contributes to both academic literature and industry practice by offering evidence-based recommendations to guide successful digital transformation in manufacturing. It emphasises that addressing employee concerns and fostering a supportive organisational culture are essential for achieving sustainable digital integration. Future research is recommended to explore the longitudinal effects of digitisation and the role of leadership in navigating these transformations.

Key words: Digital Transformation, Operational Efficiency, Employee Perceptions,
Manufacturing Innovation, Change Management

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Abbreviations

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
CCBSA	Coca-Cola Beverages South Africa
CPP	Continuous Processing Plants
DTT	Digital Transformation Theory
FMCG	Fast-Moving Consumer Goods
GDP	Gross Domestic Product
IDT	Innovation Diffusion Theory
IoT	Internet Of Things
IP	Intellectual Property
OEE	Overall Equipment Effectiveness
POPIA	Protection of Personal Information Act
RBV	Resource-Based View
ROI	Return On Investment

Chapter 1: Introduction

1.1. Introduction

In today's rapidly changing business landscape, digital transformation has become a key driver in reshaping industries, operational models, and organisational strategies. Integrating advanced technologies, such as artificial intelligence, big data analytics, cloud computing, and machine learning, has significantly transformed the way businesses operate, with substantial implications for manufacturing and supply chain processes. Coca-Cola Beverages South Africa (CCBSA) was an illustrative example of how companies in traditional industries leveraged digital technologies to enhance operational efficiency and maintain competitiveness.

This chapter explored the role of digital transformation in CCBSA's manufacturing processes, focusing on how digital tools were integrated to optimise efficiency, reduce costs, and improve productivity. Additionally, the chapter examined the broader organisational and strategic implications of digital transformation, employing various theories and frameworks to understand the changes occurring within and in the external environment.

The chapter was structured to initially outline the study's assumptions, which provided a foundation for the research. It then presented a comprehensive literature review, drawing on relevant theoretical and empirical studies on digital transformation, particularly its effects on organisational performance and industry dynamics. Lastly, the research methodology was detailed, including the design, sampling techniques, data collection methods, and analysis strategies.

1.1 Background of the study

The entire society feels the impact of digital transformation, from individuals to national and heavy engineering industries. It is not immune to the drift towards the new world of technological advancement (Leviäkangas et al., 2017). Through digital transformation and technological advancements using smart electronics, the world has undergone drastic changes compared to a decade ago, and growth continues to follow an exponential trajectory (Leviäkangas et al., 2017). As technology develops, Leviäkangas et al. (2017) noted that telecommunication has been integrated into a global network, allowing data accessibility to be shared worldwide. The World Economic Forum report indicated that by 2025, one trillion sensors will be connected to the internet to collect data from machines, allowing data analysts to study trends and predict machine behaviour for better planning and preparedness (Leviäkangas et al., 2017). European countries continue to dominate the digital world, according to the European Digital Data report, and Nordic countries, specifically Denmark, Finland, and Sweden, are among the top three countries in digital advancement for industries (Leviäkangas et al., 2017).

According to Kamel (2023), the benefits of digital transformation are not only significant in industrial engineering but also substantial in the construction sector, where digital technologies are used to streamline construction processes. In the past, conversion engineering drawing boards were used to design structures and perform first-principles structural calculations. However, with the development of the digital world, drawings are now performed using Computer-Aided Design (CAD) software, which can perform Finite Element Analysis (FEA) and Failure Mode and Effects Analysis (FMEA) (Kamel, 2023). Digital transformation within the engineering sector helps ensure that design calculations are approved at various levels, and software also provides a graphical representation of prototypes. Engineering software is developed by experts and checked in many stages before they are put on the market to ensure a very good degree of accuracy; however, it is also essential that the end user is also familiar with engineering principles so that if the simulation is wrong, they will be able to diagnose where their problem might be emanating from and take corrective actions. Systems, Applications, and Products in Data Processing (SAP) is one of the major software used in engineering for asset care purposes, and the quality of information stored in the software is determined by the person tasked with developing that information, i.e., task lists, inventory information, and employee data.

1.2. Focus of the study

The study examines how digital technology can enhance quality control in a beverage production company. The company can monitor critical parameters, such as temperature and ingredient ratios, in real-time by using sensors during key stages, including processing and packaging. This approach aims to enhance product consistency, minimise waste, and reduce costs by predicting and preventing quality issues before they occur. The study also examines the costs and benefits of adopting digitalisation of production processes, including initial setup and ongoing maintenance, while addressing challenges such as data security and system integration. Overall, the goal is to enhance product quality, customer satisfaction, and operational efficiency by implementing smart technology in beverage production.

1.3 Problem Statement

Digital transformation continues to change the world today; organisations are constantly challenged by the changes brought about by digital transformation, and it is essential to understand that digital transformation has both bright and dark sides (Scholze & Hecker, 2024). There is growing pressure to digitise specific processes within the engineering industries and processing plants. However, the readiness of the labour is still questionable at this stage (Scholze & Hecker, 2024). Digital transformation also brings the element of job losses and anxiety among employees. As a result, human nature often seeks to resist situations that threaten survival; therefore, implementation must be done in a step-by-step manner. It is also essential to address the psychological and cultural factors that may hinder the implementation of digital transformation within heavy engineering industries; therefore, a comprehensive approach is needed to consider both the benefits and drawbacks of digital transformation within these industries (Scholze & Hecker, 2024).

Scholze and Hecker (2024) indicated that the turbulent changes in the trading sector have made it imperative for organisations to change how they run operations. The pressure to produce has increased, driven by rapidly changing environments and living conditions. This is why digital transformation strategies have been adopted to improve productivity and efficiency. However, on the other hand, jobs at lower grades continue to become extinct; therefore, it is essential to strike a balance in preparing employees for future skills based on the organisation's roadmap, so that they will be more competitive in the job market. Digital transformation impacts technical workers and the supply chain, which must be prepared to adapt to rapid change. According to

de Lucas Ancillo et al. (2023), organisations are still trying to find their footing to forge the way forward against the COVID-19 pandemic; however, well-equipped organisations have managed to utilise resources to invest in remote working, which has been a tremendous success despite some glitches. The way employees adopted the new ways of working indicated that increased levels of digital transformation can lead to businesses performing better and with less mental stress.

While global research has extensively explored digital transformation in sectors such as banking, retail, and logistics, there is a limited body of empirical research that focuses specifically on its implementation within the South African FMCG manufacturing sector. In particular, studies rarely capture the nuanced experiences of employees across different operational levels in responding to digitisation efforts within production environments. This study addresses this gap by evaluating the impact of digital tools on employee perceptions, productivity, and operational processes at CCBSA. The research also integrates internal organisational dynamics with broader PESTEL influences, thus offering a multidimensional perspective that is lacking in the existing literature.

1.4 Aim

This study aims to assess the impact of digital transformation on CCBSA's manufacturing operations, identify opportunities for significant improvements in digital systems, and explore how digital technologies can enhance operational efficiency, productivity, and employee satisfaction, ultimately supporting the company's ongoing digital transformation.

1.5. Main objective

This study aims to assess the impact of digital transformation on CCBSA's manufacturing operations, identify key opportunities for enhancing digital systems, and provide actionable insights to improve operational efficiency, productivity, and employee satisfaction as part of the company's digital transformation.

1.5.1. Sub-Objectives

1. Evaluate the current effectiveness of CCBSA's digital tools and systems in optimising manufacturing operations and identifying gaps and inefficiencies.
2. Examine the relationship between digital transformation and employee productivity, job satisfaction, and engagement within CCBSA's manufacturing workforce.

3. Identify strategic opportunities for enhancing CCBSA's digital transformation, focusing on advanced technologies, training initiatives, and integration improvements to drive greater operational efficiency and productivity.

1.6. Research questions

1. How effective are CCBSA's current digital tools and systems in optimising manufacturing operations, and what are the key gaps and inefficiencies that need to be addressed?
2. What is the relationship between digital transformation and employee productivity, job satisfaction, and engagement within CCBSA's manufacturing workforce?
3. What are the strategic opportunities for enhancing CCBSA's digital transformation efforts, and how can advanced technologies, training initiatives, and system integrations improve operational efficiency and productivity?

The Digital Transformation Theory, Innovation Diffusion Theory, Resource-Based View, and Organisational Change Theory underpin these research questions and objectives. Together, these frameworks provide the analytical lens through which the study examines the interplay between digital tools, employee engagement, organisational efficiency, and external contextual forces. The conceptual framework further integrates these theories to assess how internal capabilities and employee readiness shape CCBSA's digital transformation trajectory.

1.7. Preliminary Literature Review

Digital transformation is increasingly recognised as a critical enabler for organisations to remain competitive, particularly in the FMCG sector. CCBSA digital transformation has been fundamental in optimising production processes, improving operational efficiency, and enhancing overall market competitiveness (Michael et al., 2023). Technologies such as automation, data analytics, and the Internet of Things (IoT) have been integral in streamlining operations and reducing costs. Automation, for instance, has helped reduce human error, speed up production, and ensure consistent product quality. Data analytics enables businesses like CCBSA to make data-driven decisions in real-time, enhancing operational responsiveness and reducing downtime (Chauhan et al., 2022). IoT devices allow for predictive maintenance, ensuring equipment is serviced before breakdowns occur, thereby minimising unplanned stoppages and improving efficiency.

In addition to enhancing operational performance, digital transformation has necessitated significant organisational change. CCBSA has had to restructure its workforce to accommodate new technological advancements. As automation and data analytics become increasingly integral, employees must be reskilled and upskilled to keep pace with the evolving demands of their roles (Moloko, 2021; Nworie et al., 2024). Integrating these digital tools has also led to flatter organisational hierarchies, fostering more agile decision-making and a shift toward data-driven management. CCBSA's efforts to provide extensive training programs and create a learning culture within the company have been crucial in overcoming the resistance to change often associated with such transformations.

Stakeholder engagement has been a key focus during CCBSA's digital transformation journey. The company has recognised that the success of digital transformation depends not only on technology but also on how employees, suppliers, and customers interact with it. CCBSA has implemented extensive reskilling initiatives to ensure employees possess the necessary skills to work with advanced technologies, thereby reducing resistance and fostering a positive attitude towards change (Kolade & Owoseni, 2022). Additionally, management's active role in setting clear strategic goals and ensuring alignment between digital initiatives and broader business objectives has been vital to ensuring the success of the transformation.

Suppliers, too, have been impacted by CCBSA's digital transformation. The company has integrated digital tools into its supply chain, improving inventory management, demand forecasting, and communication. This has enhanced the supply chain's efficiency and fostered stronger relationships with suppliers, ensuring better coordination and collaboration (Zhao et al., 2023). Through digital platforms, CCBSA has facilitated the sharing of real-time data, thereby improving forecasting accuracy and enabling more efficient resource allocation.

The external environment, analysed through the PESTEL framework (Political, Economic, Social, Technological, Environmental, and Legal factors), shapes how businesses like CCBSA approach digital transformation. Political factors, including government regulations, digital infrastructure, and tax incentives, influence the rate at which companies adopt new technologies. For example, CCBSA must ensure its digital strategies align with South African policies and regulatory frameworks, particularly concerning data privacy and cybersecurity (Nguyen et al., 2025). Economic conditions also affect the feasibility of investing in digital technologies. During periods of economic growth, organisations are more likely to invest in digital tools, while economic downturns may lead to more cautious spending (Wambua, 2023; Igwe et al., 2024).

Social factors, such as changing consumer behaviour, have also significantly driven CCBSA's digital transformation. Consumers now demand seamless online experiences and personalised services, encouraging CCBSA to adopt digital platforms for better customer engagement and supply chain efficiency (Yang et al., 2021). Additionally, a more tech-savvy workforce has facilitated the implementation of digital tools such as automation and data analytics with less resistance, making the digital transformation process smoother for CCBSA (Kolade & Owoseni, 2022).

Technological advancements, particularly in cloud computing, AI, and machine learning, have also played a crucial role in digitalisation. These technologies have enabled businesses like CCBSA to enhance supply chain management, improve customer interactions, and boost operational performance (Rajawat et al., 2021). Furthermore, the growing importance of environmental sustainability has led CCBSA to leverage digital tools to reduce waste, optimise energy usage, and improve resource management. By adopting more efficient production processes, the company has been able to meet consumer demands for eco-friendly practices, boosting its reputation and fostering customer loyalty (Chauhan et al., 2022).

Legal factors, including data protection and cybersecurity laws, are another key consideration for businesses undergoing digital transformation. Compliance with regulations such as South Africa's Protection of Personal Information Act (POPIA) is essential for CCBSA as it ensures the safe handling of customer data. Investing in cybersecurity technologies is crucial for protecting against data breaches, which can have serious legal and reputational consequences (Neves et al., 2022).

CCBSA's digital transformation provides valuable insights into the impact of digital transformation on FMCG manufacturing. Integrating automation, data analytics, and IoT has significantly improved operational efficiency, reduced downtime, and enhanced customer engagement. CCBSA's ability to adapt its workforce, engage stakeholders effectively, and respond to external factors such as regulatory changes and market demands has been essential for the success of its digital initiatives. The company's experience demonstrates that successful digital transformation is not just about technology adoption but also about aligning organisational structures, fostering a learning culture, and engaging with key stakeholders to ensure long-term success in a rapidly evolving business environment (Michael et al., 2023).

1.8. Research Methodology

The researcher employed a quantitative approach to assess the impact of digital transformation on CCBSA's manufacturing operations, with a focus on efficiency, productivity, and employee satisfaction. Structured surveys were the primary data collection tool, enabling the collection of objective and measurable insights. A stratified random sampling method was employed to ensure representation from various employee groups, including shop floor workers, managers, and control and automation specialists (Ogbeyemi et al., 2024). The research aimed to capture the tangible impacts of digital technologies, such as automation and data analytics, on operational performance, with key performance metrics, including production output, downtime, and error rates, being analysed.

The study was conducted across four key manufacturing facilities: Phoenix, Premier, Elgin, and Lakeside, which were selected due to their strategic importance within CCBSA. The sample size was determined using Cochran's formula, ensuring a statistically significant sample with a 95% confidence level and a 5% margin of error (Ahmed, 2024). The survey included a 5-point Likert scale to assess the operational impacts, employee satisfaction, and perceived effectiveness of digital technologies. A PESTEL analysis was also conducted to understand the influence of external factors, such as political, economic, social, technological, environmental, and legal factors, on digital transformation efforts. Cronbach's alpha was used to support data analysis and evaluate the internal consistency of the survey instrument (Forero, 2024). The research aimed to provide CCBSA with actionable insights into its digital transformation strategy and guide future decisions on operational improvements (Simplilearn, 2021).

1.9. Rationale of the study

This study aimed to bridge the gap in how employees from heavy manufacturing industries perceive digital transformation and modernise processes for future use. Technology has evolved over the years, and the digitisation process has added value to manufacturing processes, improving efficiency by reducing the amount of waste generated (Elahi et al., 2023). It is essential that when digital transformation is introduced in the heavy engineering industry, people are prepared to embrace the digital transformation process, as this will lead to a cultural shift and change the way of working (Elahi et al., 2023).). Digital transformation in heavy manufacturing companies brings numerous advantages, and more importantly, retrieving data is significantly easier than with older analogue systems (Elahi et al., 2023).

Conducting a study on digital transformation within the heavy engineering environment is crucial because employees must be gradually introduced to modern technology and allowed to mature before implementing recent changes. To ensure the success of the digitisation process, relevant stakeholders must be aware of the company's vision and align company goals with it. This study is significant for several reasons. First, it provides evidence-based insights for CCBSA and similar organisations navigating the complexities of digital transformation in manufacturing. Second, it offers a rare combination of employee-centred feedback and operational metrics, which can inform strategic decision-making. Lastly, by contextualising findings within South Africa's socio-economic and legal frameworks using the PESTEL model, this research adds a region-specific lens that enriches global digital transformation literature.

1.10. Delimitation of the study

This study examines the digital transformation efforts within CCBSA, specifically from 2016 to 2024, focusing on the adoption and impact of digital technologies, including digital marketing strategies, e-commerce platforms, digital supply chain management, and internal transformation initiatives. It limits its geographical scope to the company's headquarters and regional offices, omitting subsidiaries and international operations. The research centres on the perspectives of internal stakeholders, such as managers and operational staff, who are directly involved in or influenced by these digital transformation endeavours. By analysing these aspects, the study aims to elucidate how digital advancements within the beverage industry influence strategic decision-making and the competitive dynamics of CCBSA compared to other role players.

The findings from this study are contextualised within the broader beverage industry landscape, providing insights into the strategic implications of digital transformation and technology management by focusing on a defined timeframe and specific technological applications. The study aims to deliver targeted recommendations for enhancing digital strategies and operational efficiencies within CCBSA. This approach ensures a focused and comprehensive examination of the impact of digital transformation on the company's internal processes and competitive positioning within its industry sector.

1.11. Limitations of the study

Despite efforts to provide a comprehensive analysis, this study is subject to several limitations. Firstly, the findings are based solely on data and insights from CCBSA and may not be generalisable to other companies or industries. The study's focus on a specific timeframe (2016-2024) means it may not capture long-term effects or changes before or after this period. Additionally, the research is constrained by the availability and reliability of data provided by CCBSA employees, which could impact the depth and accuracy of the findings. Secondly, while efforts have been made to include diverse perspectives from internal stakeholders, the study may not fully capture the views of all relevant individuals within the organisation. Factors such as time constraints and organisational dynamics may have influenced the participation and responses of interviewees and survey respondents. Moreover, external factors beyond the scope of this study, such as broader economic conditions or regulatory changes, could also influence the outcomes and conclusions drawn from the research.

1.12. Assumptions

The following assumptions guide the study's approach and interpretation of findings, providing a framework within which the research is conducted and conclusions are drawn.

- Data provided by CCBSA interviewees is accurate and reliable for analysis, and stakeholders interviewed or surveyed provide truthful and representative perspectives on digital transformation efforts.
- The selected timeframe (2016-2024) adequately captures significant developments and trends in digital transformation within CCBSA.
- Digital technologies and strategies implemented by CCBSA are typical of those within the beverages industry. The findings and recommendations from the study can be extrapolated to inform similar organisations undergoing digital transformation efforts.

1.13. Chapter outline

Chapter 1: The research proposal outlines the proposal, providing the background to the study, including the context of CCBSA's digital transformation. It defines the research problem, objectives, and questions guiding the study. The significance of the research is discussed, emphasising its importance in contributing to the understanding of digital transformation's impact on manufacturing operations. The chapter concludes with a brief overview of the study's methodology and structure.

Chapter 2: Literature Review on digital transformation in the manufacturing sector, focusing on the impact of digital tools on operational efficiency, productivity, and employee engagement. It covers relevant theories, including Digital Transformation Theory, Organisational Change Theory, and the TOE framework. The chapter synthesises the findings from previous studies and provides a comprehensive framework for understanding how digital transformation affects organisational performance and workforce satisfaction.

Chapter 3: Research Methodology, including the chosen research philosophy, approach, and design. It justifies using a case study methodology for CCBSA and describes the data collection methods, including surveys and interviews. The chapter details the sampling techniques, data analysis strategies, and ethical considerations, ensuring the study's reliability and validity.

Chapter 4: Results and Discussion presents the analysis of data collected from CCBSA, discussing the findings related to the research questions and objectives. It examines the impact of digital transformation on operational efficiency, employee satisfaction, and organisational performance. The chapter compares the results with existing literature, providing insights into the effectiveness of CCBSA's digital transformation and identifying areas for further improvement.

Chapter 5: Conclusion and Recommendations concludes the study, summarising the key findings and their implications for CCBSA's digital transformation strategy. It recommends improving digital systems and enhancing employee engagement through targeted initiatives. The chapter also discusses the study's limitations and suggests areas for future research, particularly in assessing the long-term impact of digital transformation on manufacturing operations.

1.14. Conclusion

The research proposal has provided a comprehensive overview of the role of digital transformation in transforming CCBSA's manufacturing operations. The chapter explored the integration of advanced technologies, including automation, data analytics, and the Internet of Things (IoT), highlighting their significant impact on enhancing operational efficiency, reducing costs, and improving product consistency. It also addressed the broader organisational implications, noting the need for workforce reskilling and restructuring management practices to support technological advancements.

Furthermore, the chapter examined the external factors that influence CCBSA's digital transformation, using the PESTEL framework to understand how political, economic, social, technological, environmental, and legal factors shape the company's strategies. These factors have influenced the company's adoption of digital technologies and informed strategic decision-making in areas such as data privacy and compliance with industry regulations. Ultimately, this chapter establishes a solid foundation for understanding the digital transformation journey at CCBSA. It underscores the importance of aligning digital initiatives with organisational goals, engaging stakeholders effectively, and adapting to external influences. The insights gained from this review will inform the research methodology and subsequent analysis in the following chapters, providing valuable recommendations to enhance CCBSA's digital capabilities further and maintain its competitive edge in the industry.

Chapter 2: Literature Review

2.1. Introduction

This section will discuss the literature on various frameworks, including theoretical, conceptual, and empirical reviews, as well as the PESTEL model. The theoretical framework will contextualise the analysis by providing theories integral to digital transformation and modernisation of the manufacturing process. Innovation diffusion theory will help us understand how to adopt innovative patterns within the beverage manufacturing industry to fully benefit from the digital transformation of the supply chain. Resource-based view theory will further explore how CCBSA can utilise scarce resources to maximise total productivity and navigate the challenges of digital transformation.

The empirical review will clearly illustrate the literature on how digital transformation can enhance operational and environmental efficiency. Operational efficiency means production optimisation and business re-engineering through digital transformation, with a focus on achieving similar outcomes in various manufacturing concepts. A concept will be developed to link theoretical insights to practical implications, and this framework will clearly illustrate how CCBSA uses digital strategy to ensure improved supply chain excellence. The literature review will also further address stakeholder perspective and engagement, as everyone in the business has a role in the industrial revolution. It will also discuss how external environments are affected by the concept of digital transformation.

2.2. Theoretical framework

In this section, we will discuss the theories and frameworks that explain the impact of digital transformation on organisations, with a focus on CCBSA. First, we will explore Digital Transformation Theory, emphasising the need for companies to adapt to technological changes to stay competitive. We will also examine how digital transformation reduces production costs and enhances operational efficiency. Additionally, we will examine Innovation Diffusion Theory to understand how new digital technologies are adopted and spread within organisations. The section will also address the Resource-Based View, highlighting the strategic importance of leveraging digital resources to achieve a competitive advantage. Finally, we will explore Organisational Change Theory to understand how CCBSA navigates its digital transformation process, including the management of employee motivation and overcoming resistance to change.

2.2.1. Digital transformation theory

The digital transformation theory explains why organisations, such as CCBSA, need to adapt their business models to digitalisation and implement measures to ensure that the technological shift becomes an integral part of the organisation's culture, allowing them to fully benefit from the technology provided. Digital transformation theory encompasses multiple components, such as technological integration, strategic alignment, and organisational change. It is worth noting that effective digital transformation strongly requires proper alignment between digital initiatives and organisational goals and objectives to achieve a competitive advantage, thereby improving customer satisfaction.

Digital transformation theory provides a valuable framework for understanding how digital technologies drive organisational change and innovation (Elia et al., 2024). The COVID-19 pandemic has intensified the need for digital transformation, revealing significant opportunities and challenges (Elia et al., 2024). By addressing these challenges through strategic investments and organisational changes, businesses can better navigate the evolving digital landscape and achieve long-term success. As the world undergoes technological advancement, it is worth noting that every opportunity also presents a threat. As technology advances, in response to digital cybersecurity issues, organisations have invested in upgrading their digital infrastructure, thereby providing support for crucial skills to protect the organisation from potential threats (Elia et al., 2024).

Research on Digital Transformation Theory highlights how FMCG companies, such as CCBSA, have successfully integrated digital technologies to enhance efficiency, profitability, and customer satisfaction. Dwivedi et al. (2024) and Elia et al. (2024) demonstrate that businesses utilising digital tools, such as cloud computing, AI, and data analytics, enhance operational efficiency and adapt rapidly to market disruptions, including the COVID-19 pandemic. These studies emphasise the importance of aligning digital transformation strategies with organisational goals to achieve a competitive edge. CCBSA, like other firms, benefited from adapting to these digital tools but faced challenges in cultural shifts and overcoming resistance to technology. These findings underscore the importance of strategic alignment, overcoming resistance, and continuously adapting digital tools to market changes for companies like CCBSA.

2.2.1.2. Digital Transformation Contribution to Cost of Production

Digital transformation plays a crucial role in reducing production costs by enhancing manufacturing processes and optimising supply chains. Automation and data analytics are integral to reducing labour costs, minimising waste, and optimising energy consumption. A report by Bharadwaj et al. (2013) demonstrates that digital transformation in manufacturing has enabled companies to reduce costs by better managing inventories and eliminating operational redundancies significantly. Digital transformation has revolutionised manufacturing through automation, data analytics, and the Internet of Things (IoT). These advancements enable businesses to collect and analyse real-time data, optimise production schedules, and reduce operational inefficiencies. According to Li et al. (2024), IoT-enabled systems provide predictive maintenance capabilities, which helps in early detection of equipment failures, thus enhancing machine uptime and minimising disruptions.

The COVID-19 Pandemic has accelerated digital transformation. Organisations needed to be resilient in ensuring business continuity under the pressure of lockdown rules imposed on the people, thus affecting the regular trade market (Amankwah-Amoah et al., 2021). The pandemic brought many constraints on daily commuting to work; hence, critical or essential roles in organisations were prioritised, and the phenomenon of 'more for less' emerged. According to Amankwah-Amoah et al. (2021), psychological barriers hindered firms' and decision-makers decisions to adopt digital transformation platforms. At the pandemic's beginning, most people were sceptical about adopting technology; however, as time passed, more people started to embrace technological advancement.

2.2.2. Innovation diffusion theory

Innovation Diffusion Theory provides a framework for understanding how modern technologies and ideas are adopted and spread within organisations and societies (García-Avilés, 2020). Everett Rogers developed this theory, which explores the factors that influence the rate and extent of digital transformation adoption, including the perceived advantages of the innovation, its compatibility with existing practices, its complexity, and the ability to test it on a small scale (Straub, 2009). This theory is pivotal to analysing the adoption process of digital technologies, particularly in the context of external disruptions in highly competitive environments such as CCBSA. Innovation Diffusion Theory outlines several factors that influence the adoption of innovation, including relative advantage, compatibility, complexity,

testability, and observability (Straub, 2009). To test this theory, we will zoom in on employee motivation and utilisation in digital transformation at CCBSA.

2.2.2.1. Employee Motivation and Utilisation of Digital Transformation at CCBSA

The adoption of digital technologies at CCBSA has significantly altered employee roles, necessitating the development of new skill sets and specialised training programs. Research by Kolade and Owoseni (2022) emphasises that employee motivation in digital transformation can be influenced by providing continuous learning and development opportunities. As CCBSA adopts automation, data analytics, and e-commerce platforms, employees must adapt to technological advancements, making training and reskilling efforts a central part of the transformation process. Motivating employees to embrace these changes involves addressing concerns about job security, clarifying the benefits of digital tools, and showing how modern technologies can improve work efficiency and personal job satisfaction. Organisations must offer incentives and clear communication in a rapidly evolving environment to maintain high employee morale and engagement levels.

Moreover, it is crucial to recognise that employee involvement in the digital transformation process is vital for long-term success. Research indicates that when employees feel part of the transition and have a say in the tools and processes being implemented, their motivation to adopt modern technologies increases significantly (Kamel, 2023). CCBSA has proactively involved employees through workshops, training programs, and feedback mechanisms, ensuring the workforce is informed and equipped to use new digital solutions. In addition to the operational aspects, employees' psychological responses to digital transformation, such as stress, job anxiety, and resistance to change, must also be managed through change management strategies. By addressing these issues and promoting a culture of continuous learning, CCBSA enhances its chances of successful digital adoption while fostering a motivated and agile workforce that can navigate challenges and opportunities presented by digital transformation.

Jaumotte et al. (2023) explored the role of relative advantage, finding that the perceived benefits of digital solutions significantly accelerated adoption in the fast-moving consumer goods (FMCG) sector during the COVID-19 pandemic. This aligns with IDT's assertion that the perceived advantages of innovation are key drivers in the adoption process. Scott et al. (2011) also emphasised the importance of compatibility, highlighting that successful digital adoption hinges on the seamless integration of modern technologies with existing organisational practices. Cheng et al. (2025) focused on the complexities of digital adoption, noting that overcoming barriers such as complexity and ensuring testability through pilot projects are crucial for organisations to implement modern technologies successfully.

Additionally, Kolade and Owoseni (2022) underlined the importance of employee motivation and involvement in the adoption process. Their research demonstrated that clear communication, comprehensive training, and active employee participation are critical in mitigating resistance to change. These findings resonate with CCBSA's experience, where factors such as relative advantage, compatibility with existing systems, ease of use, and employee engagement have been central to its successful digital transformation. Applying Innovation Diffusion Theory in this study provides a framework for better understanding how these factors influence CCBSA's approach to digital adoption and its overall strategic objectives.

2.2.3. Resource-based view

The Resource-Based View Theory provides a valuable perspective on how organisations can achieve and sustain a competitive advantage by effectively utilising their resources (Holz, 2024). According to the Resource-Based View Theory, firms gain a competitive edge by leveraging unique, valuable, and hard-to-imitate resources that cannot be easily substituted. CCBSA has ensured that the production facilities for their products are as unique as possible and has internal standards to ensure that they are consistently met in the best possible way. CCBSA, Resource-Based theory, provides a framework for analysing how digital capabilities and resources enhance operational efficiency, customer satisfaction, and market positioning to ensure sustainability and growth (Holz, 2024).

Resource Identification and Value: At the core of Resource-Based View Theory, identifying and utilising resources provide a strategic advantage (Holz, 2024). For CCBSA, essential digital resources include advanced data analytics, comprehensive insights regarding utilising the technology provided, and robust digital infrastructure. These resources are valuable because they enable the company to make data-driven decisions, understand customer preferences more deeply, and optimise operational processes (Holz, 2024). Resource-Based View Theory also emphasises the importance of leveraging resources effectively to create competitive advantages. CCBSA's deployment of digital technologies, such as data analytics platforms like Microsoft Dynamics 365, which is embedded with customer relationship management enhancements, illustrates this attitude. By integrating digital capabilities into its operations, CCBSA can enhance its efficiency, tailor its offerings to meet customer needs and gain insights that drive strategic decision-making. The effective use of these resources helps the company maintain a competitive edge in the rapidly evolving beverage industry.

Competitive Pressures in the FMCG Sector: The FMCG sector is characterised by intense competition and rapid market changes. CCBSA's focus on leveraging digital resources aligns with the RBV principle of maintaining a competitive advantage through unique and valuable assets (Liang & Tian, 2024). By continuously investing in and optimising its digital capabilities, CCBSA can respond more effectively to market demands, stay ahead of competitors, and enhance its market position. Resource-Based View Theory provides a framework for understanding how CCBSA leverages its digital resources to achieve and sustain competitive advantage. The company enhances its operational efficiency, customer relationships, and market positioning by focusing on valuable, rare, inimitable, and non-substitutable digital capabilities. The impacts of COVID-19, the Russia-Ukraine war, and competitive pressures in the FMCG sector further highlight the importance of effective resource management in maintaining a competitive edge and achieving long-term success.

2.2.4. Organisational change theory

Organisational Change Theory provides a framework for understanding how companies like CCBSA navigate the process of digital transformation. This theory examines organisations' various methods and strategies for implementing and institutionalising changes, particularly in adopting new digital technologies (Ly, 2024). Key elements of this theory include organisational readiness for change, the role of leadership, resistance to change, and the organisational culture that supports digital innovation (Ly, 2024). By applying Organisational Change Theory, we can gain insights into the internal dynamics and challenges that CCBSA encounters as it moves toward becoming a digitally advanced organisation. For CCBSA, the primary drivers include enhancing operational efficiency, improving customer engagement, and staying competitive in an ever-evolving market. The COVID-19 pandemic has intensified these drivers by highlighting the urgent need for digital solutions that support remote work, online sales, and efficient communication (Nworie et al., 2024). The rapid shift to digital platforms during the pandemic underscores the importance of having effective change management strategies to adapt to these new demands (Nworie et al., 2024).

2.2.4.1. Perceived Threats and Opportunities in Digital transformation at CCBSA

Digital transformation presents both threats and opportunities for organisations. While it offers opportunities for enhanced productivity, cost reduction, and market competitiveness, it also introduces risks such as data security concerns and employee resistance to change. Volberda et al. (2021) suggest that change management strategies and cyber security investments are essential to mitigate the risks associated with digital transformation. Technological complexities also present significant challenges for organisations undergoing digital transformation. Integrating modern technologies into existing systems and workflows can be a complex and resource-intensive process. Organisations may face difficulties aligning new digital solutions with their legacy systems, leading to inefficiencies and operational disruptions during the transition phase.

Furthermore, the cost of implementation can be a considerable barrier, especially for smaller companies or those with limited financial resources. To overcome these barriers, organisations must carefully plan their digital strategies, ensuring that the technologies they adopt are compatible with existing infrastructures and capable of delivering long-term value. It is also essential for companies to evaluate and select digital tools that are scalable, flexible, and capable of evolving with changing business needs and technological advancements. Proper investment in system integration, employee training, and technical support can significantly reduce the potential disruptions and improve the chances of a successful digital transformation. Another threat organisations must manage during digital transformation is the risk of dependency on technology. Over-reliance on automated systems, data-driven decision-making, and AI-based solutions can sometimes erode human oversight and judgment.

While digital tools can enhance efficiency, they also may introduce new vulnerabilities. For example, if a digital platform experiences downtime or system failures, it could halt business operations, affecting productivity and revenue. Moreover, as businesses collect vast amounts of data, they must be cautious about maintaining the privacy and security of personal and customer information to avoid legal and regulatory penalties. Thus, businesses must balance digital tools with adequate human oversight to ensure that decisions align with organisational goals and values. Investing in cybersecurity, developing robust data governance policies, and maintaining a contingency plan for unforeseen technological failures can help businesses mitigate the risks associated with over-dependence on digital systems.

The change process involves a structured approach that includes planning, execution, and evaluation (Riousset et al., 2024). At CCBSA, the process begins with planning, which involves identifying the need for digital upgrades and setting specific goals for the transformation. The execution phase involves deploying new digital tools and systems, such as advanced data analytics and e-commerce platforms, to enhance business operations (Korherr et al., 2022). Evaluation is the final step, where CCBSA assesses the effectiveness of the implemented changes and makes adjustments as necessary to ensure that the digital transformation aligns with the company's objectives. This methodical approach is essential for successfully integrating new digital technologies into CCBSA's operations (Korherr et al., 2022).

Resistance to change is a common challenge in any organisational transformation. Employees may resist modern technologies and processes, mainly if they are accustomed to traditional methods. To manage this resistance, CCBSA focuses on several strategies. Clear communication about the benefits of digital changes helps employees understand the reasons behind the transformation. Comprehensive training programs are provided to build digital skills and confidence. Involving employees in the change process also helps gain their support and reduce resistance. CCBSA aims to facilitate a smoother transition to new digital practices by addressing these aspects. Leadership support is crucial; senior leaders must actively endorse and drive digital initiatives to overcome challenges and foster a positive environment for change. Employee engagement is another critical strategy; involving staff in the planning and execution phases helps build buy-in and address any concerns.

Nworie et al. (2024) explored how the COVID-19 pandemic accelerated digital adoption, emphasising that effective change management is essential for businesses to adapt to new digital tools and processes quickly. Korherr et al. (2022) examined how structured approaches, including planning, execution, and evaluation, are critical in integrating digital technologies into business operations, ensuring that changes align with organisational goals. FirstUp (2025) also emphasised the importance of leadership support and employee engagement in overcoming resistance to change, particularly in high-pressure environments such as the FMCG sector. These studies underscore that organisational readiness, clear communication, and continuous training are vital for overcoming resistance and ensuring successful transformation. In the context of CCBSA, this theory directly relates to the company's approach to digital transformation, addressing challenges such as resistance to change, the need for leadership support, and adapting to external pressures, including the pandemic and geopolitical disruptions.

2.2.4.2. Employee Engagement and Digital transformation at CCBSA

As CCBSA embarks on its digital transformation journey, employee engagement plays a critical role in ensuring the success of new initiatives. Kolade and Owoseni (2022) emphasise that initiative-taking employee engagement, which includes clear communication and comprehensive training, is essential in enabling employees to adapt to modern technologies. Digital solutions can often be resisted if employees are not adequately prepared or supported throughout the transition. At CCBSA, to mitigate this challenge, the company has implemented extensive training and up-skilling programs designed to enhance employees' digital competencies and ensure they are motivated to embrace technological advancements. These initiatives help employees understand the direct benefits of digital tools in their daily roles, fostering a sense of ownership and reducing anxiety associated with adopting modern technology.

Furthermore, continuous learning is crucial for maintaining long-term employee engagement and enhancing digital proficiency. CCBSA's commitment to providing ongoing training and development opportunities ensures that employees not only receive initial exposure to digital tools but also continue to refine their skills. This focus on growth also aligns with the organisation's long-term strategic goals, as well-equipped employees can help drive innovation and operational efficiency. Kolade and Owoseni (2022) assert that such training initiatives, paired with effective communication, create an environment where employees feel confident in utilising digital tools, enhancing organisational performance, and fostering a culture of continuous improvement. By aligning digital adoption with employee development, CCBSA ensures its workforce can navigate digital platforms and is motivated to contribute to the company's broader transformation goals.

Competitive Pressures in the FMCG Sector: The FMCG sector is characterised by intense competition, which drives the need for continuous innovation and adaptation. CCBSA's digital transformation efforts are motivated by the need to stay ahead of competitors and respond effectively to market demands. Effective change management is crucial for implementing modern technologies and processes that enhance a company's market position and operational performance (FirstUp, 2025). The geopolitical conflict has introduced additional challenges, including disruptions to supply chains and increased operational uncertainties. For CCBSA, managing these challenges requires agile and resilient digital strategies.

2.3. Empirical review

This section of the empirical review examines the digital transformation at CCBSA, highlighting its impact on operational efficiency, organisational structure, and performance outcomes. It explores how CCBSA leveraged digital technologies, including automation, the Internet of Things (IoT), and data analytics, to streamline production processes, reduce downtime, and enhance inventory management. The review also discusses how adopting these technologies led to structural changes within the organisation, including the need for new skills and training programs to support the workforce. Furthermore, the impact on key performance indicators (KPIs) such as production efficiency, financial performance, and customer satisfaction is analysed, demonstrating how data-driven decision-making and technological advancements contributed to improved business results. The review concludes by exploring how CCBSA's strategic stakeholder engagement, particularly with employees and suppliers, facilitated a smooth transition to digital operations and reinforced the success of their transformation initiatives.

2.3.1. Enhancing Environmental and Operational Efficiency

Global leaders and policymakers have made reducing carbon footprints one of their top priorities to ensure the world is preserved for future generations. The adverse effects of climate change have since become a primary concern and need to be attended urgently. First-world countries have done an excellent job in ensuring that technological development and advancement significantly reduce carbon emissions by calculating the energy consumption in their equipment and finding ways to optimise based on the allowable carbon count. Preuveneers and Ilie-Zudor (2017) agree that there is a strong correlation between the reduction of energy consumption and the technological advancement of manufacturing equipment, which directly drives digital transformation maturity in the manufacturing space. Their research has also revealed that digital transformation can be seen as a strategic response to economic and environmental issues exacerbated by climate change, which has brought about the concept of sustainable change. As the world moves towards advanced forms of digital transformation, the ways of working have drastically changed, and most companies in the FMCG space are moving towards more digitised work orders rather than conventional paper-based job cards.

This sustainable change helps ensure that the data collected by technicians is stored for a long time, eliminating the need for a clerk to manually enter the information, as tools like Freshworks, Lumada, and SAP have incorporated advanced digital transformation and data storage facilities. Streamlined asset care management, reducing the reliance on paper and thus minimising waste. This shift is aligned with global sustainability goals and enhances operational efficiency by facilitating better coordination and real-time problem-solving among team members. Nworie et al. (2024) extend this understanding by exploring enterprise-wide digital transformation and its multifaceted benefits. They describe digital transformation as a process that involves reconfiguring organisational structures into distinct quadrants to manage and integrate digital changes more effectively. Their study reveals that digital transformation is instrumental in reducing carbon footprints by optimising supply chains and improving data management. For instance, cloud computing and big data technologies enable real-time data tracking, enhancing supply chain transparency and efficiency. This technological integration fosters a culture of efficiency and waste reduction as digital tools replace traditional, resource-intensive practices.

Nworie et al. (2024) also emphasised that digital transformation introduces significant changes in organisational culture and mindset, shifting focus towards continuous improvement and environmental stewardship. Recent technological advancements have made its livelihoods easier, thus underscoring the role of environmental sustainability. Nworie et al. (2024) have also pinpointed that eSignatures of controlled documents are an excellent example of energy utilisation reduction because the physical printer and papers are removed from the equation. The move towards electronic documentation reduces the carbon footprint associated with physical paperwork and streamlines administrative processes, contributing to overall operational efficiency.

Integrating findings from the studies conducted by Preuveneers and Ilie-Zudor (2017) and Gupta (2024) reveals a clear pattern: Digital transformation significantly impacts environmental sustainability and operational efficiency. Migration to digital tools and practices facilitates better asset management, optimises supply chains, and supports real-time data tracking, all contributing to reduced carbon emissions and improved resource management. Sallam et al. (2023) noted that the quality and reliability of these studies also warrant consideration, which is highly dependent on the data provided for processing; if unreliable data is loaded, then inaccurate results will be generated. Digital transformation is crucial for enhancing operational

efficiency in manufacturing and corporate settings, while also promoting environmental sustainability.

2.3.2. Production optimisation

In an era where production optimisation has become even more imperative, digital transformation has emerged as a transformative force to significantly reshape conventional manufacturing practices. The narrative drives this change to enhance efficiency, reduce operational costs, and improve product quality, thereby meeting customer demands. Empirical research underpins the pivotal role of modern digital transformation in achieving these objectives, with insights drawn from diverse sectors, including FMCG Manufacturing practices and recent developments in technology adoption. Advanced analytics represents a foundation of modern production optimisation. Liu et al. (2023) emphasise that the impact of predictive analytics within manufacturing environments is essential for better preparation and enhanced planning and preparedness. Their research demonstrates that incorporating data analytics facilitates real-time monitoring and comprehensive analysis of production metrics, enabling the early detection and resolution of potential issues, such as equipment failures, as well as addressing the depletion of raw materials and planning deliveries before they are depleted. This predictive capability lessens downtime and enhances overall equipment effectiveness (OEE). Liu et al. (2023) demonstrate that organisations leveraging advanced analytics significantly improve production efficiency, cost management, and product quality due to the importance of data-driven decision-making.

Similarly, modern automation technologies, including robotics, are crucial in optimising production processes. Zhang and Chen (2023) explore the benefits of automation in manufacturing, highlighting its impact on reducing reliance on manual labour, accelerating production cycles, and improving precision. Their empirical findings reveal that adopting robotics leads to substantial gains in production speed and consistency, translating into lower production costs and increased output. This trend towards automation reflects a broader movement toward intelligent manufacturing, where the integration of advanced technologies and interconnected systems drives substantial improvements in production performance.

The Internet of Things (IoT) is another critical technology for production optimisation. Li et al. (2024) examine the role of IoT devices and sensors in manufacturing, noting their capacity to provide real-time data on machine performance and environmental conditions that will become an aid to alert relevant stakeholders when maintenance is due on that equipment is also worth

noting that inventory levels can also be monitored using real-time data to prevent any surprises that can potentially disrupt operations.

This capability of modern digital transformation enables initiative-taking maintenance of equipment based on their criticality scale, reduces waste, and enhances supply chain management. Li et al. (2024) demonstrate that IoT-enabled production environments achieve higher levels of operational efficiency and reduced lead times, underpinning the significance of real-time data in refining manufacturing processes. The empirical evidence highlights the effectiveness of IoT in optimising production and improving manufacturing outcomes.

For FMCG heavy manufacturing organisations such as CCBSA, investing in appropriate manufacturing technologies is essential for navigating a volatile business environment and securing a competitive advantage. Zhu and Ning (2023) state that strategic investment in innovative technologies, such as artificial intelligence, big data computing, the Internet of Things (IoT), and 3D printing, can significantly enhance overall business performance. In a competitive landscape, aligning technological investments and human capital with strategic objectives is crucial for addressing internal and external factors that impact productivity. Integrating these advanced technologies into production processes represents a change in basic assumptions towards intelligent manufacturing, enabling firms to achieve greater efficiencies and cost savings through digital transformation.

The growing demand for intelligent automation further emphasises the impact of digital transformation on production throughput. Preuveneers and Ilie-Zudor (2017) report that the market for intelligent automation reached \$186.68 million in 2022, with projections suggesting it will expand to approximately \$301.5 million by 2030, reflecting a compounded annual growth rate of 6.1%. This surge in demand underscores the growing importance of intelligent automation in manufacturing, highlighting its role in enhancing production efficiency and throughput. Preuveneers and Ilie-Zudor (2017) data illustrate how digital transformation is revolutionising production processes and driving substantial improvements in manufacturing performance.

Despite these advancements, the application of digital transformation comes with various challenges. Kamble et al. (2018) address the difficulties organisations encounter in aligning their workforce with new digital tools and processes. Their research emphasises the need for considerable training and change management investments to overcome resistance and ensure the successful implementation and adoption of digital transformation objectives and strategies. Effective technology and workforce development management is crucial for maximising the benefits of digital innovations and achieving production optimisation.

2.3.3. Business re-engineering

The COVID-19 pandemic and global politics have brought about sizable disruptions across the supply chain, forcing organisations to navigate unprecedented challenges and redesign their business operations under new, unfavourable conditions. The pandemic led to a significant slowdown in economic activities and a contraction in production, resulting in many organisations, whether large-scale enterprises or small and medium-sized enterprises (SMEs), suspending operations and experiencing complete setbacks in revenue generation (Michael et al., 2023). As businesses faced these disruptions, the urgency to find practical ways to adapt and sustain operations during and after the pandemic became more paramount than ever.

A significant shift occurred in reliance on digital technology as organisations sought to maintain business continuity amid social distancing measures and restrictions on physical interactions. The pandemic accelerated the adoption of digital tools, such as online meetings and remote work platforms, to meet day-to-day operational requirements and protect the health of their employees. According to Michael et al. (2023), Small and Medium Enterprises (SMEs) face a particularly precarious situation, with many risking the loss of critical skills and potential non-compliance with government regulations. This uncertainty fuelled fears among 51% of the workforce about the possibility of losing their income, highlighting the need for agile and strategic thinking from top management to navigate the crisis effectively.

Organisations were forced to implement crisis management techniques and robust response plans in reaction to the pandemic's effects. According to Michael et al. (2023), external cooperation and infrastructure development are critical elements of a successful recovery plan. Retrenchments and reduced space utilisation were two standard downsizing measures that resulted from the need to lower operational costs, including wage bills (Michael et al., 2023).

The crisis compelled businesses to reassess their objectives and plans, necessitating operational reengineering to accommodate the new circumstances. According to Michael et al. (2023), while digital transformation is essential for maintaining operational continuity and efficiency, management must be aware of the risks involved in these changes. To integrate technological innovations and advancements while maintaining core business principles, prudent investment in digital technologies must be balanced with extensive research.

The empirical data presented by Michael et al. (2023) highlight the intricate relationship between crisis management and digital transformation. Businesses that navigated the pandemic's challenges effectively demonstrated the importance of making swift decisions and investing in digital infrastructure. In addition to accelerating the adoption of digital tools, the pandemic highlighted the need for carefully re-engineering business processes to ensure resilience and continuity in the face of current and future disruptions.

2.4. Theoretical Underpinning

Digital transformation in manufacturing environments is a strategic and systemic endeavour that encompasses the integration of advanced technologies, reconfiguration of organisational processes, and evolution of workforce capabilities to drive innovation and competitiveness. This study draws on four complementary theories, Digital Transformation Theory, Innovation Diffusion Theory, the Resource-Based View, and Organisational Change Theory, to analyse how CCBSA navigates the complexities of digitalisation within its operational context.

Digital Transformation Theory offers a comprehensive lens through which to understand the structural and strategic shifts necessary to integrate digital technologies into core business functions. Innovation Diffusion Theory informs the analysis of how new digital tools and processes are adopted, communicated, and institutionalised within the organisation. The Resource-Based View underscores the strategic value of internal capabilities, technological, human, and organisational, as sources of sustained competitive advantage. Organisational Change Theory, meanwhile, offers insights into the human and procedural dynamics involved in transitioning to new digital systems, including leadership, resistance, and change readiness.

This section critically examines digital transformation at CCBSA through three interrelated lenses: organisational change and outcomes, digital strategy implementation, and stakeholder engagement. Each theme is anchored in this multi-theoretical framework, enabling a robust and holistic understanding of how CCBSA's digital transformation journey unfolds in practice.

2.4.1. Organisational Change and Outcomes

The introduction of digital transformation has intensely transformed organisational landscapes and ways of doing things. CCBSA is the perfect example of these changes within the beverage manufacturing sector. This empirical review examines how digital technologies at CCBSA impact organisational processes, structures, and performance metrics. It assesses improvements in operational efficiency, enhanced customer satisfaction, innovation in product offerings, and the overall competitive advantage within the industry. The empirical evidence highlights a nuanced picture of these impacts, providing a comprehensive understanding of digital transformation's role in modernising and optimising organisational performance.

Digitisation has significantly enhanced operational efficiency at CCBSA. Implementing advanced technologies, such as automation and data analytics, has streamlined manufacturing processes, reducing processing times and considerably minimising downtime (Wambua, 2023; Igwe et al., 2024). Empirical studies illustrate that digital transformation in similar manufacturing settings has led to remarkable improvements in production efficiency. Integration of Internet of Things (IoT) devices has enabled real-time monitoring of machinery, allowing for predictive maintenance and reducing unexpected equipment failures; when machines are detected early for possible failure, it makes it easy for the organisation to be better prepared for any possible breakdowns and act decisively while there is still time (Chauhan et al., 2022). Data from CCBSA's recent OEE reports confirm these findings, and substantial reduction directly speaks to Business Best Practices (BBP), which measures plant performance against other plants or organisations in a similar sector.

Organisational structures at CCBSA have also evolved in response to digital transformation, which is evident in the type of talent they are looking for to join the organisation. The shift toward digital technologies has changed organisational settings and workforce roles (Moloko, 2021; Nworie et al., 2024). The introduction of automation has led to restructuring tasks, responsibilities, and accountabilities, requiring a specialised set of skills and training programs for the workforce. Studies on digital transformations reveal that companies often experience

structural adjustments to accommodate new technological advancements and optimise workflows; this shift enhances responsiveness and aligns with broader trends of flattening hierarchies to support agile and data-driven decision-making (Moloko, 2021; Nworie et al., 2024).

Performance metrics at CCBSA have improved due to digital transformation. Quantitative data indicates significant gains in key performance indicators (KPIs) such as production efficiency and financial performance. When one zooms in, digital transformation has facilitated more accurate forecasting and inventory management, leading to reduced stock-outs and overstock situations; this is made possible by using necessary tools and data integrations to predict consumer behaviour. Effective adoption of digital transformation will be evident in the financial reports from CCBSA, showcasing an increase in return on investment (ROI) associated with digital initiatives and enhanced cost management facilitated by data-driven decisions.

CCBSA's adoption of digital platforms has transformed customer interactions, offering more personalised and efficient services that will maximise customer loyalty. Data analytics enables deeper insights into customer preferences and behaviours, allowing CCBSA to tailor its product offerings and marketing strategies more effectively (Yang et al., 2021). Empirical evidence from customer behaviour towards CCBSA product offerings demonstrates that digital engagement tools, like mobile apps and online platforms, improve customer satisfaction by providing convenient access to products and services (Yang et al., 2021). CCBSA does not sell directly to the public; however, giant retailers such as Pick n Pay, Checkers, and Boxer, to name a few, purchase Coca-Cola products produced by CCBSA. Nevertheless, the supply chain efficiency is 100% controlled by CCBSA. The use of digital tools has been reflected in higher customer satisfaction scores and increased brand loyalty, aligning with industry trends that show a positive correlation between digital engagement and customer experience (Yang et al., 2021).

Digital transformation has fostered innovation in product offerings at CCBSA, enabling the leveraging of data and advanced technologies to drive the development of new products and enhancements to existing ones (Nworie et al., 2024; Angira, 2021). Research indicates that digital tools enable faster and more efficient product development cycles, allowing companies to respond swiftly to market trends and consumer demands. Digital transformation at CCBSA has significantly impacted its organisational processes, structure, and performance metrics. While operational efficiency, customer satisfaction, and innovation have all improved, a gap remains in understanding the long-term effects of digital transformation on organisational culture and workforce adaptation. Despite clear evidence of the benefits of digital transformation, the role of CCBSA's workforce training, talent acquisition, and role restructuring in facilitating this change remains underexplored (Wambua, 2023).

The organisational changes observed at CCBSA align closely with the principles of Organisational Change Theory, which emphasises that transformation is not merely technological but deeply embedded in cultural shifts, leadership dynamics, and change readiness. Digital Transformation Theory further reinforces that successful outcomes emerge when digital initiatives are embedded within strategic, structural, and operational realignments. Through the Resource-Based View, the outcomes can also be interpreted as reflections of how internal resources, such as skilled talent, digital infrastructure, and organisational agility, are leveraged and reconfigured to sustain competitive advantage. Together, these theories provide a coherent explanation of how digital change unfolds not as a singular event but as a multi-level organisational evolution within CCBSA.

2.4.2. Digital strategy implementation

Developing and applying digital strategies have become essential for achieving operational excellence and sustainability as firms navigate this complex environment. Digital technology, such as supply chain management software, asset care management systems, e-commerce software, and machine automation, is essential to this process. To guarantee the successful implementation of digital strategy, one must possess a strong understanding of the digitalisation of processes in the FMCG industry. Investment is the primary determining factor since digital transformation technology is expensive and must be carefully planned and capitalised appropriately.

One of the most critical components for guaranteeing business expansion and trade simplicity is e-commerce software. Recent research suggests that e-commerce platforms play a crucial role in enhancing online presence and facilitating seamless consumer transactions (Westerman et al., 2014; Hai et al., 2021). The purpose of these platforms is to facilitate a smooth trading experience. However, companies like CCBSA are essential to maintaining supply chain excellence, so they offer features such as user-friendly interfaces, secure payment processing, and CRM system integration. Organisations hoping to fulfil changing customer expectations and take advantage of the expanding market share must have a strong e-commerce strategy.

To get everyone on the same page, e-commerce strategies must be developed by defining target markets, establishing specific goals, and choosing the right affordable digital platforms for suppliers and customers. Successful e-commerce platforms use data analytics to tailor user experiences and maximise sales performance, according to research by Kamble et al. (2018). By utilising sophisticated algorithms and machine learning, businesses can enhance their understanding of client behaviour, tailor their marketing strategies, and increase conversion rates. The sales department utilises advanced machine learning algorithms to forecast customer needs and determine the best way to set up operations to maximise sales.

Asset care management systems are a critical component where the benefits of digitalisation are maximised. By adhering to the organisation's maintenance plan, these systems maximise the management and upkeep of physical assets, which are essential for enhancing dependability and reducing expenses. To improve asset performance, asset management techniques emphasise the use of data analytics, real-time monitoring systems, and predictive maintenance (Bhanji et al., 2021). Asset care management solutions enable businesses to extend the life of vital equipment, minimise downtime, and proactively address maintenance needs. Maintaining well-maintained machinery maximises operational output, giving the company a competitive edge. The FMCG industry's fast-moving machinery requires alertness and agility from the ground crew, as any delay can result in substantial revenue loss.

An essential component of developing a digital strategy is the interface for supply chain management. Complex supply chain management systems combine several tasks, including order processing, inventory control, and logistical planning. Mohsen (2023) asserts that these solutions enable businesses to become more efficient, enhance visibility into the supply chain, and better meet consumer expectations. By employing innovative technology like automated

inventory management and real-time tracking, businesses maximise inventory levels, save lead times, and improve overall supply chain effectiveness.

Automation signifies a notable improvement in operational effectiveness. Research indicates that automation technologies, such as robotics and advanced machinery, improve the accuracy, velocity, and expandability of manufacturing operations (Rajawat et al., 2021). Machine automation reduces the need for manual labour, minimises human errors, and enhances production efficiency. Maintaining tight quality assurance and controls is essential to ensure maximum production quality, as relying solely on machines can quickly lead to the mass production of low-quality products despite improving operational efficiency and product consistency. Careful planning and execution are necessary for the successful implementation of digital strategies. Ensuring digital initiatives are aligned strategically is vital for supporting organisational goals and contributing to the overall strategic vision. Sechele et al. (2024) emphasise the importance of ensuring that digital projects align with business objectives by setting specific goals, identifying Key Performance Indicators (KPIs), prioritising initiatives based on their strategic impact, utilising resources effectively, and achieving intended outcomes.

Vial (2021) emphasise the importance of organisations spending their budgets prudently on technology, assigning knowledgeable staff to manage digital projects, and offering thorough training and support. Effective allocation of resources ensures that digital projects are adequately supported and potential issues are addressed proactively. Developing organisational capabilities is essential for successfully implementing digital strategies. This involves building in-house knowledge in overseeing and using e-commerce software, asset care systems, supply chain management tools, and automated machinery (Bilgeri et al., 2017). Investing in employee training and promoting a culture of ongoing learning is crucial for improving an organisation's digital capabilities and ensuring employees can effectively utilise modern technologies. Incorporating digital solutions into current operations requires ensuring they are compatible with existing systems and processes. Efficient integration is crucial for achieving operational synergies and leveraging digital innovations to enhance business outcomes (Nguyen et al., 2025). This necessitates careful planning and implementation to synchronise modern technologies with existing workflows, improving overall operational efficiency.

As digital transformation reshapes business landscapes, developing and applying robust digital strategies is crucial for operational excellence, particularly in the FMCG sector. Integrating digital technologies such as e-commerce platforms, asset care management systems, and supply chain management tools is pivotal for enhancing efficiency, customer engagement, and competitive advantage. However, the high costs of digital transformation necessitate careful planning and investment to ensure alignment with business goals and sustainability. To optimise digital strategies, firms must foster organisational capabilities, overcome resistance to change, and integrate modern technologies with existing systems (Sechele et al., 2024).

Despite the growing recognition of digital transformation's role in enhancing operational excellence in the FMCG sector, significant gaps remain in understanding how organisations can effectively align complex digital strategies with overarching business objectives. Specifically, there is limited empirical research on overcoming challenges such as resistance to change, integration complexities, and resource allocation during the digital transformation process. Additionally, the practical impact of key digital tools, including e-commerce platforms, automation, and asset care management systems, on long-term business sustainability and performance metrics remains underexplored, presenting an opportunity for further investigation into their real-world effectiveness and contribution to business success.

The implementation of digital strategy at CCBSA can be critically framed through Digital Transformation Theory, which positions strategy as a vehicle for enabling digital integration across business functions. The Resource-Based View adds depth by suggesting that digital strategies are effective when grounded in the firm's unique resource endowments, including technological assets, leadership competence, and operational capabilities. Innovation Diffusion Theory provides insight into how these strategies are adopted internally, tracing the patterns of communication, adoption rates, and the role of change agents in influencing acceptance. These theoretical intersections clarify that the success of digital strategy at CCBSA is not merely a function of planning but of capability alignment, organisational will, and systemic readiness for innovation.

2.4.3. Stakeholder perspective and engagement

As digital transformation reshapes the operational excellence at CCBSA, understanding stakeholder perspectives and engagement becomes crucial. This section examines the impact of digital transformation on various stakeholder groups, including employees, management, suppliers, and customers. It examines the strategies employed by CCBSA to fast-track effective stakeholder engagement through digital transformation capabilities. Investigating empirical evidence, this section explains the multi-layered effects of digital transformation on stakeholder relationships and highlights best practices for managing stakeholder interactions in a digitally evolving environment. From the employee perspective, digital transformation at CCBSA has insightful implications and impacts. Implementing new digital tools and technologies has compelled significant changes in job roles and skills (Kolade & Owoseni, 2022).

Empirical research indicates that employees often experience a learning curve and adjustments in responsibilities as organisations integrate advanced technologies such as automation and data analytics (Kolade & Owoseni, 2022). At CCBSA, this has involved extensive training programs and reskilling initiatives to ensure that employees are equipped to benefit effectively from new digital systems. Successful digital transformations are often accompanied by employee engagement strategies that encourage initiative-taking, which include clear communication about the benefits of digital transformation and support structures for managing change. In this way, employees can fully embrace technology as an enabler of efficient operation (Kolade & Owoseni, 2022).

Management perspectives on digital transformation at CCBSA reflect the opportunities and challenges associated with gathering resources and setting goals for digital transformation. Digital transformation offers management the tools to enhance decision-making through real-time data and analytics, thereby improving strategic planning and operational efficiency (Korherr et al., 2022). However, it also presents challenges in change management and integration; it must also be remembered that digital transformation requires substantial investment, including time. Empirical evidence suggests that effective management engagement is pivotal in guiding organisations through digital transitions and setting up win strategies (Korherr et al., 2022).

Suppliers represent another critical stakeholder group affected by digital transformation at CCBSA. Supplier engagement has often become a significant challenge when integrating supplier ways of work and CCBSA, as they are not contracted solely to service CCBSA, but other entities also require their services. Digital transformation often requires changes to supply chain processes and systems, impacting how suppliers interact with the company. Empirical studies indicate that digital transformation can lead to more efficient supply chain management, with benefits such as improved inventory tracking and streamlined procurement processes (Zhao et al., 2023). At CCBSA, digital transformation has facilitated closer collaboration with suppliers through integrated digital platforms that enhance communication and data sharing. This has led to more accurate forecasting, better demand management, and strengthened supplier relationships. CCBSA's efforts to involve suppliers through collaborative planning and digital integration demonstrate best practices in managing supply chain relationships amidst technological changes.

Overall, the empirical review of CCBSA's stakeholder engagement and viewpoints shows how digital transformation affects various stakeholder groups differently. The organisation demonstrates best practices in stakeholder engagement throughout digital transformation, adopting an initiative-taking approach to managing these relationships through training, strategic communication, and digital integration. While CCBSA has effectively utilised digital tools to enhance employee training, management decision-making, and supplier collaboration, a gap remains in understanding the long-term impact of these changes on stakeholder satisfaction and organisational cohesion. Though conceptual evidence supports improved performance and efficiency through digital transformation, the effects of digital transformation on the relationships and trust between CCBSA and its diverse stakeholders (employees, management, suppliers, and customers) are not fully explored (Kolade & Owoseni, 2022). Further research into how CCBSA can optimise its stakeholder engagement strategies in a digitally evolving environment would offer valuable insights into sustaining organisational success and trust.

Stakeholder engagement in CCBSA's digital transformation reflects the collaborative and adaptive processes outlined in Organisational Change Theory, particularly the need for participatory change mechanisms and communication-driven trust-building. Innovation Diffusion Theory contributes to the understanding of the diffusion of digital innovations by highlighting the importance of opinion leaders, early adopters, and social systems in influencing the spread of these innovations across stakeholder groups. Digital Transformation Theory supports the view that stakeholder inclusion is not ancillary but central to aligning digital initiatives with user needs, expectations, and value creation. From the perspective of the Resource-Based View, stakeholders, both internal and external, constitute critical intangible resources whose buy-in, knowledge, and feedback loops are essential for ensuring that digital transformation initiatives are sustainable and contextually appropriate.

2.5. PESTEL and Its Impact on Digital transformation

2.5.1 Political Factors

Political stability and government policies are critical for the adoption and success of digital transformation. Government regulations regarding data privacy, digital infrastructure, and tax incentives can encourage or hinder digital transformation efforts. For instance, businesses are more likely to invest in digital technologies in countries where governments incentivise technology adoption or research and development (R&D) in digital transformation. Conversely, strict regulations surrounding data security and privacy, such as those found in the General Data Protection Regulation (GDPR) in the European Union, can pose compliance challenges for businesses attempting to digitise their operations. CCBSA must ensure that its digital transformation strategies align with South African governmental policies, which may include infrastructure development and regulatory frameworks that either promote or restrict digital advancements (Nguyen et al., 2025).

2.5.2. Economic Factors

Economic conditions significantly impact a business's ability to invest in digital technologies. In periods of economic growth, companies are more likely to allocate budgets for digital transformation initiatives, as the financial resources to support technological advancements are available. Moreover, economic trends such as globalisation and digital consumerism drive the need for businesses to adopt more digital strategies. For CCBSA, economic pressures, such as reducing production costs or enhancing operational efficiency, can catalyse digital

transformation. The shift toward more data-driven decision-making and automated manufacturing processes can lead to significant cost savings and efficiency improvements, benefiting profit margins and market competitive positioning. However, during economic downturns, companies might become more cautious with investments, delaying or reducing budgets for digital transformation (Wambua, 2023; Igwe et al., 2024).

2.5.3. Social Factors

Social factors encompass cultural, demographic, and social attitudes that influence consumer behaviour and workforce expectations. The growing consumer preference for digital interaction and online shopping creates a demand for businesses to adopt e-commerce platforms and enhance their digital engagement strategies. Consumers now expect seamless online experiences, personalised services, and quick product access. Digital transformation allows CCBSA to meet these consumer demands by providing user-friendly digital platforms for retailers and improving supply chain efficiencies (Yang et al., 2021). Moreover, social media platforms and mobile applications have transformed the way companies interact with consumers, enabling real-time communication and feedback. Social factors also affect employee engagement with digital tools. A more tech-savvy workforce is keen to adopt modern technologies, making it easier for companies to implement automated systems, data analytics, and other digital transformation tools without significant resistance (Kolade & Owoseni, 2022).

2.5.4. Technological Factors

Technological advancements are the most directly impactful factor in digital transformation. The rapid pace of innovation in areas such as cloud computing, big data, artificial intelligence (AI), and machine learning has enabled companies like CCBSA to achieve significant efficiency gains and a competitive advantage. Integrating these technologies into operations leads to enhanced predictive analytics, improved supply chain management, and personalised customer interactions. Furthermore, technologies like IoT (Internet of Things) enable real-time monitoring and predictive maintenance, significantly reducing downtime and maintenance costs. As CCBSA integrates these advanced digital technologies into its processes, it can improve product quality, operational efficiency, and cost-effectiveness, driving its market competitiveness (Rajawat et al., 2021).

2.5.6. Environmental Factors

Environmental sustainability is becoming increasingly important for both consumers and businesses. Digitalisation can play a crucial role in helping organisations adopt more environmentally friendly practices. Through data analytics, CCBSA can reduce waste, optimise energy consumption, and make more informed decisions about resource management. Additionally, IoT sensors can monitor energy use and environmental impact, helping to reduce the carbon footprint of manufacturing processes. Furthermore, integrating digital tools can lead to more efficient coordination and supply chain management, reducing transportation emissions and overall environmental impact. Digital transformation can also enable companies to meet growing consumer demand for sustainable products and eco-friendly practices, contributing to brand loyalty and improving public perception (Chauhan et al., 2022).

2.5.7. Legal Factors

Legal frameworks play a pivotal role in determining the scope and nature of digital transformation initiatives. Regulations surrounding data privacy, intellectual property (IP) rights, and cybersecurity directly impact how businesses collect, store, and utilise customer data in their digital operations. Companies must comply with local and international laws to ensure their digital transformation efforts do not result in legal liabilities. For CCBSA, compliance with data protection laws, such as South Africa's Protection of Personal Information Act (POPIA), is crucial when handling consumer data. Moreover, businesses must invest in cybersecurity technologies to protect against data breaches, which could disrupt operations, damage the company's reputation, and erode consumer trust (Turel et al., 2010).

2.6 Conceptual framework

A coherent conceptual framework is essential in guiding the structure and logic of empirical investigation, particularly in studies that seek to unpack multifaceted organisational phenomena such as digital transformation. This study is anchored in Digital Transformation theory, which serves as the primary theoretical lens. Digital Transformation theory asserts that digital transformation is not merely about technological implementation but involves the reconfiguration of organisational processes, employee roles, and strategic objectives. It highlights the interplay between technological integration and cultural adaptation, making it well-suited to assess how digital technologies transform manufacturing environments, such as those of CCBSA.

To strengthen the explanatory power of the framework, three supporting theories are applied. First, Innovation Diffusion Theory offers a behavioural dimension by explaining how individuals within an organisation adopt and respond to innovations based on their perceived relative advantage, compatibility, complexity, and trialability. This theory is instrumental in understanding varying levels of employee receptiveness to digitisation and the extent to which such perceptions shape usage patterns and acceptance.

Second, the Resource-Based View provides a strategic management perspective by framing digital tools, employee skills, and organisational knowledge as internal capabilities that can yield sustained competitive advantage. Within the CCBSA context, digital infrastructure, automation systems, and workforce digital literacy represent valuable, rare, and hard-to-imitate resources that directly influence productivity and innovation.

Third, Organisational Change Theory underpins the social and cultural aspects of transformation. It recognises that digital shifts often disrupt established routines, roles, and hierarchies, leading to resistance that must be managed through leadership, communication, and inclusive change strategies. Organisational Change Theory is particularly relevant in examining how training, leadership support, and organisational readiness facilitate or hinder successful transformation in CCBSA's manufacturing operations.

These four theories are synthesised into a conceptual framework that maps the key constructs of the study. The framework identifies three independent variables: (1) the deployment of digital tools and systems, (2) the provision of training and development, and (3) the presence of leadership support. These variables are theorised to influence two central mediating

variables: employee motivation and job satisfaction. These mediators capture the human response to digital change, reflecting how well employees feel supported, equipped, and incentivised during the transformation process.

The mediators, in turn, affect the study’s dependent variables: operational efficiency and cost savings. These are tangible organisational outcomes that digital transformation initiatives typically aim to improve. By examining the link between employee-centred variables and performance outcomes, the framework enables a nuanced understanding of how the social and technical dimensions of digital transformation intersect.

Additionally, the framework incorporates the PESTEL model to account for external contextual influences. These factors, while not directly tested as variables, function as moderators that shape how internal processes unfold. For example, regulatory changes or shifts in labour law can significantly impact the pace and scope of technology adoption.

By integrating these theories and constructs, the framework provides a robust foundation for addressing the research questions and objectives. It ensures theoretical coherence and empirical relevance by aligning organisational, behavioural, and contextual dimensions of digital transformation. Furthermore, it facilitates a multi-level analysis, capturing both structural (tools, leadership) and subjective (employee perceptions) elements, and demonstrates how these converge to influence strategic outcomes. This model positions the study to make a meaningful contribution to both academic literature and managerial practice by offering a structured pathway to explore not only *what* digital transformation achieves but also *how* and *under what conditions* it is successfully enacted in manufacturing-intensive environments like CCBSA.

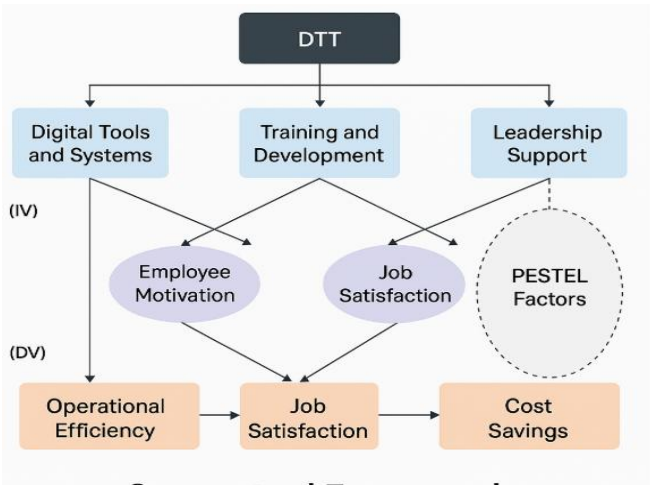


Figure 2.1: Conceptual Framework for the Study

2.6. Conclusion

Digital transformation at CCBSA demonstrated the substantial benefits of technological adoption to an organisation. The strategic implementation of digital tools, including automation and data analytics, has significantly improved operational efficiency, reduced downtime, and enhanced decision-making processes. CCBSA's experience highlights the importance of investing in technology, reskilling the workforce, and fostering a culture of continuous learning to ensure successful digital integration. Moreover, the company's approach to managing organisational change through effective communication and employee engagement played a crucial role in overcoming challenges and achieving smoother transitions.

External factors, including political, economic, and technological influences, shaped CCBSA's digital journey and provided valuable insights into how businesses can leverage their environments to drive innovation. The growing demand for digital engagement from consumers, coupled with advancements in AI, cloud computing, and data analytics, positioned CCBSA to capitalise on emerging opportunities in the market. Addressing sustainability concerns and ensuring compliance with legal frameworks, such as data protection laws, also demonstrated the company's proactive approach to responsible digital transformation.

Chapter 3: Methodology

3.1. Introduction

This chapter outlines the research methodology employed to assess the impact of digital transformation on CCBSA's manufacturing operations. The primary aim of this study is to assess the impact of digital technologies on operational efficiency, productivity, and employee satisfaction within CCBSA's manufacturing facilities. A quantitative research approach was selected to provide objective, measurable insights that can be statistically analysed to identify patterns and correlations between digital transformation and performance outcomes.

The research utilised a structured survey instrument (Appendix B) to capture employee perceptions and experiences with digital tools. Key focus areas included the operational impacts of digital transformation, employee satisfaction with the technology, and perceived improvements in productivity. A stratified random sampling technique ensured that data was collected from diverse employee groups, including shop floor workers, managers, and control and automation specialists, to reflect the varying interactions with digital systems at different organisational levels.

The data collection involved survey questionnaires to measure tangible outcomes such as production output, downtime, and error rates. Statistical techniques, such as Cronbach's alpha and Exploratory Factor Analysis (EFA), were used to assess the reliability and validity of the survey instrument, ensuring that the data collected was accurate and meaningful. Ethical considerations were a cornerstone of this research, strictly adhering to principles such as informed consent, confidentiality, and data security to protect participants' rights. By employing a rigorous, structured methodology, the study aimed to provide CCBSA with actionable insights into the effectiveness of its digital transformation and offered recommendations for optimising operational performance and employee engagement across its manufacturing facilities.

3 .2. Research Design

This study adopted a quantitative, survey-based research design to assess the impact of digital transformation on manufacturing performance at CCBSA. The purpose was to generate empirical evidence on how specific digital technologies, such as automation, real-time data systems, and advanced analytics, have influenced operational efficiency, productivity, and process optimisation across CCBSA's facilities. A quantitative approach was most appropriate for capturing measurable data that could be subjected to statistical analysis to reveal patterns, relationships, and the magnitude of change attributable to digital interventions.

The structured survey instrument was designed to collect standardised data from a diverse employee base across the manufacturing value chain. Closed-ended questions were used to quantify employee experiences with digital systems, focusing on usability, perceived performance improvements, and operational challenges. To strengthen the reliability and validity of the findings, the survey data were triangulated with key performance metrics, including production output, downtime, defect rates, and resource utilisation—both before and after the implementation of digital solutions. This enabled an objective and comparative analysis of changes in performance indicators resulting from digital transformation.

To ensure representativeness, the study employed a stratified random sampling method. The population was divided into key strata based on functional roles—namely, shop floor workers, mid-level managers, and control and automation specialists. These groups were chosen to reflect the differential engagement levels with digital systems across the organisation: shop floor workers, as direct users of digital equipment; managers, as integration overseers; and technical staff, as implementation agents. Participants within each stratum were randomly selected to eliminate selection bias and enhance generalisability. The final sample provided balanced insights into the organisational impacts of digital transformation from multiple operational vantage points.

Data collection procedures adhered to rigorous ethical protocols. All participants were informed of the study's purpose and the voluntary nature of their participation, and they provided written consent. Anonymity was maintained through coded responses, and all data was securely stored in compliance with institutional and corporate data protection policies. The quantitative design not only upheld ethical standards but also ensured analytic rigour and reproducibility.

Overall, this research generated statistically grounded insights that can inform CCBSA's strategic decision-making regarding future digital investments. By quantifying the impact of digital technologies across performance metrics and functional groups, the study offers a robust evidence base for enhancing operational excellence in digitally enabled manufacturing environments.

The choice of a quantitative survey-based methodology is grounded in the study's aim to empirically assess the impact of digital transformation initiatives on manufacturing performance at CCBSA. This approach is theoretically supported by the study's conceptual framework, which integrates Digital Transformation Theory, Innovation Diffusion Theory, Resource-Based View and Organisational Change Theory. Each of these theories underscores the importance of measurable organisational attributes and outcomes, validating the use of a methodology that captures quantifiable data on performance, adoption patterns, and capability utilisation.

Digital Transformation Theory views digitalisation as a systemic and measurable shift in organisational capabilities, requiring the empirical assessment of operational metrics such as efficiency, productivity, and system responsiveness. A quantitative approach enables the measurement of these outcomes through structured instruments and statistical analysis, aligning with the emphasis on evidence-based evaluation of digital maturity and transformation outcomes in Digital Transformation Theory.

Innovation Diffusion Theory supports the use of structured surveys to assess adoption patterns, user perceptions, and the influence of social and organisational factors on the diffusion of new technologies. By collecting data on how different employee groups experience and interact with digital systems, the study captures essential elements of Innovation Diffusion Theory, such as perceived usefulness, ease of use, and rates of adoption across the organisation.

The Resource-Based View advocates for the identification and measurement of internal resources and capabilities that contribute to sustainable competitive advantage. A quantitative methodology enables the empirical examination of how digital resources, such as technical infrastructure, employee skills, and process innovations, are leveraged to enhance operational performance, thereby linking resource deployment to measurable outcomes.

Organisational Change Theory emphasises the importance of evaluating change readiness, resistance, and implementation effectiveness, constructs that are best explored through quantifiable indicators. Surveys provide a practical mechanism for gauging employee responses to digital change, tracking behavioural shifts, and identifying areas of alignment or misalignment within the change process.

Together, these theoretical perspectives justify the adoption of a quantitative methodology that can capture the multifaceted and measurable nature of digital transformation in a large-scale manufacturing environment. The structured design supports objective, generalisable insights that are essential for strategic decision-making and aligns with the study's goal of providing actionable evidence to guide digital transformation at CCBSA.

3.3. Study Area

The study was conducted across four key manufacturing facilities of CCBSA: Phoenix, Premier, Elgin, and Lakeside. These facilities were selected as the focus of the study due to their strategic importance within CCBSA's operations, particularly in the coastal regions. By selecting these diverse facilities, the study aimed to capture a wide range of perspectives on the impact of digital transformation within the company, given the different operational environments and challenges each site faces.

3.4. Target Population

The target population for this study consisted of three key employee groups within CCBSA's manufacturing facilities: manufacturing employees, managers, and control and automation personnel. These groups were deliberately selected to reflect the different roles and levels of interaction with digital technologies within the organisation. Manufacturing employees, comprising approximately sixty-eight individuals across the selected facilities, represented the frontline workforce engaged in the daily operation of machinery and production processes. Their firsthand experience with the implementation of digital tools provided essential insights into how digital transformation directly affected productivity, system usability, and workflow dynamics on the shop floor.

The second subgroup consisted of ten managers who were responsible for overseeing production processes and ensuring that digital transformation initiatives aligned with strategic objectives and operational goals. Managers played a critical role in integrating digital tools into manufacturing workflows, facilitating change management, and evaluating the effectiveness of technological implementations across departments. Their perspectives were vital for understanding how digital transformation influenced leadership practices, decision-making, and performance monitoring.

The third subgroup included four control and automation specialists whose primary responsibilities involved the technical management, configuration, and maintenance of the digital systems in use. These individuals possessed specialised knowledge of automated systems, data analytics tools, and process optimisation technologies. Their contributions offered a nuanced understanding of the capabilities and limitations of the technologies employed within the manufacturing environment.

By including participants from these three distinct groups, the study captured a comprehensive view of the organisational impact of digital transformation. The diversity within the target population allowed for an in-depth analysis of the perceived benefits, challenges, and effectiveness of digital technologies from multiple functional perspectives, thereby enriching the study's findings and recommendations.

To ensure the validity and relevance of the data collected, specific inclusion and exclusion criteria were applied during the sampling process. The inclusion criteria focused on employees directly engaged in or impacted by digital transformation initiatives within CCBSA's manufacturing operations. Eligible participants included full-time employees from the manufacturing, managerial, and control and automation departments across the four selected facilities—Phoenix, Premier, Elgin, and Lakeside. These individuals were selected based on their routine involvement in production processes, oversight of digital system integration, or technical management of automation tools. Participants were required to have at least six months of tenure at CCBSA to ensure they had adequate exposure to the digital tools and systems implemented during the organisation's transformation process.

Conversely, the study excluded temporary workers, contractors, and employees not directly involved in manufacturing or digital processes, such as administrative staff or those in logistics and distribution. These roles were deemed to have minimal interaction with core digital manufacturing systems, and their inclusion might have introduced irrelevant variability in the data. Additionally, employees on extended leave or those who had not used or interacted with digital technologies in their work environment during the previous six months were excluded to maintain consistency in the exposure and experience levels among participants.

Applying these inclusion and exclusion criteria helped ensure that the data collected reflected informed and relevant perspectives, thereby strengthening the internal validity of the findings and supporting meaningful conclusions about the impact of digital transformation on operational efficiency and employee engagement.

3.5. Sampling Techniques

To ensure representativeness and capture diverse perspectives within CCBSA, this study employed a stratified random sampling strategy. The population was divided into clearly defined strata based on job function and location, ensuring proportional representation from key employee groups: shop floor workers, mid-level managers, control and automation specialists, and staff from various manufacturing facilities across the organisation. These strata were selected due to their differentiated exposure to and interaction with digital transformation initiatives. Within each stratum, participants were randomly selected using an employee database as a sampling frame, ensuring equal probability of selection and minimising sampling bias.

This sampling approach enhanced the validity and generalisability of findings by ensuring that critical subgroups, each with unique roles in the digital transformation process, were systematically included. For instance, shop floor employees directly engage with automated systems, managers oversee digital integration, and technical staff manage infrastructure and system optimisation. This stratified design enabled a comparative analysis of how digital transformation affects various operational levels and workflows across CCBSA's manufacturing operations.

Following data collection, the study applied descriptive statistical analysis to assess the reliability and interpret trends in the survey data. Key statistical techniques—including calculation of means, standard deviations, and frequency distributions—were used to

summarise perceptions and performance-related responses. This enabled the identification of significant patterns and group-specific variations in the impact of digital tools on the population. The use of structured, closed-ended survey questions facilitated systematic data analysis while minimising subjective interpretation.

The analytic process adhered to best practices in quantitative research, as described by Simplilearn (2021), where data is systematically collected, numerically evaluated, and interpreted to draw meaningful conclusions while minimising bias. This rigorous sampling and analysis approach supported the study's goal of providing evidence-based insights into the operational effects of digital transformation across the different functional tiers within CCBSA.

3.4. Sample Size

Determining an appropriate sample size is a crucial element of this research study, which examines the impact of digital transformation across various roles and locations within CCBSA. To achieve this, we will utilise Cochran's formula, a robust statistical tool well-suited for large and diverse populations (Ahmed, 2024)

. The formula is defined as:

$$n_0 = \frac{Z^2 \cdot p \cdot (1 - p)}{e^2}$$

In this equation, n_0 represents the sample size, Z^2 is the z-value corresponding to the chosen confidence level, p is the estimated proportion of the population exhibiting the characteristic of interest, and e^2 is the margin of error. This study focuses on employees from varied roles and geographic locations within CCBSA. Given the inherent variability in this population stemming from differences in job functions, levels of exposure to digital transformation, and regional contexts, accounting for this diversity in the sample size calculation is essential.

For this study, we set a 95% confidence level, corresponding to a z-value of approximately 1.96, along with a 5% margin of error (0.05). These parameters facilitated a statistically significant sample size, thereby enhancing the reliability of the findings.

While Cochran's formula provided a solid theoretical foundation for determining sample size, practical considerations also had to be addressed. These included ensuring access to a representative group of respondents across various roles, assessing budget constraints for data collection, and factoring in time limitations that might have affected the study timeline. Adjustments to the calculated sample size were necessary to maintain feasibility while upholding the integrity of the research (Ahmed, 2024). Employing Cochran's formula allowed us to determine a sample size that accurately reflected the broader employee population at CCBSA. This methodological approach aimed to bolster the validity of our findings and provide actionable insights into the organisation's digital transformation strategy, benefiting decision-making processes across the company (Ahmed, 2024).

3.7. Research Instruments.

To examine the impact of digital transformation at CCBSA, the study employed structured surveys as the primary data collection instrument. These surveys were systematically developed to capture standardised, quantifiable data across diverse employee groups involved in manufacturing operations. The instrument focused on key dimensions of digital transformation, namely operational efficiency, employee perceptions, and external environmental influences, ensuring both depth and breadth in data collection.

Each survey item was constructed using a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). This format allowed for the consistent measurement of attitudes, perceptions, and experiences related to digital transformation, thereby facilitating robust statistical analysis. The development of survey items was informed by both existing literature on digital transformation and the theoretical framework underpinning the study, Digital Transformation Theory, Innovation Diffusion Theory, Resource-Based View, and Organisational Change Theory. This ensured construct validity and alignment with the study's objectives.

The survey instrument addressed the following core domains:

- **Operational Impact:** Assessed the perceived effects of digital technologies on production processes, workflow optimisation, and overall operational performance.
- **Employee Satisfaction:** Measured employee experiences with digital tools, including usability, adequacy of training, and impacts on job satisfaction.

- Perceived Effectiveness: Evaluated the extent to which employees believed digital transformation improved productivity and addressed operational challenges.

In addition to internal organisational assessments, the study integrated a PESTEL analysis to examine the influence of external environmental factors on CCBSA's digital transformation efforts. The same 5-point Likert scale was employed for consistency across datasets. The PESTEL dimensions included:

- Political: Influence of government policies and regulations on digital initiatives.
- Economic: Financial considerations and resource allocation affecting digital adoption.
- Social: Employee and societal readiness for technology integration.
- Technological: Availability and advancement of digital tools and infrastructure.
- Environmental: Role of sustainability and environmental priorities in shaping digital strategies.
- Legal: Impact of legal compliance, data protection, and regulatory frameworks.

The combined use of employee-focused survey items and a PESTEL framework provided a comprehensive, multi-level view of the factors shaping digital transformation at CCBSA. This methodological approach ensured that both internal and external determinants were rigorously captured, supporting the reliability, validity, and generalisability of the study's findings.

3.8. Pretesting

Pretesting was essential in validating the effectiveness and reliability of the survey instrument developed for this study. The pilot test involved administering the survey to a representative sample of 10% of participants from each targeted employee group, including shop floor workers, managers, and control and automation specialists. This strategic approach allowed researchers to identify potential issues in the survey design, ensuring that questions were clear, relevant, and aligned with the study's objectives (Forero, 2024).

The initial pilot test helped refine the questionnaire by revealing ambiguities and areas for improvement. Feedback obtained during this pretesting phase was crucial for modifying question phrasing, structure, and content, enhancing clarity and respondent engagement (Kostyk et al., 2021).

3.9. Validity and Reliability

Cronbach's alpha was utilised to assess the reliability of the survey instrument. This statistical measure evaluated the internal consistency of the survey items, indicating how closely related the items were in measuring the same underlying construct. Cronbach's alpha assessed whether multiple items designed to measure the exact concept yielded similar scores.

Understanding Cronbach's Alpha

Cronbach's alpha is calculated using the following formula:

$$\alpha = \frac{N \cdot c}{v + (N - 1) * c}$$

Where:

- **N**= number of items
- **c** = average covariance between item pairs
- **v** = average variance of each item

The value of Cronbach's alpha ranges from 0 to 1, with higher values signifying greater internal consistency. A threshold of 0.70 is typically regarded as the minimum acceptable level of reliability, although values above 0.80 are often preferred in social science research (Tavakol & Dennick, 2011). It is essential to recognise that while a high Cronbach's alpha suggests good internal consistency, it does not inherently guarantee the instrument's validity for measuring the intended construct. Therefore, it should be complemented with additional validity assessments, such as content and construct validity (Forero, 2024).

Furthermore, exploratory factor analysis (EFA) was employed to investigate the underlying structure of the questionnaire. EFA helped verify that the survey items grouped into coherent factors that accurately reflected the constructs being studied, providing insights into the alignment of the questions with the research objectives (Hair et al., 2012). By combining pilot testing, reliability analysis using Cronbach's alpha, and exploratory factor analysis, this study aimed to enhance the validity and reliability of the survey instrument.

3.10. Data Collection Techniques

For this study, data collection primarily involved paper-based surveys, as many employees, especially frontline workers at the CCBSA manufacturing facilities, did not have regular access to computers or digital platforms. While some employees may have had access to work emails, the study's primary mode of communication was paper-based to ensure inclusivity across all employee groups, particularly frontline workers who were less familiar with or had limited access to technology.

The surveys were distributed in person at the Phoenix, Premier, Elgin, and Lakeside facilities, with the researcher available to aid where necessary. This included interpreting questions or clarifying misunderstandings to ensure respondents accurately understood the survey items. This approach was particularly important for frontline workers, who may have had varying levels of literacy or technical proficiency. For employees with access to work email, the option of receiving the survey electronically was offered. However, the focus remained on paper-based surveys to ensure that all participants could contribute regardless of technological access. Once completed, the paper-based surveys were collected and manually analysed, providing valuable insights into employee perceptions of digital transformation, its impact on their roles, and operational efficiency at CCBSA's manufacturing facilities.

3.11. Data Analysis.

Data analysis in this study focused on the impact of digital transformation at CCBSA, specifically examining its influence on manufacturing efficiency, cost of production, employee motivation, and perceived threats and opportunities. The analysis integrated PESTEL (Political, Economic, Social, Technological, Environmental, and Legal) factors to assess external influences on digital transformation.

Key aspects of analysis will include:

- **Cost of Production:** Evaluating how digital tools, such as automation and predictive maintenance, reduce production costs.
- **Employee Motivation:** Investigating how digital transformation affects job satisfaction and productivity.
- **Perceived Threats and Opportunities:** Analysing employee concerns about job displacement and opportunities for innovation through digital transformation.

3.11.1. Descriptive Data Analysis

Descriptive data analysis methods were employed to verify the accuracy of the collected data by calculating measures such as the mean, standard deviation, and variance. The mean provided a central value summarising the data set, while the standard deviation offered insights into the variability of the data points around the mean. By comparing the mean to the first standard deviation, researchers could better understand the precision of the collected data (Murad et al., 2019). This process was crucial for evaluating how closely the responses aligned with expected values and identifying any outliers that might have skewed the results.

The data collected was organised and extracted into Excel, where graphical representations, such as bar charts and pie charts, were generated to visually depict the findings. Visualisations enhanced data interpretation and facilitated communication of results to stakeholders, making complex information more accessible and actionable.

Validity and Reliability Analysis ensured the accuracy of the survey instrument, with Cronbach's alpha used to assess internal consistency, aiming for a value above 0.70 (Tavakol & Dennick, 2011). Bartlett's Test of Sphericity verified the suitability of data for factor analysis (Bartlett, 1954).

Correlation Analysis examined the relationships between digital transformation and several factors, including cost reduction, employee motivation, utilisation, and perceived threats and opportunities, excluding external PESTEL elements, using Pearson's correlation coefficient to assess the strength and direction of these relationships (Fu et al., 2020). This helped to determine whether the constructs used to build the questionnaire accurately reflected employees' confidence levels in the results.

3.11.2. Implications

Integrating these data analysis techniques provided a robust framework for understanding employee perceptions of digital transformation at CCBSA. The insights gained from quantitative data analysis informed discussions and recommendations for management. This multifaceted approach aimed to enhance the management of digital transformation and technological advancements within the engineering sector, ensuring that employee perspectives were considered in strategic planning.

The recommendations generated from this analysis played a critical role in enhancing the company's sustainability. CCBSA could create a more supportive environment for

implementing modern technologies by addressing employee concerns and preferences. This, in turn, contributed to the organisation's ability to safeguard information and maintain operational efficiency for current and future employees.

3.12. Demographic analysis

Demographic analysis is a critical component of this study, as it helps contextualise the findings related to the impact of digital transformation within CCBSA. Understanding the demographic composition of the sample population allows for a nuanced interpretation of how distinct groups perceive and experience the effects of digital transformation in manufacturing.

3.12.1. Target Population Characteristics

The target population consists of three primary groups: manufacturing employees, managers, and personnel involved in control and automation. This diverse representation is crucial for capturing a comprehensive operational landscape.

- **Manufacturing Employees:** Approximately sixty-eight frontline workers are involved in day-to-day operations. This group encompasses various roles, from machine operators to quality assurance personnel, each contributing uniquely to the production process. The diversity within this group may influence perceptions of digital tools, as different job functions may experience varying levels of interaction with these technologies (Saunders et al., 2019).
- **Managers:** The study includes ten managerial staff who oversee production processes. Their perspectives are essential for understanding how digital transformation affects decision-making, operational oversight, and team dynamics. Managers often play a pivotal role in facilitating the adoption of modern technologies, and their insights can illuminate the strategic implications of digital transformation (Brynjolfsson & McAfee, 2014).
- **Control and Automation Personnel:** With four specialists responsible for digital systems, this small yet crucial group is integral to the successful implementation and maintenance of automated processes. Their expertise provides valuable insights into the technical challenges and opportunities associated with digital transformation, highlighting the intersection of technology and human capital (Kagermann et al., 2016).

3.12.2. Demographic Variables

Several demographic variables were considered to enhance the analysis, including age, gender, educational background, and years of service. These variables could influence employees' attitudes toward technology and adaptability to change. For instance, younger employees might have been more tech-savvy and open to digital innovations, while older employees may have exhibited resistance due to unfamiliarity (Venkatesh et al., 2011).

- **Age:** Age demographics can significantly affect technology acceptance. Younger employees tend to adopt modern technologies more readily than their older counterparts, which may necessitate additional training and support (Venkatesh et al., 2011). This study will analyse how age correlates with perceptions of digital transformation.
- **Gender:** Understanding gender dynamics within the workforce is essential, as different experiences may shape perspectives on digital tools. Gender diversity in manufacturing has influenced collaborative practices and innovation.
- **Educational Background:** Employees' qualifications can also impact their comfort with digital technologies. Those with higher education levels may have more exposure to digital tools in their previous experiences, leading to higher acceptance and satisfaction levels.
- **Years of Service:** Employees' time in their roles can provide insights into their adaptability to modern technologies. Longer-serving employees might have ingrained practices that could hinder the adoption of digital tools, while newer employees may be more flexible and willing to embrace change.

3.12.3. Implications for Data Interpretation

Analysing demographic factors enabled the study to uncover patterns and trends across employee groups. By stratifying the data according to these variables, the research offered a more comprehensive understanding of how digital transformation impacted operational efficiency and employee satisfaction. This analysis was critical for tailoring interventions that addressed the unique needs and challenges faced by different demographic groups within the organisation. Demographic analysis was a vital aspect of this study, as it enriched the understanding of how various employee characteristics influenced perceptions of digital transformation at CCBSA. This understanding contributed to the development of more effective strategies for implementing digital transformation in the manufacturing sector.

3.13. Ethical Considerations.

Ethical considerations are crucial in any research study, particularly those involving human participants. This study on the impact of digital transformation at CCBSA must follow ethical guidelines to ensure that participants' rights are protected and that the research is conducted responsibly.

3.13.1. Informed Consent

Informed consent was one of the most important ethical principles in the research. It meant that participants had to fully understand what the study was about before agreeing to take part. To achieve this, an information sheet was provided to each participant, clearly explaining the purpose of the research, their role in the study, any potential risks, and the benefits they might gain from participating. This information helped participants decide whether to participate (Correia, 2023).

The consent process also emphasised that participation was entirely voluntary. Participants had the right to withdraw from the study at any time without any negative consequences. This ensured that they felt comfortable and safe throughout the research process. Participants were also encouraged to ask any questions they might have, promoting an open and trusting environment.

3.13.2. Confidentiality and Anonymity

Confidentiality and anonymity were essential for protecting participants' personal information. To maintain confidentiality, all data collected from surveys and performance metrics was stored securely and accessible only to the research team. Any identifying information, such as names or job titles, was removed from the data set to ensure that individual responses could not be traced back to specific participants (Correia, 2023). Additional steps were taken to ensure anonymity by reporting findings in aggregate form. This meant that data was presented by combining responses from multiple participants, making it impossible to identify any individual. Informing participants about these measures helped reassure them that their privacy would be protected.

3.12.3. Data Security

In today's digital age, protecting data from breaches and unauthorised access is crucial. To ensure data security, strong data protection measures were implemented. Electronic data was encrypted and stored on secure servers, while any physical documents were kept in locked file cabinets. The research team received training on data protection protocols to minimise the risk of data leaks (Saunders et al., 2019). Participants were also informed about the data security measures in place. This transparency helped build trust and encouraged participation, as individuals felt more confident that their information was being managed safely.

3.13.4. Impact of Findings

Considering the potential impact of the research findings was also an important ethical aspect. The results of this study could influence company policies, practices, and employee experiences. Therefore, it was essential to approach the reporting of findings responsibly. The aim was to provide constructive insights that could lead to positive organisational changes while being mindful of any negative consequences for participants. To ensure ethical reporting, the study communicated how the findings would be used. This included sharing the intended audience for the results and the potential implications for employees. Being transparent about how the findings would be used helped participants understand the significance of their contributions to the research.

3.13.5. Researcher Integrity

The integrity of the researchers was another critical ethical consideration. Researchers were required to conduct the study honestly and transparently, avoiding any conflicts of interest. The data would be reported accurately, and any study limitations would be acknowledged. This commitment to integrity was vital for maintaining trust with participants and stakeholders (Resnik et al., 2015).

Researchers also had to be cautious about how they presented their findings. Misrepresenting data or drawing unsupported conclusions could undermine the credibility of the research and harm participants. By adhering to ethical standards, researchers could ensure their work contributed positively to the field.

3.13.6. Compliance with Ethical Guidelines

To uphold these ethical principles, the study complied with guidelines established by relevant organisations and regulatory bodies. This included obtaining approval from the UKZN Ethics Committee, as outlined in Appendix C, which reviewed the research proposal to ensure that ethical standards were met. Compliance with these guidelines helped protect the rights and welfare of participants while ensuring that the research was conducted responsibly (Correia, 2023). Ethical considerations were a fundamental part of this study on digital transformation CCBSA. By focusing on informed consent (as per Appendix D), confidentiality, data security, the potential impact of the findings, and researcher integrity, the research adhered to high ethical standards. This commitment enhanced the study's credibility and fostered trust and collaboration between researchers and participants.

3.12. Conclusion

This chapter outlined the research methodology designed to assess the impact of digital transformation on CCBSA's manufacturing operations. A quantitative approach was employed to gather measurable data on employee perceptions, operational efficiency, and productivity, enabling rigorous statistical analysis. The study employed stratified random sampling to ensure diverse representation from key employee groups, including shop floor workers, managers, and automation specialists, capturing a comprehensive view of digital transformation's effects across the organisation.

Data was collected through structured surveys, providing valuable insights into employee experiences with digital tools and their perceived impact on productivity and operational processes. The study employed statistical techniques, including Cronbach's alpha and Exploratory Factor Analysis (EFA), to ensure reliability and validity. Ethical standards, including informed consent and data security, were strictly upheld throughout the research. This methodology generated actionable insights to guide CCBSA in optimising its digital transformation strategy and improving operational performance.

Chapter: 4 Results and Discussion

4.1. Introduction

This chapter presents findings and overviews on the study of digital transformation to gather a comprehensive understanding of the operational efficiency and overall performance of CCBSA manufacturing facilities. The findings of this research will inform strategies that can enhance operational efficiency and drive improvements in manufacturing performance. This includes the application of Cochran's formula to determine the optimal sample size, ensuring the statistical significance of the results. The research instruments, such as survey questionnaires and performance metrics data sheets, will also be discussed. These instruments are designed to capture quantitative data on employee perceptions of digital transformation and operational metrics related to production efficiency.

4.2. Presentation of Data

The data for this study was collected using a combination of survey questionnaires and performance metrics data sheets distributed to employees of CCBSA manufacturing facilities. The survey aimed to capture quantitative data on employee perceptions regarding digital transformation and operational data related to production efficiency. Sixty-eight employees were initially targeted for participation, comprising frontline workers, managers, and personnel responsible for control and automation. However, thirty-nine responses were received, yielding a response rate of 57.35%. The breakdown of responses is presented in the table below.

Table 4.1: Planned responses and response rate

	Planned responses	Actual responses
Questionnaire sent	68	39
Percentage	100%	57.35%

According to Cochran's formula for sample size determination (Table 4.2 below), the initial sample size for this study was calculated to be 68 participants, which would achieve a 5% margin of error and a 95% confidence level. However, due to practical limitations, including employee unavailability during the survey period and other personal circumstances, only 39 responses were received.

Table 4.2: Cochran's formula showing precision on both planned and actual sample sizes

Sample size	Z ²	p	1-p	e ²
68	1.96	0.95	0.05	0.05
39	1.96	0.95	0.05	0.1

Despite the increased margin of error to 10%, the research still proceeded because the insights gained were crucial for informing CCBSA's digital transformation strategy. Practical constraints, such as employee unavailability and time limitations, often required adjustments to the sample size, which affected precision. However, the collected data provided valuable, actionable insights.

4.3. Presentation of Demographics Results

4.3.1. Age distribution

The results breakdown represents 17.95% of respondents in the 20-30 age group, 33.33% in the 31-40 age group, 17.95% in the 41-50 age group, 23.08% in the 51-60 age group, and 7.69% in the 61-65 age group. The breakdown can be seen in Figure 4.1 below.

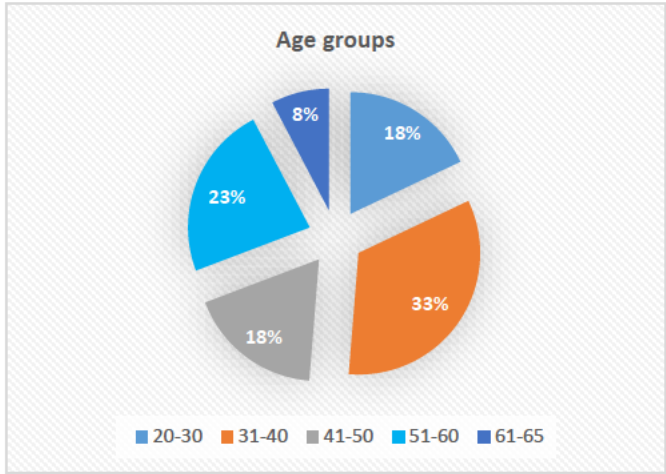


Figure 4.1: Age distribution.

The distribution shows a diverse range of age groups, with the most significant proportion of respondents falling within the 31-40 age group. Older age groups indicate a mix of experienced employees alongside younger, more recently hired staff. This reflects a workforce with varying levels of experience, which is essential for understanding how digital transformation might be perceived and implemented across different age demographics within CCBSA (Elia et al., 2024)

4.3.2. Gender distribution

The higher number of male respondents in this study, as shown by the gender breakdown (23 males to 16 females), as per Figure 4.2 below, reflects a common trend in the manufacturing industry, where male employees typically outnumber female employees.

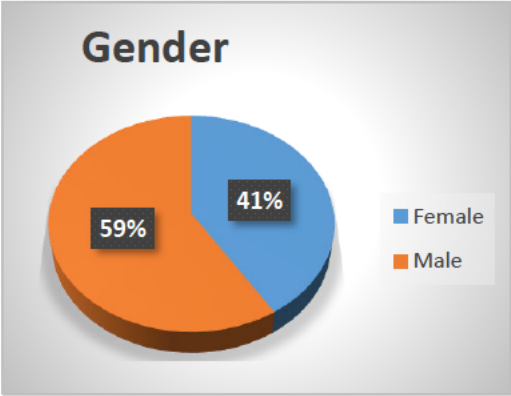


Figure 4.2 Gender distribution.

Manufacturing roles, particularly in production and technical areas, have historically attracted a higher proportion of male workers. This gender imbalance is often due to industry norms and the types of roles available, which may be perceived as more physically demanding or less appealing to women. However, CCBSA has made significant efforts to address this imbalance through various initiatives aimed at increasing female representation in the manufacturing workforce, including targeted recruitment programs and promoting inclusive workplace policies. Despite these efforts, the data in this study still reflects the broader gender patterns within the sector. The adoption of digital transformation helps organisations to be more decisive and inclusive in recruitment processes (Moloko, 2021; Nworie et al., 2024).

4.3.3. Racial distribution

The racial composition of the respondents in this study reflects the diverse workforce within CCBSA and is aligned with the broader demographic structure of the country. South Africa is renowned for its rich cultural diversity, with diverse racial groups contributing to the workforce across various industries, including manufacturing. A deeper analysis of racial groups will better indicate how racial and cultural groups will adopt digital transformation (Scholze & Hecker, 2024). The breakdown of responses by race groups is depicted in the graphical representation of Figure 4.3.

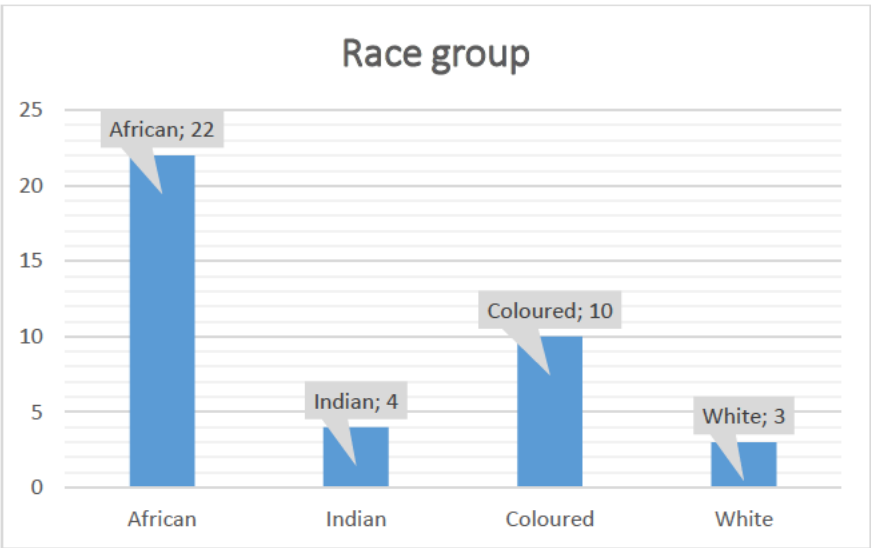


Figure 4.3: Race groups

This racial distribution represents 56.41% African, 10.26% Indian, 25.64% Coloured, and 7.69% White among the thirty-nine respondents. While the racial composition of the survey sample broadly represents South Africa's population, it is essential to acknowledge that certain groups remain underrepresented in the manufacturing sector.

4.3.4. Job positions at the CCBSA

The demographic distribution of CCBSA respondents reveals that 69.2% are frontline workers, 20.5% are managers, and 10.3% are control technicians, as per Figure 4.4 below. This breakdown suggests that frontline workers, who are directly involved in day-to-day operations, are most impacted by digital transformation efforts. Their feedback is crucial in understanding how digital tools and processes affect workflow, productivity, and employee satisfaction at the operational level (Kolade & Owoseni, 2022).

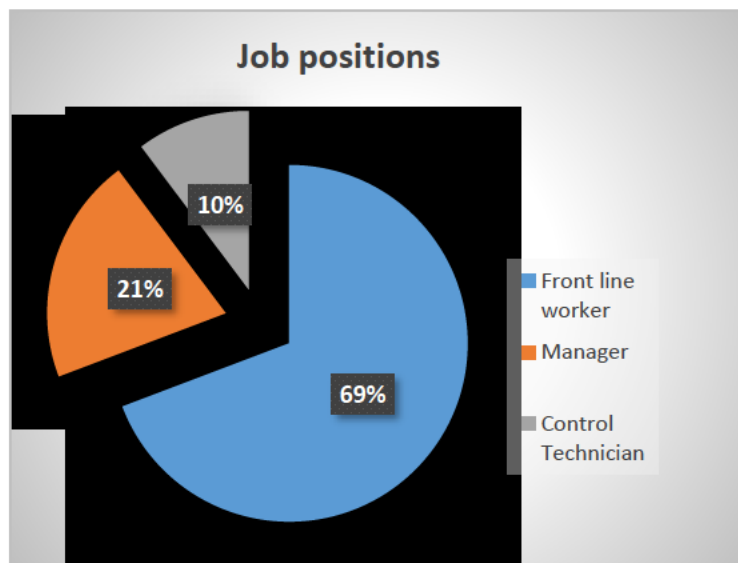


Figure 4.4: Stratified job positions targeted for this study

While representing a smaller group, managers provide valuable insights into how digital transformation aligns with broader business goals such as efficiency, cost reduction, and regulatory compliance. They focus on the strategic and long-term impacts of digital transformation (Korherr et al., 2022). Control technicians, though fewer in number, offer specialised feedback on the technical aspects of digital transformation, particularly in terms of how well the systems and tools are performing and any technical challenges they encounter. The overall composition indicates that while most feedback comes from frontline workers, the perspectives of managers and control technicians are equally crucial in evaluating the success of digital transformation. Considering the diversity of roles, a comprehensive approach to understanding the impact of digital transformation requires gathering insights from all levels of the organisation.

4.3.5. Years of experience at CCBSA

This breakdown represents 10.26% of respondents with 0-1 year of experience, 7.69% with 1-3 years, 17.95% with 4-6 years, 23.08% with 7-10 years, and 41.03% with 10 or more years of experience at CCBSA. The data in Figure 5 below shows a substantial proportion of respondents with over 10 years of experience at CCBSA, indicating that long-term employees comprise a sizeable portion of the workforce. This is important as employees with more experience may have different views on the impact of digital transformation compared to those with fewer years at the company (Igwe et al., 2024). The balanced representation across various experience levels will provide a comprehensive understanding of how employees perceive and adopt digital transformation at different stages of their careers (Korherr et al., 2022).

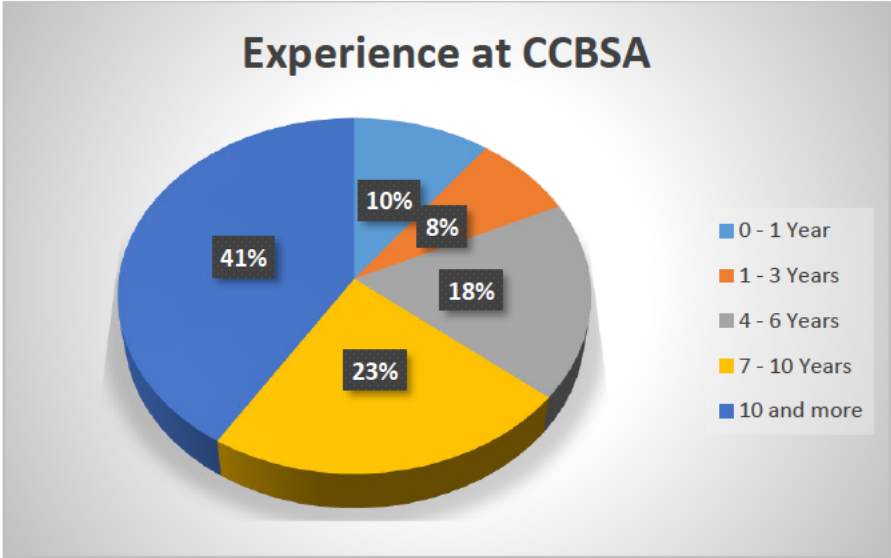


Figure 4.5: Participants' experience at CCBSA

4.3.6. Education level

The educational background of respondents at CCBSA in Figure 4.6 below shows a diverse range of qualifications (38.5% of respondents have technical training, suggesting that a sizeable portion of the workforce has specialised skills relevant to digital transformation's operational and technical aspects). 30.8% of respondents have completed Grade 12, indicating a group likely in entry-level or hands-on roles whose feedback will be crucial in understanding how digital transformation affects everyday tasks (Kolade & Owoseni, 2022). Those with a bachelor's degree (25.6%) hold managerial or specialised positions and provide insights on how digital transformation impacts organisational efficiency and long-term strategy. The smallest group, with master's Degrees (5.1%), are likely in leadership or research-focused roles, offering a broader, strategic view of digital transformation ((Wambua, 2023; Igwe et al., 2024). This mix of educational backgrounds highlights the need to consider various perspectives when assessing the impact of digital transformation across various levels of the organisation (Turel & Serenko, 2010).

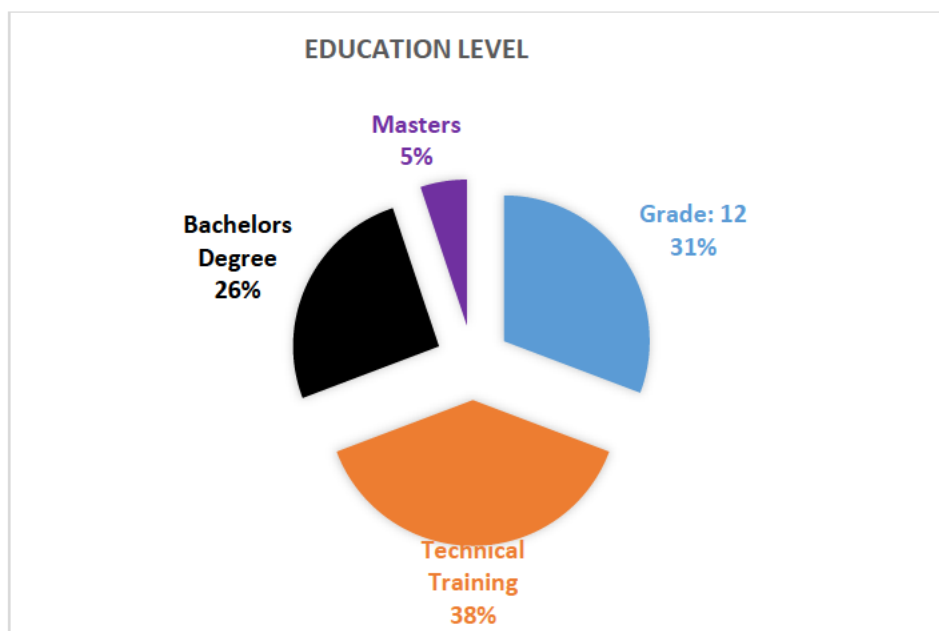


Figure 4.6: Educational background

4.3.7. Manufacturing facilities

This breakdown in figure 4.7 below represents 61.54% of the responses from Elgin, 23.08% from Lakeside, 10.26% from Phoenix, and 5.13% from Premier.

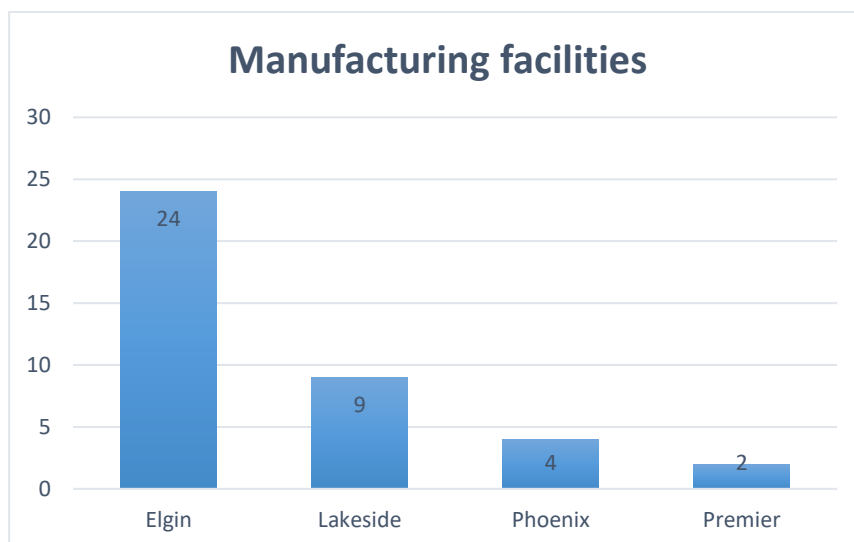


Figure 4.7: Different sites in the coastal region

Based in Elgin, which was geographically closer to Lakeside, the researcher conducted more follow-ups and engaged with participants from these two facilities more easily. This proximity enabled more in-depth interactions, resulting in a higher response rate from Elgin and Lakeside. The more substantial number of responses from these two locations likely reflected this increased engagement. In contrast, being more remote, Phoenix and Premier had fewer responses due to limited follow-up opportunities. The diverse representation from these facilities provided valuable insights into the varying impacts of digital transformation across different operational environments within CCBSA. The findings from these sites provided a comprehensive understanding of how digital technologies were being implemented and perceived, enabling benchmarking of practices across the company's operations (Yang et al., 2021).

4.4. Presentation of manufacturing results

4.4.1. Contribution to Cost of Production

The survey results below from CCBSA demonstrate that digital transformation has significantly impacted production costs and operational efficiency. Most respondents (68%) indicated that digital transformation has contributed to reducing production costs. This aligns with global trends, where digital technologies such as automation, sensors, and data integration are known to optimise manufacturing processes and minimise waste (Li et al., 2024). Additionally, 68% of employees reported measurable cost savings from digital systems, confirming that the investment in digital transformation has produced tangible financial benefits for the company.

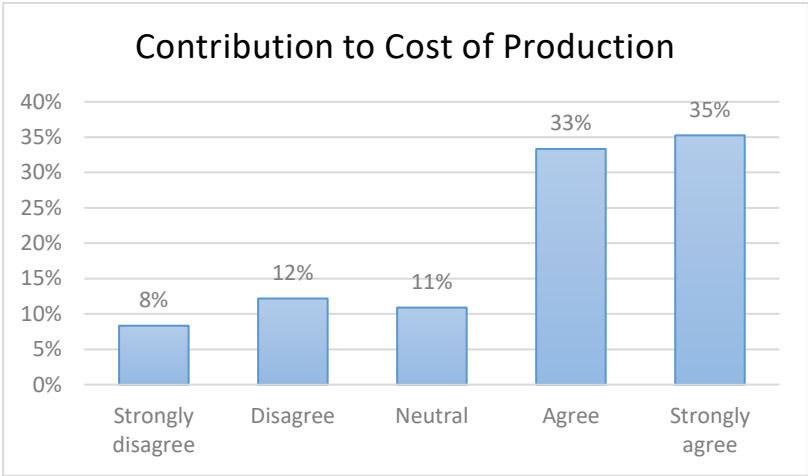


Figure 4.8: Likert scale responses on the cost of production

Figure 4.8 above illustrates that 68% of employees agreed that digital systems have improved production efficiency. Real-time monitoring and automated adjustments contributed to reducing downtime and improving overall quality control, supporting the idea that digital transformation enhances process optimisation (Bharadwaj et al., 2013). However, the small percentage of respondents (20%) who disagreed or remained neutral suggests that the benefits of digital transformation are not equally felt across all departments, highlighting the need for further targeted efforts to ensure widespread digital adoption and integration (Scholze & Hecker, 2024).

Moreover, the graph reveals that, for most respondents (68%), the cost of implementing and maintaining digital systems is justified by the resulting savings. This reflects a positive perception of digital investment, consistent with the broader industry view that long-term financial and operational benefits outweigh the initial costs (Bharadwaj et al., 2013). However, it also highlights the need for ongoing communication, training, and support to ensure that all employees fully understand and effectively utilise the benefits of these technologies.

4.4.2. Employee Motivation and Utilisation of Digital transformation at CCBSA

The survey results reveal mixed levels of employee motivation and utilisation of digital transformation at CCBSA. While 30% of employees strongly agree that digital transformation has improved their performance, 24% strongly disagree, indicating a significant gap in adoption and motivation. As shown in Figure 9, the variation in responses suggests that although digital transformation has clear benefits for some, others remain disengaged, potentially due to insufficient training, a lack of understanding, or resistance to change (Kolade & Owoseni, 2022). This suggests that CCBSA should focus on addressing these barriers through targeted interventions.

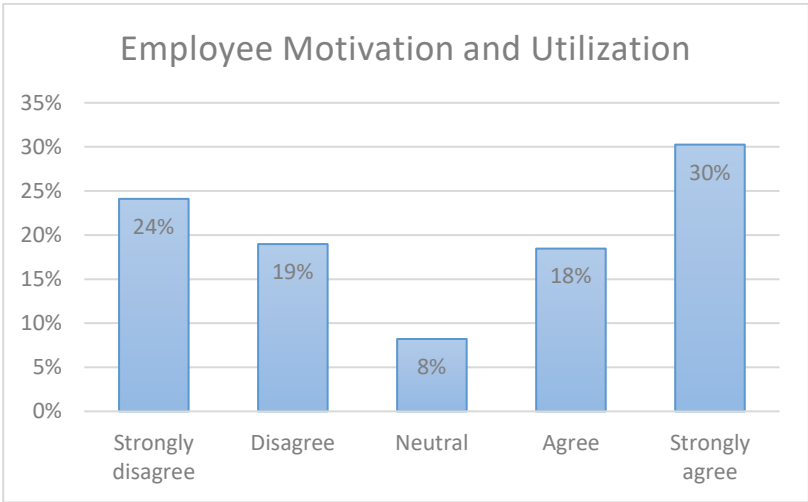


Figure 4.9: Likert scale responses on motivation and utilisation

The sub-results further reveal that while 50% of respondents feel adequately supported by the company in using digital tools, a sizable portion (13 employees) feel less confident about their training. This confidence gap may hinder the full utilisation of digital systems. With only 18% strongly agreeing that the company provides sufficient incentives for digital adoption, it is evident that employees may not feel sufficiently motivated to fully embrace digital transformation unless tangible rewards or recognition systems are put in place (Kamel, 2023).

Regarding job efficiency, 15 respondents agreed that digital transformation made their jobs easier and more efficient, which aligns with studies showing that employees are more likely to stay engaged when they perceive practical benefits from digital tools (Kamel, 2023). However, the 10 employees who strongly disagreed with this statement suggest that some systems may still be perceived as cumbersome or ineffective, possibly due to integration challenges or a lack of customisation to specific job roles (Kolade & Owoseni, 2022). These employees may need additional support to see the value of the systems.

To optimise the impact of digital transformation at CCBSA, it is crucial to focus on improving the training and support infrastructure. Providing more transparent communication, ensuring adequate incentives, and fostering a culture of continuous learning will help enhance employee motivation. Strengthening these areas will lead to better engagement with digital tools and help CCBSA achieve higher levels of efficiency and productivity, aligning with the broader goals of digital transformation (Kolade & Owoseni, 2022).

4.4.3. Perceived Threats and Opportunities in Digital transformation at CCBSA

The posted graph displayed in Figure 4.10 below reveals that employees at CCBSA have a mixed perspective on the perceived threats and opportunities related to digital transformation. Approximately 29% of employees strongly agree that digital transformation presents opportunities for improvement, while 20% strongly disagree, indicating a divided viewpoint. This disparity highlights the varied perceptions within the company, with some employees viewing digital transformation as a way to enhance productivity and efficiency, while others may be apprehensive about the potential risks involved, such as job displacement or disruption of traditional processes (Volberda et al., 2021; Reynolds, 2024).

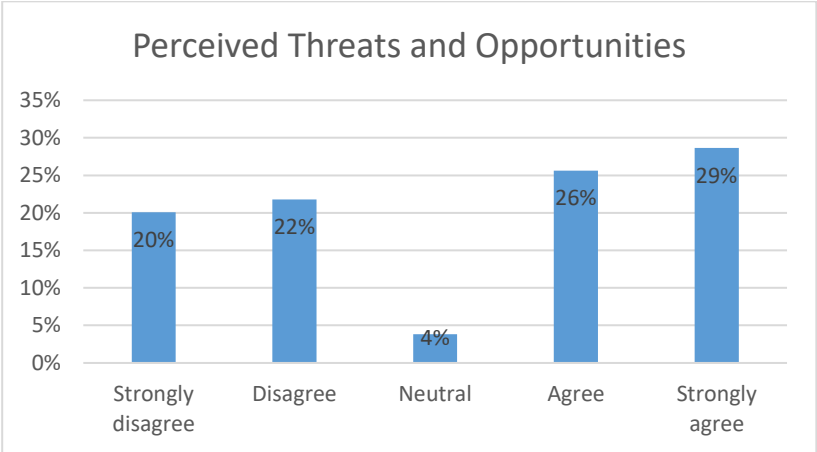


Figure 4.10: Likert scale responses on threats and opportunities.

A closer look at the sub-results shows that 26% of employees agree that digital transformation brings more opportunities than threats. However, a portion (22%) still expresses concerns regarding the challenges that digital tools may present. These employees may feel threatened by the pace of change, job insecurity, or the potential for increased pressure to adopt new technologies without adequate preparation or support. This suggests that CCBSA should address these concerns by providing more precise information about the benefits and offering reassurance regarding job security, which could help mitigate anxiety about job displacement (Volberda et al., 2021; Reynolds, 2024).

The 4% of respondents who remain neutral on the matter suggest that there are employees who are still uncertain about the impact of digital transformation due to insufficient exposure to digital tools or a lack of concrete evidence showing tangible benefits. These employees could benefit from further engagement and education about the potential advantages of digital transformation to their specific roles, thereby fostering a more balanced perspective on the opportunities available. Creating a transparent dialogue about the ongoing changes within the company would help employees make informed decisions and embrace digital systems with greater confidence (Riousset et al., 2024).

To fully capitalise on the opportunities and address the perceived threats, CCBSA must prioritise efforts to enhance employee understanding and comfort with digital transformation. Providing regular updates, detailed demonstrations, and clear pathways for career development in the context of modern technologies will help alleviate fears and empower employees. Furthermore, ensuring that opportunities for growth through digital innovation are accessible to all employees will strengthen the company's overall commitment to a balanced and inclusive digital transformation (Korherr et al., 2022).

4.5. Presentation of PESTEL results

4.5.1. Political: Mixed Impact on Regulatory Compliance and Policy Support

The data on the political impact of digital transformation at CCBSA shows a general positive lean, as displayed in Figure 4.11 below, with most employees aligning with favourable views.

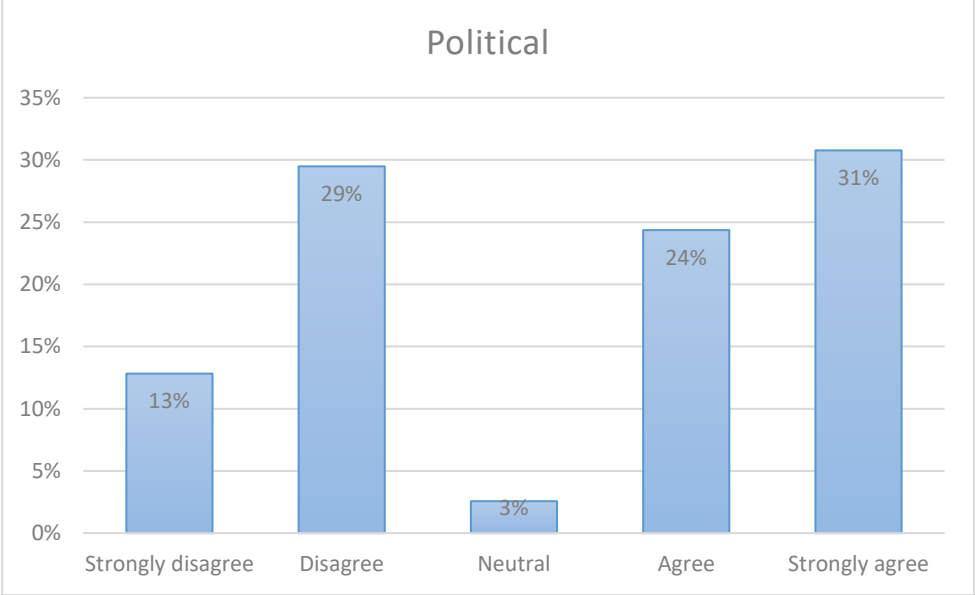


Figure 4.11: Likert scale responses on political factors.

Thirty-one per cent of employees strongly agree, and 24% agree, reflecting a combined 55% who acknowledge the positive influence of digital transformation on regulatory compliance and government policies. This majority indicates that most employees believe the company's digital transformation has been beneficial in navigating political and regulatory landscapes. On the other hand, 13% strongly disagree, and 23% disagree, signalling some level of scepticism or concern about the political implications of digital transformation. With 3% of employees remaining neutral, it suggests that a small portion of the workforce is uncertain or lacks a clear stance on the issue. The data suggests that the company has made strides in aligning with political requirements through digital transformation, as most responses lean toward agreement. However, the considerable number of employees who disagree indicates some still feel the impact is not as beneficial or are unsure of how these political factors are being addressed. This pattern underscores the importance of ongoing communication and education to achieve broader alignment on the political benefits of digital transformation.

4.5.2. Economic Factors: Tangible Benefits in Cost Savings and Productivity Gains

The Economic dimension of the survey shows a mixed but positive view of digital transformation's fiscal impact. Employees recognise that digital transformation has led to significant cost savings in production processes (combined Agree: 24%, strongly Agree: 31%) and improved financial performance through increased efficiency and productivity (combined Agree: 24%, Strongly Agree: 31%). These results, depicted in Figure 4.12 below, reflect the belief that digital transformation is economically beneficial for the company through reductions in operational costs and improvements in overall performance. However, there is some divergence in the responses regarding the long-term economic benefits of digital transformation, with a more neutral response (combined Neutral: 31%, Agree: 24%). This could suggest that while the immediate effects of digital transformation are recognised, employees may need more evidence or clarity about its long-term financial impact, especially regarding return on investment.

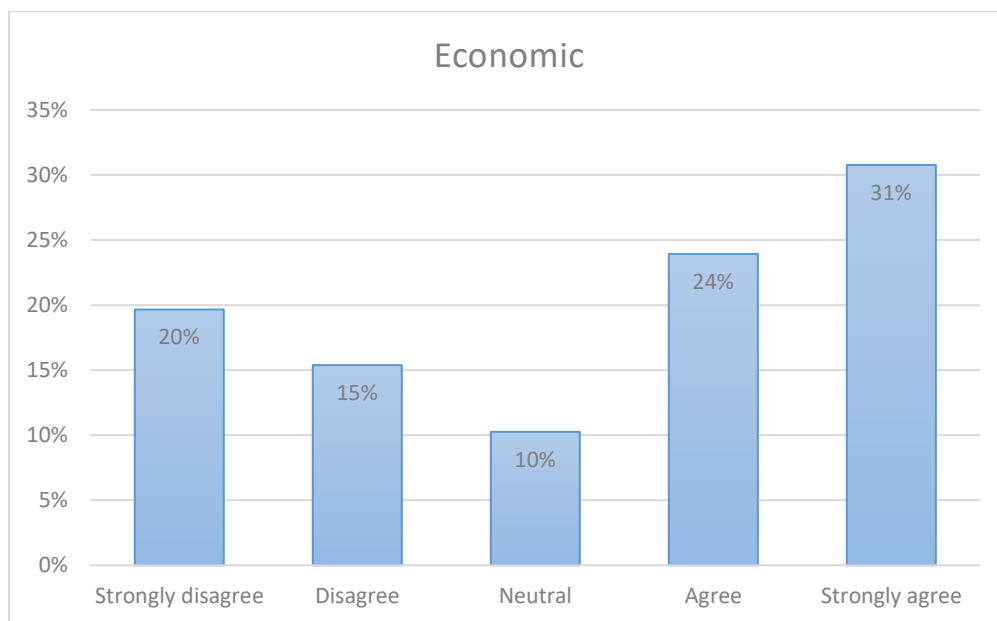


Figure 4.12: Likert scale responses on economic factors

4.5.3. Social Factors: Employee Engagement and Adaptability to Change

In the Social dimension, the results in Figure 4.13 below reveal that digital transformation is perceived positively regarding its effects on employee satisfaction and engagement. 26% agree, and 32% strongly agree that digital transformation has positively affected job satisfaction, indicating that employees feel more engaged due to digital tools and processes. Furthermore, 26% agree, and 32% strongly agree that employees at CCBSA have adapted well to the changes brought about by digital transformation, and there is dedicated support for ongoing digital transformation initiatives (combined Agree: 26%, Strongly Agree: 32%). This demonstrates that most employees view digital transformation as an opportunity for professional growth and adaptation to the evolving workplace. However, a 14% neutral response indicates that some employees may still be adjusting to these changes or uncertain about the long-term benefits of digital transformation. Additionally, 5% disagree, and 6% strongly disagree with the overall support for ongoing digital transformation efforts, indicating the presence of some resistance due to concerns about job roles or lack of proper training.

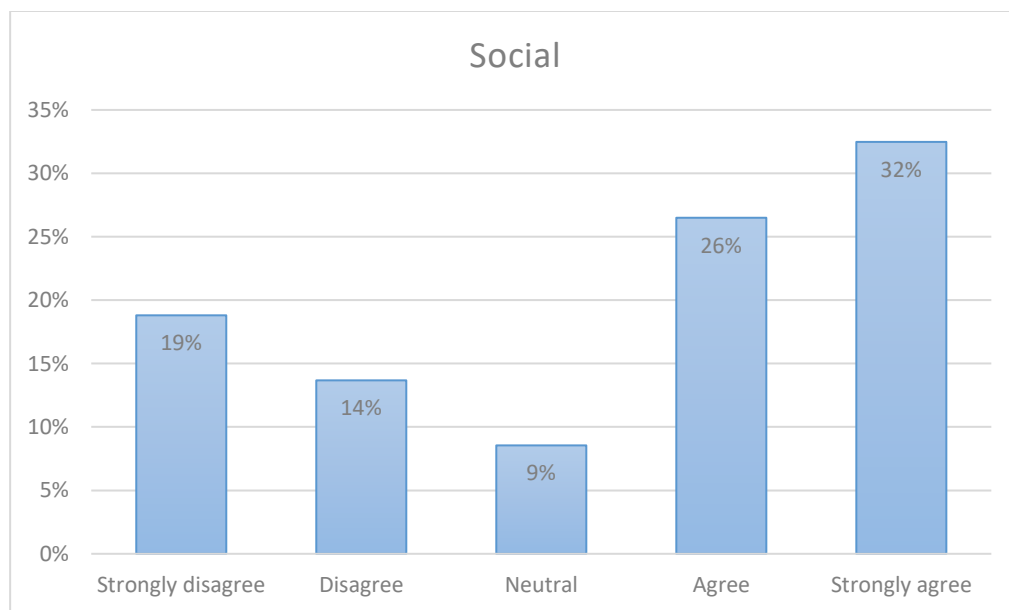


Figure 4.13: Likert scale responses on social factors

4.5.4. Technological: Strong Support for Technological Advancements

The data on the technological impact of digital transformation at CCBSA reveal a U-shaped distribution, as shown in Figure 4.14 below, indicating a polarised response among employees. 26% strongly disagree, and 23% disagree, which suggests that a significant portion of the workforce is dissatisfied or resistant to technological advancements. This could be due to inadequate training, difficulty adapting to modern technologies, or concerns about potential disruptions. Conversely, 23% agree, and 26% strongly agree, indicating that half of the workforce perceives technological changes positively, recognising improvements in efficiency, productivity, or innovation. The 2% of neutral responses reflect uncertainty or indifference.

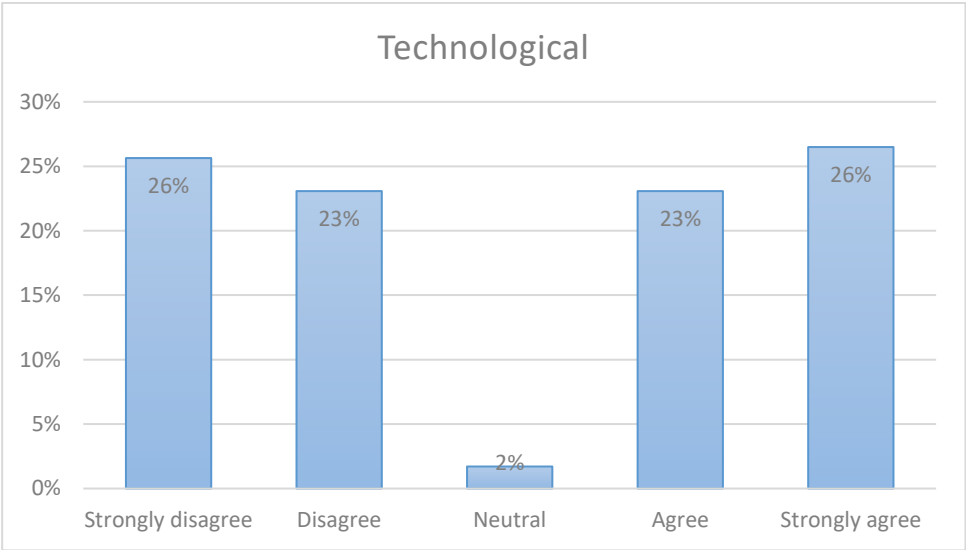


Figure 4.14: Likert scale responses on technological factors.

This U-shape can be seen as inconclusive, as the data presents a sharp divide between those who support the changes and those who oppose them without a clear middle ground. While the positive responses suggest that the technology benefits some, the prominent disagreement indicates that others are dissatisfied or unconvinced by its impact. This polarised distribution makes it difficult to draw definitive conclusions about the overall success or acceptance of the digital transformation, highlighting the need for further investigation, improved communication, and targeted support to better understand different perspectives.

4.5.5. Environmental Factors: Positive Contributions to Sustainability

The results indicate that employees perceive digital transformation at CCBSA as having a significant positive environmental impact. A substantial portion of respondents agree that digital transformation initiatives have contributed to more environmentally sustainable manufacturing practices, with 36% agreeing and 41% strongly agreeing, as shown in Figure 4.15 below. This suggests that employees recognise the environmental benefits of digital transformation, particularly in reducing the environmental footprint of production processes, as reflected in the high Agree and Strongly Agree percentages (combined 77%).

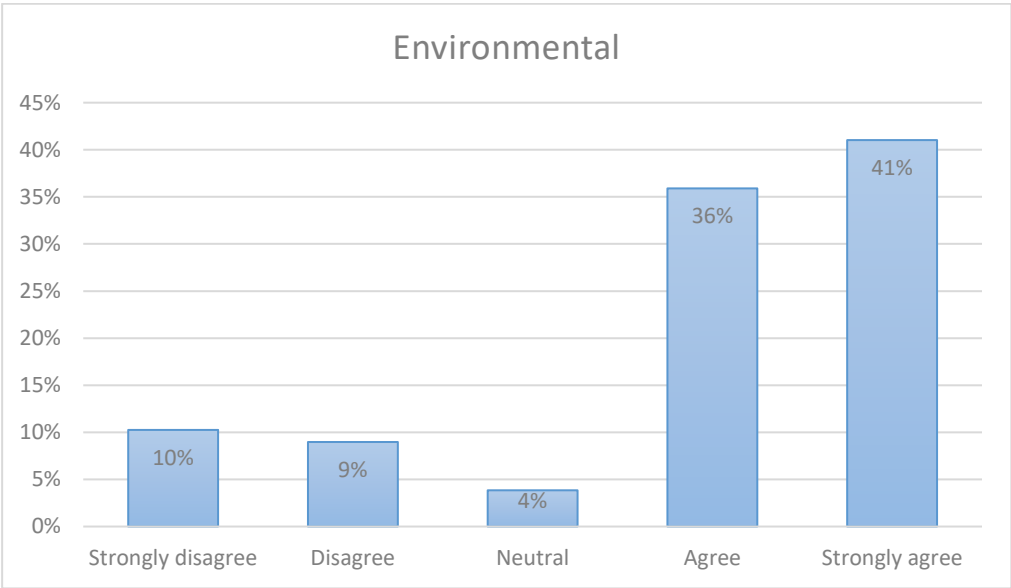


Figure 4.15: Likert scale responses to environmental factors

The results suggest that the workforce has positively responded to the company's efforts to align digitalisation with sustainability goals. However, while the overall sentiment is positive, the neutral or lower agreement responses (10% disagree, 9% strongly disagree) could indicate areas where certain employees may not fully perceive the environmental benefits due to a lack of awareness or understanding of the specific outcomes of digital transformation efforts.

4.5.6. Legal Factors: Enhanced Compliance and Effective Legal Management

In the Legal dimension, the data indicates a strong sense of employee confidence regarding the company's legal compliance during digital transformation. A notable 40% strongly agree that digital transformation has enhanced compliance with legal and regulatory requirements, while 21% agree, reflecting a total of 61% positive responses. Furthermore, 23% of employees agree that legal considerations have been effectively managed during the implementation of digital transformation systems, as shown in Figure 4.16 below.

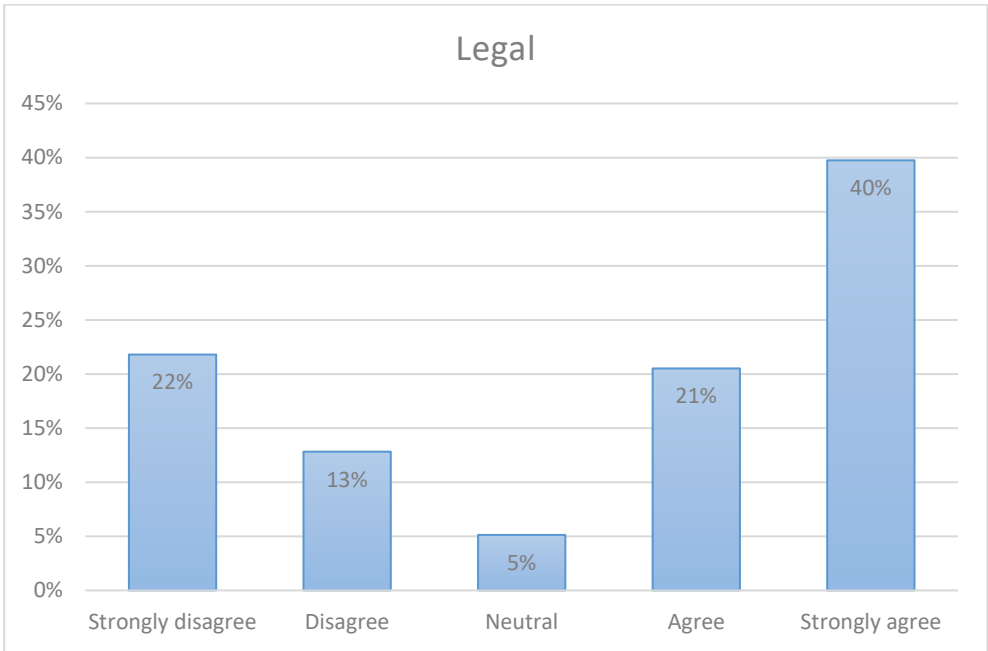


Figure 4.16: Likert scale responses on legal factors

These findings suggest that the workforce believes the legal and regulatory aspects of digital transformation have been appropriately managed, which likely contributes to the smooth adoption of these systems. This is important as it reflects the company's commitment to following necessary legal protocols during its digital transformation. However, the 5% neutral and 13% disagree responses suggest that some concerns or uncertainty may still exist regarding how these processes are managed, indicating a need for more transparent communication or further training on legal aspects.

4.6. Data Reliability and Validity Analysis

As the methodology indicates, when Cronbach’s Alpha values range from 0 to 1, values above 0.7 indicate acceptable internal. The calculated Cronbach’s Alpha for the following key areas:

1. **Employee Motivation and Utilisation:** This section assessed the level of confidence employees had in using digital transformation tools, the training and support they received, and their motivation to engage with digital systems. A high Cronbach’s Alpha value indicated that these questions reliably measured the same underlying concept.
2. **Perceived Threats and Opportunities:** This section explored employees' perceptions of potential job insecurity, career advancement, and the broader impact of digital transformation on work processes. The researcher calculated Cronbach’s Alpha for this section to ensure that the items formed a consistent scale.
3. **Cost of Production and Digitisation Benefits:** The last section focused on the relationship between digital transformation and its perceived impact on cost reduction, efficiency, and overall productivity. Cronbach’s Alpha was calculated to confirm the internal consistency of the items in this section.

Table 4.3: Calculated Cronbach's Alpha

Construct	Cronbach's Alpha	N of Items
Contribution to Cost of Production	0.039	4
Employee Motivation and Utilisation	0.072	5
Perceived Threats and Opportunities	-0.099	6

By calculating Cronbach's Alpha for these sections, as shown in Table 4.3, the researcher identified any subscales with low reliability, suggesting the need for revision or removal of certain items to improve consistency (Tavakol & Dennick, 2011). Unfortunately, all scale items demonstrated low reliability (Cronbach Alpha < 0.7), and further tests were required in factor analysis to understand the dimensionality of individual statements.

4.7. Data Validity Assessment

In addition to evaluating the reliability of the survey data, the researcher assessed its validity, ensuring that the questions accurately measured the intended constructs (Diamond, 2021). The researcher focused on three types of validity:

1. **Content Validity:** The researcher reviewed the survey questions to ensure they comprehensively addressed all relevant aspects of the research topic. For instance, questions regarding employee motivation and utilisation of digital transformation were examined to confirm that they covered the full spectrum of employee experiences with digital tools in the workplace (Diamond, 2021; Marinho et al., 2021).
2. **Construct Validity:** The researcher assessed whether the items within each subscale effectively measured the intended constructs, such as perceptions of the impact of digital transformation on work processes. High Cronbach's Alpha values would have indicated good construct validity, meaning that the survey items reliably measured the intended constructs (Diamond, 2021; Marinho et al., 2021).
3. **Criterion-related Validity:** Although not directly evaluated, the researcher compared the survey results to expected trends and findings from previous studies on associated topics. This helped confirm that the survey captured valid data on the impact of digital transformation in the workplace, consistent with existing literature (Diamond, 2021; Marinho et al., 2021).

Table 4.4: Calculated KMO values and Bartlett's test.

Construct	KMO	Bartlett's Test Significance	Number of Factors Extracted	Overall Explained Variation
Contribution to Cost of Production	0.383	0.043	2	66.58%
Employee Motivation and Utilisation	0.492	0.729	2	51.65%
Perceived Threats and Opportunities	0.448	0.376	3	64.10%

Table 4.4 highlights the exploratory factor analysis results used to evaluate construct validity. Unfortunately, the KMO results are below 0.5 for each of the constructs, indicating that the low sample size has impacted the factor analysis outcome. In addition, each construct was found to have sub-dimensions, and items were not grouped in a manner that accurately reflects the intended constructs of the research. It is inappropriate to calculate composite measures for the constructs for further inferential analysis.

Furthermore, the varying levels of education and age have impacted the reliability and validity of the constructs. Hence, the data is not appropriate for parametric inferential statistical analysis. However, the correlations between individual statements can be evaluated to determine whether any underlying relationships exist.

4.7.1. Correlations on the Contribution to Cost of Production

The correlation results in Table 4.5 below indicate a moderate positive correlation between the third and fourth statements of this construct. It was found that there is a significant correlation between the cost of implementing and maintaining digital transformation systems, which is justified by the savings in production costs, and digital systems have increased the efficiency of our production processes, leading to cost reductions ($r = 0.393$; $p\text{-value} = 0.013$). Digital transformation theory explains the positive correlation between the statements by emphasising that investing in digital technologies, such as automation and data analytics, leads to significant efficiency improvements in production processes

Table 4.5: Correlation results with cost of production constructs

		Digital transformation has significantly reduced our overall production costs.	Investing in digital transformation has led to measurable cost savings in the manufacturing process.	The cost of implementing and maintaining digital transformation systems is justified by the savings in production costs.	Digital systems have increased the efficiency of our production processes, leading to cost reductions.
Digital transformation has significantly reduced our overall production costs.	Pearson Correlation	1	-.109	.032	-.130
	Sig. (2-tailed)		.507	.846	.432
	N	39	39	39	39
Investing in digital transformation has led to measurable cost savings in the manufacturing process.	Pearson Correlation	-.109	1	-.255	.172
	Sig. (2-tailed)	.507		.118	.294
	N	39	39	39	39
The cost of implementing and maintaining digital transformation systems is justified by the savings in production costs.	Pearson Correlation	.032	-.255	1	.393*
	Sig. (2-tailed)	.846	.118		.013
	N	39	39	39	39
Digital systems have increased the efficiency of our production processes, leading to cost reductions.	Pearson Correlation	-.130	.172	.393*	1
	Sig. (2-tailed)	.432	.294	.013	
	N	39	39	39	39

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

These technologies streamline operations, reduce errors, and enhance decision-making, resulting in cost savings. While initial investments in digital systems may be high, the long-term benefits justify the cost through reduced operational expenses. As efficiency gains grow, the cost savings validate further digital investments, creating a feedback loop that strengthens the relationship between technology adoption and financial performance. This aligns with Elia et al. (2024), who highlight how strategic digital initiatives drive organisational change and competitive advantage.

4.7.2. Correlations on Employee Motivation and Utilisation

The correlation results show a moderate positive correlation between the second and fifth statements for this construct, as displayed in Table 4.5 above. It was found that there is a significant correlation between the company providing sufficient incentives for employees to adopt and effectively use digital systems and the company offering adequate support and resources to help employees make the most of digital tools ($r = 0.328$; $p\text{-value} = 0.042$).

Table 4.6: Correlation results with motivation and utilisation constructs.

		I feel well-trained and confident in using the digital transformation systems provided by the company.	The company offers adequate support and resources to help employees make the most of digital tools.	Digital transformation systems have made my job easier and more efficient.	I am motivated to use digital transformation systems because they improve my performance and productivity.	The company provides sufficient incentives for employees to adopt and effectively use digital systems.
I feel well-trained and confident in using the digital transformation systems provided by the company.	Pearson Correlation	1	-.052	.023	-.036	-.125
	Sig. (2-tailed)		.753	.889	.829	.448
	N	39	39	39	39	39
The company offers adequate support and resources to help employees make the most of digital tools.	Pearson Correlation	-.052	1	-.112	.020	.328*
	Sig. (2-tailed)	.753		.498	.905	.042
	N	39	39	39	39	39
Digital transformation systems have made my job easier and more efficient.	Pearson Correlation	.023	-.112	1	.197	-.042
	Sig. (2-tailed)	.889	.498		.229	.800
	N	39	39	39	39	39
I am motivated to use digital transformation systems because they improve my performance and productivity.	Pearson Correlation	-.036	.020	.197	1	-.085
	Sig. (2-tailed)	.829	.905	.229		.606
	N	39	39	39	39	39
The company provides sufficient incentives for employees to adopt and effectively use digital systems.	Pearson Correlation	-.125	.328*	-.042	-.085	1
	Sig. (2-tailed)	.448	.042	.800	.606	
	N	39	39	39	39	39

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

Innovation Diffusion Theory can explain the significant correlation between the second and fifth statements by highlighting how the adoption of modern technologies within an organisation is influenced by factors such as perceived advantages and employee support. According to Innovation Diffusion Theory, when companies offer incentives and resources, it increases the likelihood of adoption, as these factors help reduce resistance and enhance

compatibility with existing practices (Straub, 2009). The correlation between "sufficient incentives for adoption" and "adequate support" aligns with Innovation Diffusion Theory's emphasis on providing the right resources and motivations, which are crucial for the effective diffusion of digital tools within an organisation (García-Avilés, 2020)

4.7.3. Correlations on the Perceived Threats and Opportunities

Table 4.7: Correlation results within perceived threats and opportunity constructs.

		I am concerned that digital transformation may lead to job losses or job insecurity in my role.	Digital transformation presents opportunities for career advancement and skill development.	I believe that the benefits of digital transformation outweigh any potential threats to job security.	I feel that digital transformation has created new opportunities for innovation and problem-solving in our work processes.	The shift to digital transformation has increased the complexity of my job, making it more challenging.	I see digital transformation as a positive change that will lead to long-term improvements in our manufacturing processes.
I am concerned that digital transformation may lead to job losses or insecurity in my role.	Pearson Correlation	1	-.303	.082	.303	-.005	.038
	Sig. (2-tailed)		.061	.619	.060	.977	.820
	N	39	39	39	39	39	39
Digital transformation presents opportunities for career advancement and skill development.	Pearson Correlation	-.303	1	-.022	-.146	.335*	-.015
	Sig. (2-tailed)	.061		.893	.374	.037	.926
	N	39	39	39	39	39	39
I believe that the benefits of digital transformation outweigh any potential threats to job security.	Pearson Correlation	.082	-.022	1	-.024	.007	.007
	Sig. (2-tailed)	.619	.893		.883	.966	.968
	N	39	39	39	39	39	39
Digital transformation has created new opportunities for innovation and problem-solving in our work processes.	Pearson Correlation	.303	-.146	-.024	1	-.251	-.045
	Sig. (2-tailed)	.060	.374	.883		.124	.784
	N	39	39	39	39	39	39
The shift to digital transformation has increased the complexity of my job, making it more challenging.	Pearson Correlation	-.005	.335*	.007	-.251	1	-.180
	Sig. (2-tailed)	.977	.037	.966	.124		.272
	N	39	39	39	39	39	39
I see digital transformation as a positive change that will lead to long-term improvements in our manufacturing processes.	Pearson Correlation	.038	-.015	.007	-.045	-.180	1
	Sig. (2-tailed)	.820	.926	.968	.784	.272	
	N	39	39	39	39	39	39

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

The correlation results shown above in Table 4.7 depict a moderate positive correlation between the second and fifth statements for this construct. It was found that there is a significant

correlation between the shift to digital transformation, which has increased the complexity of my job, making it more challenging, and digital transformation presents opportunities for career advancement and skill development. ($r = 0.335$; $p\text{-value} = 0.037$), The correlation between the increased complexity of jobs due to digital transformation and the opportunities for career advancement can be understood through Organisational Change Theory. This theory emphasises how organisations like CCBSA manage digital transformation, balancing resistance to change with growth potential (Ly, 2024). While digital transformation may increase job complexity, it also presents opportunities for skill development and career progression, which are crucial for employee engagement. Effective leadership, organisational readiness, and a culture supportive of innovation are key to managing these dual perceptions and ensuring successful digital adoption (Ly, 2024).

Several statistically significant correlations, such as between digital tool usage and perceived efficiency gains, were previously interpreted as causative. These must be reframed. While such correlations suggest associations, they do not confirm direct causality. For example, increased use of automation may correlate with lower error rates; however, this could also be influenced by external factors, such as updated training protocols or revised shift schedules. The analysis thus remains exploratory and should refrain from making definitive claims of causation without further experimental or longitudinal validation. While statistically significant correlations were observed (e.g., between digital tool adoption and operational efficiency), these results indicate associations rather than direct causality. Further research, especially longitudinal studies, would be necessary to establish definitive cause-and-effect relationships.

4.7.4 Thematic Integration of Key Findings

The results showed strong agreement among respondents that digital transformation initiatives, especially automation and real-time monitoring, have enhanced production efficiency and reduced error rates. However, variation existed across employee strata, with shop floor workers reporting more challenges with system usability than control and automation specialists.

To ensure theoretical coherence, these findings are interpreted through:

- **Digital Transformation Theory:** Confirms that strategic digital investments are beginning to yield operational gains. However, limited digital literacy among some employee groups suggests incomplete institutionalisation of transformation processes.

- **Innovation Diffusion Theory:** Highlights uneven adoption. Early adopters (e.g., control specialists) rated systems as more effective and usable, while later adopters (e.g., shop floor employees) showed hesitation, aligning with Rogers’ adoption curve.
- **Resource-Based View:** This framework indicates that CCBSA’s digital infrastructure (tangible resources) is being utilised effectively; however, human capital (intangible resource) development, particularly digital skills, remains an area that requires attention to fully realise its competitive advantage.
- **Organisational Change Theory:** Variances in perception suggest that change readiness and internal communication differ across groups, underscoring the need for a more inclusive change management strategy

4.8. Discussion of results

Table 4.8: Comparative Analysis Across Employee Groups and Theoretical Dimensions

Theme	Shop Floor Workers	Mid-Level Managers	Control & Automation Specialists	Theoretical Insight
System Usability	Moderate confidence, high learning curve	Generally positive, moderate issues	High usability, early adopters	IDT: Adoption curve; RBV: capability differentials
Efficiency Gains	Noted increase but tempered by task complexity	Strong agreement	Strong agreement	DTT: Operational efficiency driver
Change Readiness	Resistance noted, training needed	Mixed views	High readiness	Organisational Change Theory: Varying change receptivity
Support & Communication	Limited two-way communication	Moderate communication	High involvement in implementation	RBV: Human capital engagement; Change Theory

This table 4.8 highlights key differences in how employee groups experienced digital transformation, reinforcing the need for context-specific change management strategies.

CCBSA's digital transformation largely aligns with existing research, confirming the benefits of integrating advanced technologies such as automation, IoT, and data analytics. These technologies enhanced operational efficiency, particularly through IoT's role in predictive maintenance, which minimised downtime and improved equipment effectiveness. Additionally, the use of data analytics to optimise inventory management aligns with research showing that digital tools have a positive impact on supply chain operations. However, CCBSA’s experience highlighted differences from prior studies.

While many suggest rapid financial returns from digital investments, CCBSA's ROI came more gradually due to high initial costs and the extensive training required for its workforce. This contrast suggests that the economic benefits of digital investments may take longer to materialise in some instances fully.

Regarding workforce utilisation, CCBSA's approach to reskilling and upskilling employees aligns with findings that organisations with comprehensive training programs encounter fewer issues when adopting digital tools. Interestingly, CCBSA's experience contradicted the typical resistance to change observed in digital transformations. Company's proactive strategies, such as clear communication and effective training, facilitated a smoother transition and reduced resistance.

In supply chain management, CCBSA's use of automated inventory systems and real-time tracking validates research showing that these technologies improve operational efficiency and supply chain visibility. However, the company found it challenging to achieve full integration across all supply chain levels. Complete system synchronisation was not fully realised, which contrasts with the view that digital tools can seamlessly integrate supply chains. The environmental benefits of digitalization were also confirmed. CCBSA utilised IoT sensors to monitor energy consumption and optimise resource management, thereby contributing to its sustainability goals. However, the immediate environmental impact was less pronounced than expected, suggesting that the full environmental benefits of digitisation may take longer to materialise.

CCBSA's adherence to legal frameworks, particularly in data privacy under South Africa's Protection of Personal Information Act (POPIA), aligned with research highlighting the importance of legal compliance in digital transformations. However, the company's experience highlighted the complexities of staying current with evolving legal standards, such as data sovereignty and cybersecurity.

The results confirmed key theoretical frameworks, including the Digital Transformation Theory (DTT), Resource-Based View (RBV), and Innovation Diffusion Theory (IDT). CCBSA's focus on IoT, automation, and DA highlighted the technological drivers of digital adoption, while its investment in workforce training illustrated the organisation's readiness. Additionally, the company's proactive change management strategies minimised resistance, underscoring the crucial role of leadership in digital transformations.

This integrated synthesis reveals that while digital transformation has delivered positive operational outcomes, its effectiveness and perception vary significantly across roles. These variations are theoretically supported, suggesting that technological adoption should be paired with targeted change management and continuous capability development. Additionally, the correlations identified in the study should be understood as associative patterns rather than deterministic outcomes, and should inform future longitudinal or mixed-methods studies.

4.9. Conclusion

The survey results at CCBSA indicate a positive view of the impact of digital transformation across environmental, legal, economic, and social areas. Employees perceive digital transformation as beneficial for improving environmental sustainability, ensuring legal compliance, and increasing economic efficiency while also boosting job satisfaction. The majority agree that it has contributed to more sustainable manufacturing and better legal compliance. Economic benefits, such as cost savings and improved financial performance, are recognised; however, some employees remain uncertain about the long-term financial impacts.

Digital transformation is also seen as a key driver of employee engagement and satisfaction, with many adapting well to the changes. However, mixed responses suggest that concerns about the long-term economic benefits and varying adaptation levels remain. Employees acknowledge the value of digital tools in improving productivity but suggest more support and incentives are necessary for further adoption.

While there are some concerns regarding job security, many employees recognize opportunities for career growth and skill development. CCBSA's ability to balance these opportunities and challenges will be crucial to maintaining positive perceptions of digital transformation as a long-term change. While digital transformation at CCBSA has achieved success, ongoing communication, training, and targeted support will be essential to addressing concerns and ensuring continued success within the organization.

Chapter 5: Main Findings, Recommendations and Future Research

5.1. Introduction

This chapter synthesises the key findings, theoretical insights, practical implications, and future research directions arising from the study on digital transformation within CCBSA manufacturing facilities. Employing a quantitative approach grounded in four complementary theories, Digital Transformation Theory, Innovation Diffusion Theory, the Resource-Based View, and Organisational Change Theory, the study evaluated how digital technologies influence operational efficiency, employee engagement, and organisational performance.

The findings confirm that digital transformation has yielded significant operational benefits, including enhanced production efficiency, reduced costs, and improved sustainability outcomes. However, the analysis also reveals important challenges, notably disparities in digital adoption across employee groups, persistent concerns about job security, increased role complexity, and insufficient training in certain areas. These barriers suggest the need for more inclusive change management approaches and strategically aligned interventions.

To address these concerns and consolidate the gains of digital transformation, this chapter presents a set of evidence-based and theoretically informed recommendations. These include strengthening digital skills training, fostering transparent communication about the long-term economic advantages of digital adoption, and implementing supportive mechanisms to reduce employee anxiety and build digital confidence. The chapter further highlights the importance of aligning digital transformation initiatives with organisational culture and resource capabilities to maximise sustainable impact.

Finally, several promising avenues for future research are identified. These include longitudinal studies on the evolving effects of digital transformation on employee engagement, investigations into the role of organisational culture in influencing adoption patterns, and broader analyses of the socio-economic implications of digital transformation in emerging markets. These insights provide a critical foundation for both academic inquiry and organisational strategy, enabling CCBSA and similar firms to optimise their digital transformation journeys and maintain long-term competitive advantage.

5.2. Main Findings

CCBSA's digital transformation is guided by three sub-objectives that aim to enhance operational efficiency, productivity, and employee satisfaction. By evaluating the current state of digital systems, understanding their impact on employee experience, and identifying key opportunities for improvement, the study provides actionable insights to advance CCBSA's manufacturing capabilities. These efforts directly support the main objective of the research, ensuring that the company's digital transformation not only optimises manufacturing processes but also fosters a more engaged and productive workforce, ultimately driving sustainable growth and competitive advantage.

Table 5.1: Objective–finding–recommendation linkages

Objective	Key Finding	Conclusion	Linked Theory
Evaluate the extent of digital transformation extent	Varying adoption maturity across departments	Partial integration of digital tools	Digital Transformation Theory
Assess the impact on efficiency/productivity	Noted operational improvements, especially in automation	Tangible gains in speed, error reduction	DTT, RBV
Understand employee perceptions	Managers/specialists more positive than shop floor workers	Readiness stratified, need for support	Organisational Change Theory
Examine external factors (PESTEL)	Tech/economic strong; legal/political moderate	External factors support but challenge adoption	IDT, PESTEL, RBV

Objective 1: Evaluate the current effectiveness of CCBSA's digital tools and systems in optimising manufacturing operations and identifying gaps and inefficiencies.

This sub-objective focuses on assessing the performance of existing digital systems, such as automation, data analytics, and IoT, within CCBSA's manufacturing operations. It aims to identify any inefficiencies or gaps in the current digital setup that may hinder operational performance and pinpoint areas where improvements can be made to enhance overall effectiveness.

Objective 2: Examine the relationship between digital transformation and employee productivity, job satisfaction, and engagement within CCBSA's manufacturing workforce.

This sub-objective examines the impact of introducing digital tools and systems on employee productivity, job satisfaction, and overall engagement. It aims to assess how digital transformation has influenced employee experiences, whether it has streamlined workflows, and to what extent it has fostered a more efficient and positive work environment, ultimately contributing to higher levels of job satisfaction.

Objective 3: Identify strategic opportunities for enhancing CCBSA's digital transformation, focusing on advanced technologies, training initiatives, and integration improvements to drive greater operational efficiency and productivity.

This sub-objective aims to identify specific areas where CCBSA can take the next steps in its digital transformation journey. It will explore potential opportunities for adopting advanced technologies, integrating new digital solutions into existing systems, and improving employee training and support programs to maximise operational efficiency, reduce downtime, and improve overall productivity across the organisation.

5.3. Implications of the Research

The findings of this study hold significant implications for CCBSA and other organisations embarking on digital transformation journeys. The research highlights the importance of aligning digital transformation strategies with employee needs, organisational culture, and broader environmental, economic, legal, and social considerations. The implications are as follows:

5.3.1. Impact on Organisational Strategy and Decision-Making

The study's findings highlighted the need for CCBSA's leadership to recognise both the opportunities and challenges associated with digital transformation, aligning directly with the evaluation of the impact of digital transformation on manufacturing operations. The positive results in operational efficiency, cost savings, and legal compliance confirmed the strategic value of digital technologies. However, concerns related to job security, role complexity, and additional training suggested that clear communication and employee engagement strategies were necessary. This aligned to identify key opportunities for enhancing digital systems and ensuring the workforce was adequately supported during the transformation process.

Addressing these concerns would enable CCBSA to develop a strategy that balances technological progress with the workforce's ability to adapt, thereby improving decision-making at the organisational level.

5.3.2. Workplace Culture and Employee Well-being

The insights on employee engagement and satisfaction supported the objective of assessing how digital transformation impacted employee satisfaction and work conditions. The positive reception of digital tools in improving productivity highlighted the importance of creating a workplace culture that embraced technology while addressing concerns about job insecurity and role complexity. For CCBSA, providing adequate resources, support, and opportunities for reskilling would be critical in fostering an environment where employees feel motivated to engage with digital systems. These findings confirmed that digital transformation improved operational efficiency and enhanced workplace culture and employee well-being when supported by proper training and engagement.

5.3.3. Environmental and Legal Benefits

The study revealed that the environmental and legal benefits of digital transformation were crucial for CCBSA's broader sustainability goals, aligning with the objective of identifying opportunities for advancing the company's digital transformation efforts. Digital systems allowed CCBSA to reduce its environmental footprint and streamline compliance processes, thus improving operational efficiency and mitigating legal risks. The findings suggested that further integration of digital technologies in manufacturing operations would provide significant long-term benefits, both environmentally and legally. CCBSA could leverage these advantages to strengthen its position as a leader in sustainable practices, contributing to improved operational performance and a competitive edge through digital transformation.

5.3.4. Economic Implications for Long-Term Growth

The findings on the economic impact addressed the objective of evaluating the impact of digital transformation on employee satisfaction and identifying opportunities for advancing CCBSA's digital capabilities. While digital transformation had already led to cost savings and improved efficiency, uncertainty about the long-term economic benefits highlighted the need for CCBSA to communicate these benefits more effectively. Demonstrating how digital transformation contributed to long-term growth through increased profits and competitive advantage would align employees' understanding with the company's goals, strengthening their commitment to further digital investments. This provided actionable insights for improving financial

performance and ensuring digital transformation supported CCBSA's long-term economic strategy.

5.3.5. Broader Implications for Policy and Industry Standards

The broader implications of the study for policy and industry standards addressed the objective of identifying opportunities for CCBSA's digital transformation efforts. The research suggested that policymakers should support industries' digital transformation through incentives to address workforce displacement and skills development. Additionally, CCBSA could play a key role in shaping industry-wide standards, particularly in areas such as employee engagement, sustainability, and legal compliance. By contributing to the development of best practices for digital transformation, CCBSA could not only benefit from its progress but also help shape the future of digital manufacturing practices within the industry. This highlighted the importance of adopting a forward-thinking strategy in response to digital disruption, aligning the company's goals with broader sector-wide changes.

5.4. Limitations of the Study

Despite its comprehensive approach, this study is not without limitations. These limitations must be acknowledged as they influence the interpretation and generalizability of the findings. The main limitations of the study are as follows:

5.4.1. Geographical and Organisational Scope

This research was conducted within the context of the CCBSA and focused on its operations from 2016 to 2024. As such, the findings may not directly apply to other companies within the beverage industry or other sectors in South Africa or globally. The specific practices, strategies, and experiences of CCBSA limit the study. As such, the results cannot be generalised to organisations with different organisational structures, cultures, or technological implementations. The findings may also not fully represent the broader South African manufacturing sector or industries at distinct stages of digital transformation.

5.4.2. Sampling Bias

The study primarily relied on interviews and surveys conducted within the organisation, which means that the views and experiences captured may be subject to sampling bias. Only internal stakeholders (managers, operational staff, and employees directly involved in the digital transformation efforts) were surveyed, potentially excluding relevant perspectives from

external stakeholders, such as customers, suppliers, or regulatory bodies. The sample may not represent the views of all employees at CCBSA, particularly those not involved in the digital transformation initiatives or those from lower organisational levels. Moreover, certain groups may have been underrepresented or overrepresented based on factors such as job roles or departments, which could affect the diversity and comprehensiveness of the data.

5.4.3. Timeframe Constraints

The study focused on a specific period from 2016 to 2024, which may not capture long-term effects or the impact of future technological advancements. Digital transformation efforts and their outcomes can evolve significantly over time, and the findings of this study may not reflect future developments. The short-to-medium-term perspective may limit the ability to assess digital transformation's full, lasting impact on organisational performance, employee satisfaction, and overall strategic direction.

5.4.4. Data Limitations

The study's reliance on self-reported data from employees and managers introduces potential biases, such as social desirability bias, where participants may provide answers, they believe are expected or acceptable. There is also the possibility of recall bias, where participants may not accurately remember past experiences or misrepresent their perceptions of the impact of digital transformation. Additionally, while the study employed quantitative data collection methods, the depth of quantitative data, for example, coordinated interviews, may not have fully explored the nuances of employee perceptions, particularly regarding sensitive topics such as job insecurity or resistance to change.

5.4.5. Technological and Organisational Factors

The study assumed that CCBSA's digital transformation processes represented the broader digital transformation trends within the manufacturing industry. However, the company's specific technological infrastructure, leadership approach, and organisational culture may differ significantly from those of other companies, potentially limiting the external validity of the findings. The level of digital transformation, the specific systems in use, and how they were implemented could all influence the outcomes. It may not apply to organisations with different technological maturity or implementation practices.

5.4.6. External Factors and Contextual Variables

The research was conducted during the COVID-19 pandemic, which had a significant impact on the global economy and various industries. The pandemic has accelerated the adoption of digital tools and remote work, which may have influenced the study's results. However, this external factor was not considered in detail within the study, and its potential influence on employee attitudes toward digital transformation was not fully explored. Furthermore, other macroeconomic or political factors, such as shifts in regulatory frameworks or changes in consumer behaviour, may have influenced the implementation and outcomes of digital transformation at CCBSA but were not examined in the study.

5.5. Recommendations

The research highlights the need for CCBSA to invest in digital technologies while ensuring clear communication and support for its workforce to adapt effectively. It is recommended that the company provide targeted training and development programs to equip employees with the necessary skills to operate new digital tools. Addressing concerns about job security and role complexity through open communication channels will help build trust and reduce resistance to change. Additionally, CCBSA should prioritise the creation of a workplace culture that fosters continuous learning and embraces technological advancements, ensuring that employees are motivated and supported throughout the digital transformation process.

CCBSA should further integrate digital tools and systems that streamline manufacturing processes, enhance inventory management, and provide real-time data for informed decision-making, thereby improving operational efficiency and productivity. Investing in advanced technologies, such as automation, AI, and data analytics, will enable the company to reduce operational costs and enhance the overall quality of its products. CCBSA should also ensure that its digital systems are scalable to evolve with the changing needs of the business and the industry, securing a competitive edge in the long term.

The company should leverage the environmental and legal benefits of digital transformation by adopting more sustainable practices and ensuring compliance with evolving regulations. By integrating green technologies and enhancing energy efficiency through digital solutions, CCBSA can strengthen its sustainability efforts, appeal to environmentally conscious consumers, and improve its market position. Moreover, CCBSA should engage in industry-wide collaborations to share best practices and help shape standards for digital transformation, positioning itself as a leader in operational excellence and corporate social responsibility.

To ensure the sustainable success of digital transformation at CCBSA, the study recommends implementing targeted digital training for shop floor workers to enhance readiness and reduce resistance, aligning with Organisational Change Theory. A phased integration roadmap should be developed to synchronise digital upgrades with business operations, as supported by Digital Transformation Theory. Strengthening cross-functional communication channels will foster internal buy-in and facilitate the diffusion of innovation, reflecting the principles of Innovation Diffusion Theory. In line with the Resource-Based View, CCBSA should optimise existing technical resources to gain a competitive advantage. Finally, ongoing monitoring of legal and regulatory changes is crucial for mitigating risks and supporting compliance, aligning with the Innovation Diffusion Theory and PESTEL frameworks.

These recommendations underscore the necessity for a strategic, evidence-based, and inclusive digital transformation approach at CCBSA. The following sections offer considerations for future research and conclude the study.

5.6 Contribution to Knowledge and Practice

This study makes a meaningful contribution to the growing discourse on digital transformation in emerging economies, particularly within the South African manufacturing sector. It offers empirical insights into the operational impact of digitalisation at Coca-Cola Beverages South Africa (CCBSA), highlighting both the benefits and challenges of technological integration. By grounding the analysis in established theories, including Digital Transformation Theory, Innovation Diffusion Theory, the Resource-Based View, and Organisational Change Theory, it provides a practical framework for organisational leaders to align digital initiatives with internal capabilities, employee readiness, and external environmental demands, thus supporting more sustainable and contextually responsive transformation journeys.

5.7. Future Research

While this study provides valuable insights into the impact of digital transformation at CCBSA, future research could explore several areas more deeply:

Long-Term Effects of Digital Transformation: Future studies in digital transformation at CCBSA, and more broadly in the manufacturing sector, should explore several key areas to deepen the understanding of the long-term impacts of digital transformation on operational and organisational performance. One key direction for future research would be to conduct longitudinal studies to assess how digital transformation initiatives evolve and their enduring

effects on employee engagement, job satisfaction, and overall productivity. These studies could provide valuable insights into how the company can adapt to changes in workforce and market demands, ensuring that digital systems remain aligned with the organisation's broader goals and objectives.

Impact of Organisational Culture on Digital Adoption: Future research could delve deeper into the role of organisational culture in shaping employees' perceptions and adoption of digital technologies. This would provide more insights into how leadership, employee buy-in, and company culture can facilitate the successful implementation of digital tools. As digital transformation continues to automate many processes, further research into how these technological advancements affect job roles and skills requirements is essential. This research could help organisations anticipate and manage changes in workforce needs. Ultimately, studies examining the broader societal and economic implications of digital transformation, particularly in emerging economies, would enable policymakers and business leaders to better understand how technology contributes to economic growth and social development.

These proposed directions highlight the need for continued exploration of digital transformation beyond cross-sectional assessments. A longitudinal approach would allow researchers to observe how digital maturity evolves over time, providing deeper insights into sustained behavioural, operational, and strategic shifts. Comparative studies across African manufacturing firms could enhance the generalisability of findings and reveal regional trends or contextual nuances in adoption. Additionally, incorporating mixed-method approaches would enrich the understanding of psychological and cultural dimensions that influence digital adoption, offering a more holistic view of transformation dynamics. Collectively, these avenues for future inquiry can strengthen both theoretical understanding and practical implementation of digital strategies in complex, evolving manufacturing contexts.

5.8. Conclusion

This study highlights the transformative potential of digital transformation at CCBSA, demonstrating its substantial contributions to enhancing operational efficiency, ensuring legal compliance, and promoting environmental sustainability. The integration of digital technologies has streamlined manufacturing processes, reduced costs, and helped CCBSA align with sustainability goals, offering a competitive edge in the industry. However, the research also identifies significant challenges that must be addressed, particularly concerning employee concerns around job security, role complexity, and inadequate training. These concerns underscore the need for CCBSA to prioritise employee support during the digital transformation process. To ensure long-term success, it is crucial for the company to implement comprehensive training programs, foster open communication about the benefits of digital transformation, and create a culture of continuous learning and innovation; by addressing these areas, CCBSA can enhance employee engagement and ensure the workforce remains motivated and capable of adapting to new digital tools. In doing so, CCBSA can achieve a balanced and sustainable transformation that not only enhances its operations but also ensures employee well-being and long-term growth. This holistic approach will position CCBSA as a leader in digital manufacturing and provide a model for other organisations navigating similar digital journeys.

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Appendix: A – Informed consent

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

**APPLICATION FOR ETHICS APPROVAL
For research with human participants**

INFORMED CONSENT LETTER

Information Sheet and Consent to Participate in Research

Date:

Dear: Respondent,

My name is Hloniphani Ntuli from CCBSA Elgin coastal region and I am MBA student at the University of KwaZulu Natal Gradual School of Business and Leadership, my contact details are as follows: Cell number and email address [REDACTED] and 210512732@stu.ukzn.ac.za.

You are being invited to consider participating in a study that involves research examining the role of digitization within Coca-Cola Beverages South African manufacturing facilities. The aim and purpose of this research is to identify and analyze the impact of digitization within CCBSA manufacturing sites in order to uncover potential threats and opportunities that may arise within the supply chain as digitization increasingly permeates the manufacturing environment. The study is expected to enroll Shop floor Employees: 68 employees. Managers: 10 managers. Control and Automation technicians: 4. it will involve the following procedures series of questionnaires that will aid the researcher to unpack employees perception on the subject. The duration of your participation if you choose to enroll and remain in the study is expected to be 20-30 Minutes.

The study may involve the following risks and/or discomforts to disclose demographics such as age, gender and position of the participant however disclosure is completely voluntary. We hope that the study will create the following benefits the improvement of adoption and utilization of digitization to increase supply chain efficiency. The researcher must disclose in full any appropriate alternative procedures and treatment etc. that may serve as possible alternate options to study participation.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number: **HSSREC/00007849/2024**)

In the event of any problems or concerns/questions you may contact the researcher at ([REDACTED] or 210512732@stu.ukzn.ac.za) or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gains or loss from participating in this interview. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN. A researcher may terminate a participant from a study if they fail to comply with the protocol, withdraw consent, or engage in disruptive behavior. Other reasons for termination may include not meeting eligibility criteria or risks to data integrity. Any decision to terminate will be communicated respectfully, ensuring the participant's rights are upheld.

Data security will be ensured by storing all relevant data on the UKZN drive associated with my account (210512732), which is protected by institutional access controls. The data will be stored in a secure, centralized location, and access will be strictly limited to authorized individuals. Only I, as the primary account holder, and my Supervisor will have access to the shared drive.

Access to the shared drive will be carefully monitored and restricted, with permissions set to ensure that only those with explicit authorization can view, edit, or share the data. The UKZN drive already has multi-factor authentication (MFA) in place, adding an additional layer of security to prevent unauthorized access. This ensures that even if login credentials are compromised, access to the data will remain secure.

Furthermore, the shared drive will be regularly backed up to ensure data integrity and prevent loss in case of system failure. These measures will align with institutional and regulatory data protection standards, including those set out by the South African Protection of Personal Information Act (POPIA), ensuring the confidentiality, integrity, and availability of sensitive data.

CONSENT

I (_____) have been informed about the study entitled Examining the role of digitization within Coca-Cola Beverages South African manufacturing facilities by Mr Hloniphani Ntuli.

I understand the purpose and procedures of the study hopes to unpack the perception of the CCBSA employees to digital transformation and involvement in adoption and utilization of digital platforms provided by CCBSA

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed about any available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at Mr H. Ntuli on _____ or 210512732@stu.ukzn.ac.za.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
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Email: HSSREC@ukzn.ac.za

Signature of Participant

Date

Signature of Witness

Date

Appendix: B – Questionnaire

Kindly note that Section One of this form is optional, and you may skip it if you prefer. Opting not to complete this section will not affect your participation or the processing of data provided.

Section: One Demographics

Name

Age

20 – 30 years	31 – 40 Years	41- 50 Years	51 – 60 Years	61 – 65 Years
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Gender

Male	Female
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Race:

African	Coloured	Indian	White
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1.1. What is your current job role?

- Front line worker
- Manager
- Control Technician

1.2. How many years have you been employed with Coca-Cola Beverages South Africa?

- Less than 1 year
- 1 to 3 years
- 4 to 6 years
- 7 to 10 years
- More than 10 years

1.3. What is your highest level of education?

- Grade: 12
- Technical Training (e.g. Trade, N6, NDip)
- Bachelor's Degree
- Masters

1.4. Which manufacturing facility are you currently working in?

- Elgin
- Phoenix
- Premier
- Lakeside

Section: Two

2.1. Contribution to Cost of Production:

1. Digitization has significantly reduced our overall production costs.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
2. The investment in digitization has led to measurable cost savings in the manufacturing process
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
1. The cost of implementing and maintaining digitization systems is justified by the savings in production costs.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
2. Digital systems have increased the efficiency of our production processes, leading to cost reductions.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

Employee Motivation and Utilization:

5. I feel well-trained and confident in using the digitization systems provided by the company.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
6. The company offers adequate support and resources to help employees make the most of digital tools.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
7. Digitization systems have made my job easier and more efficient.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
8. I am motivated to use digitization systems because they improve my performance and productivity.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
9. The company provides sufficient incentives for employees to adopt and effectively use digital systems.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

Perceived Threats and Opportunities:

10. I am concerned that digitization may lead to job losses or job insecurity in my role.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

11. Digitization presents opportunities for career advancement and skill development.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

12. I believe that the benefits of digitization outweigh any potential threats to job security.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

13. I feel that digitization has created new opportunities for innovation and problem-solving in our work processes.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

14. The shift to digitization has increased the complexity of my job, making it more challenging.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

15. I see digitization as a positive change that will lead to long-term improvements in our manufacturing processes.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

Section: Three

Political:

1. Digitization has influenced regulatory compliance positively at Coca-Cola Beverages South Africa.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
2. Government policies and regulations related to technology have facilitated the digitization process at Coca-Cola Beverages South Africa.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly

Agree Economic:

3. The implementation of digitization systems has resulted in significant cost savings in the production process at Coca-Cola Beverages South Africa.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
4. Digitization has improved financial performance through increased efficiency and productivity at Coca-Cola Beverages South Africa.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
5. The investment in digitization has been economically beneficial for Coca-Cola Beverages South Africa in the long term.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

Social:

6. Digitization has positively affected employee job satisfaction and engagement at Coca-Cola Beverages South Africa.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
7. Employees at Coca-Cola Beverages South Africa have adapted well to the changes brought by digitization.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree
8. There is strong support from the workforce for ongoing digitization initiatives at Coca-Cola Beverages South Africa.
 - Strongly Disagree / Disagree / Neutral / Agree / Strongly agree

Technological:

9. The technological advancements introduced by digitization have improved the operational efficiency of Coca-Cola Beverages South Africa.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

10. Coca-Cola Beverages South Africa has invested adequately in the latest technology to support digitization efforts.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

11. Digitization has led to innovative technological solutions that enhance the production process at Coca-Cola Beverages South Africa

- Strongly Disagree / Disagree / Neutral / Agree / Strongly

Agree Environmental:

12. Digitization initiatives at Coca-Cola Beverages South Africa have contributed to more environmentally sustainable manufacturing practices.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

13. The shift to digitization has reduced the environmental footprint of production processes at Coca-Cola Beverages South Africa.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

Legal:

14. Digitization has enhanced compliance with legal and regulatory requirements at Coca-Cola Beverages South Africa.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree

15. Legal considerations have been effectively managed during the implementation of digitization systems at Coca-Cola Beverages South Africa.

- Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree