IMPLEMENTING QUALITY IMPROVEMENT PROJECTS IN SOUTH AFRICAN AUTOMOTIVE FIRMS: A CASE STUDY OF AN EASTERN CAPE AUTOMOTIVE MANUFACTURER

Dissertation submitted in partial fulfilment of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

In the

RHODES BUSINESS SCHOOL

by

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NOVEMBER 2025

ABSTRACT

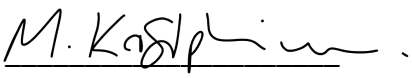
This study investigates the implementation of quality improvement projects (QIPs) within a South African automotive manufacturing firm in the Eastern Cape. Drawing on Human Capital Theory, the Resource-Based View, and Total Quality Management, the research examines the critical success factors that enable or hinder effective QIP delivery in resource-constrained environments. A case study approach was adopted, combining survey responses from seventy employees across organisational levels with follow-up interviews and thematic analysis.

Findings reveal that while management commitment is consistently strong, challenges persist in resource availability, communication, and technology adoption. Perceptions of QIP effectiveness vary by organisational role, with senior managers reporting higher levels of effectiveness than shop-floor employees. The study highlights the importance of workforce development, cross-level communication, and contextually appropriate technological solutions in embedding sustainable quality improvement practices.

A conceptual framework is proposed to link workforce skills, cultural alignment, and resource utilisation to measurable improvements in defect reduction, operational efficiency, and stakeholder satisfaction. The research contributes practical recommendations for automotive firms seeking to enhance competitiveness through structured QIPs, while acknowledging the limitations of single-case generalisability and the need for longitudinal and comparative studies.

Declaration

I, Mongi Mesuli Ka-Siphiwo, declare that the dissertation entitled, Implementing Quality Improvement Projects in South African Automotive Firms: A Case Study of an Eastern Cape Automotive Manufacturer, which I hereby submit for the degree Master of Business Administration at Rhodes University, is my own work. I also declare that I have not previously submitted this thesis/ dissertation for a degree at this or any other tertiary institution and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



Mongi Mesuli Ka-Siphiwo

Dedication

This dissertation is dedicated to my late mother, *Nontsika Nobuntu Ka-Siphiwo*; you are dearly missed, *Matita*, and I hope that you are proud of the man that I have become.

Acknowledgements

To my beautiful wife, **Buhle**: I could never have completed this journey without your love, patience, and support. Thank you for encouraging me to keep going and for believing in me, even when I doubted myself.

To my sons: thank you for understanding when Dad could not be at your sports games or read your bedtime stories because deadlines demanded long nights of work. Your patience and love have meant everything to me.

To my supervisor, **Mr Evert Knoesen:** Thank you for your guidance, support, and encouragement throughout my MBA journey.

Finally, to the MBA 2023 cohort: thank you for the camaraderie, encouragement, and support that made this journey more rewarding.

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Definition of Terms

- Quality improvement projects (QIPs) refer to structured initiatives aimed at enhancing product quality and operational efficiency through the systematic application of quality management tools and methodologies.
- Total quality management (TQM) is a holistic approach to long-term success that focuses on customer satisfaction, continuous improvement, and employee involvement.
- Human capital in this context is defined as the collective skills, knowledge, and competencies of the workforce that contribute to the operational effectiveness of an organisation.
- Resource-based theory (RBT), which evolved from the earlier resource-based view (RBV), emphasises that a firm's tangible and intangible resources are the primary source of sustained competitive advantage.
- Lean Six Sigma is a methodology that combines lean manufacturing principles with Six Sigma tools to improve process efficiency and quality.
- Operational efficiency describes the extent to which an organisation optimises its resources to produce high-quality outputs with minimal waste.
- Technological integration refers to the effective incorporation of digital technologies such as IoT and AI into existing production systems to enhance process control and quality assurance.

Chapter 1: Introduction and Background

1.1 Introduction

Quality improvement is a strategic priority in the South African automotive industry, driven by the dual need to maintain global competitiveness and meet rising customer expectations. The dynamic nature of the sector, characterised by rapid technological advancements and increasing market pressures, necessitates ongoing improvements in production processes and quality management systems (Khan, Khan, & Haleem, 2019).

This study recognises the critical role of quality improvement projects (QIPs) in enhancing product quality and improving operational efficiency, thereby contributing to the long-term sustainability of automotive firms (Black & Roberts, 2019).

This research focuses on the implementation of QIPs within a prominent automotive manufacturer based in the Eastern Cape. Using a case study approach, it explores the intersection of human resources, technological integration, and strategic interventions in advancing quality management objectives. The study seeks to bridge theoretical insights with the practical realities of implementation.

This research holds significant value for both academia and industry. Its findings proffer guidance to industry leaders seeking to optimise quality initiatives, inform policymakers on supporting interventions, and contribute to the broader discourse in quality management and project execution (Makgato & Ojah, 2018).

1.2 Background

The South African automotive industry is a key pillar of the national economy, contributing significantly to industrial growth, export earnings, and employment. It is characterised by the presence of several global automotive brands and an export-oriented production structure that demands high-quality standards. However, local manufacturers face persistent challenges such as increasing global competition, limited skilled labour, infrastructural inefficiencies, and supply chain disruptions. These

challenges have intensified the need for sustained quality improvement initiatives to enhance competitiveness and operational efficiency (Black & Roberts, 2019).

Quality improvement has evolved from being a purely economic imperative to a strategic focus aligned with long-term sustainability goals. Frameworks such as total quality management (TQM), lean manufacturing, and Six Sigma have been widely adopted to address quality-related challenges in various manufacturing contexts. These methodologies are underpinned by theories such as human capital theory, the resource-based view (RBV), and TQM principles, which collectively emphasise the importance of skilled human resources, efficient resource allocation, and process optimisation (Khan, Khan, & Haleem, 2019; Oakland, 2003).

While global studies report success in applying these methodologies, much of the literature is derived from developed economies. There remains a gap in understanding how these frameworks can be effectively adapted to emerging markets such as South Africa, where contextual constraints such as technological limitations and skills shortages complicate implementation (Du & Chhetri, 2020).

Recent advances in Industry 4.0 technologies, including the Internet of Things (IoT), artificial intelligence (AI), and data analytics, have significantly reshaped expectations around quality control and predictive maintenance. Despite the potential for enhancing operational performance, many South African automotive firms face significant barriers in adopting these technologies due to financial and infrastructural limitations (Ligarski, Rożałowska, & Kalinowski, 2021; Maharaj, 2019).

Human capital remains central to the successful implementation of quality improvement initiatives. Beyond technical skills, fostering a culture of continuous improvement and employee engagement is critical. Empirical evidence suggests that targeted employee development contributes not only to higher performance but also to organisational resilience and innovation (Firdaus et al., 2023; Nwachukwu, 2024).

The RBV adds further relevance by asserting that a firm’s competitive advantage lies in its ability to leverage both tangible and intangible resources effectively. In the South African context, where financial and technical resources are constrained, the strategic

use of human capital, equipment, and systems becomes paramount in delivering quality outcomes (Barney, 1991; Crook et al., 2011).

Although frameworks such as Lean Six Sigma and TQM have demonstrated efficacy in enhancing manufacturing performance, their success in South Africa depends on thoughtful adaptation to local realities, including cultural norms and institutional limitations (Mohsin et al., 2014; Dombrowski et al., 2014).

Moreover, South African manufacturers are required to navigate growing external pressures, including shifting global demand and evolving regulatory requirements. While benchmarking against global best practices has yielded valuable insights, significant gaps remain in localising these practices to suit regional contexts, particularly in the Eastern Cape (Pavlínek, 2013).

Few studies have holistically explored the intersection of human capital development, technological integration, and resource optimisation within the quality improvement space in South Africa. This research addresses this gap by examining these interdependencies in a case study of an Eastern Cape-based automotive manufacturer. The study aims to offer practical insights for both industry practitioners and policymakers, contributing to the broader discourse on sustainable quality improvement in resource-constrained environments (Makgato & Ojah, 2018; Chhetri & Du, 2020).

1.3 Problem Statement

South Africa's automotive sector operates within a globalised, fast-changing environment, where technological shifts and limited resources present serious challenges. These constraints frequently limit the industry's ability to implement robust quality improvement strategies. If left unaddressed, such barriers could undermine both competitiveness and sustainable development efforts within the sector (Carino, 2012).

While quality improvement models are often theoretically sound, their practical implementation, especially in resource-limited settings, remains a pressing issue. Most scholarly work has centred on developed economies or isolated dimensions of

quality improvement, leaving a gap in understanding the interplay of factors in emerging contexts such as the Eastern Cape. Rapid digital transformation and growing pressure to innovate further compound the situation (Ligarski et al., 2021).

Compounding the issue is the misalignment between evolving technological demands and current workforce skill levels. A lack of targeted training, high employee turnover, and limited investment in human capital have left many manufacturers struggling to adapt. This research, therefore, investigates these obstacles and seeks to develop integrated, evidence-based strategies that support more effective project execution in South Africa's automotive industry.

Research Objectives:

1.3.1 To evaluate the impact of quality improvement projects on product quality and operational efficiency within the South African automotive manufacturing sector.

1.3.2 To identify and assess the critical success factors that influence the implementation of quality improvement initiatives.

1.3.3 To develop an empirically grounded quality-improvement framework for South African automotive manufacturers, informed by evidence from an Eastern Cape case study.

1.3.4 To propose actionable recommendations for managers and policymakers to enhance quality improvement outcomes in resource-constrained environments.

1.4 Research Questions

1.4.1 What are the critical success factors influencing the implementation of quality improvement projects in South African automotive firms?

1.4.2 How do human capital development and technological innovation impact quality outcomes in the manufacturing context?

1.4.3 What empirically grounded quality-improvement framework can be developed for South African automotive manufacturers, informed by evidence from an Eastern Cape case study?

1.4.4 How can a context-specific quality improvement framework address the implementation needs of South African automotive manufacturers?

1.5 Significance of the Study

This paper carries significant implications for theory, practice, and policy. Theoretically, it seeks to bridge the gap between established quality management frameworks such as Total Quality Management (TQM), Lean Six Sigma, and the Resource-Based View, and their practical application in emerging economies. It argues that quality improvement is achievable even in resource-constrained environments (Khan, Khan, & Haleem, 2019), particularly through the integration of human capital theory with technological innovation. Future research can build upon this refined theoretical foundation to address existing knowledge gaps or adapt the framework for deeper insights and more context-specific applications.

Practically speaking, results from this research are meant to help fast-track operations and/or product quality with respect to South African automotive manufacturers. For instance, by identifying measurable critical success factors and showing their relationships with quality results, this research can help practitioners in the industry to develop these factors further and make changes to their work mechanisms. The automotive manufacturers in South Africa's Eastern Cape can begin to develop training programmes, excel in the adoption of technological capability, and improve their resource management methods, due to insights from this research. This research advances corporate managerial decision-making and competitiveness in both local and international markets (Makgato and Ojah, 2018).

The policy implications of this study are equally significant. The research offers valuable insights for government and regulatory bodies, highlighting the need to support quality improvement initiatives through targeted incentives and public-private partnerships. Such findings can guide policymakers in designing frameworks that promote investment in workforce development and technological innovation, both essential for building a more competitive and resilient automotive industry. These initiatives have the potential to stimulate broader national economic growth by creating employment opportunities and positioning the automotive sector as a key driver of development (Black & Roberts, 2019). Ultimately, this study contributes to advancing the transformation of quality management practices in emerging markets, fostering sustainable and inclusive industrial growth.

1.6 Limitations of the Study

This study is subject to several limitations that may influence the interpretation and generalisability of its findings. Methodologically, it is framed as a quantitative case study, a strategy chosen to explore complex, context-bound phenomena in depth.

Firstly, the research focuses on a single automotive manufacturer in the Eastern Cape, which limits the extent to which the results can be generalised to other regions, industries, or automotive firms. Case study findings are therefore intended for analytic rather than statistical generalisation, and their transferability depends on the reader's assessment of similarity between contexts (Creswell & Creswell, 2018).

Secondly, the nature of the study, particularly the reliance on self-reported data through questionnaires and interviews, introduces potential subjectivity and response bias. Furthermore, the author conducted the inquiry as an organisational insider, gaining privileged access but also facing risks of role conflict, power dynamics, and confirmation bias. These risks were managed through reflexive journaling, peer debriefing, and transparent disclosure of positionality.

Thirdly, non-responses or selective participation among targeted stakeholders may have skewed the data, particularly where participants were unwilling or unavailable to provide complete input. Logistical and financial constraints also restricted the scope of data collection, preventing a broader industry-wide assessment. Additionally, both technological integration and regulatory frameworks in the automotive sector are rapidly evolving.

As such, the findings presented in this study may reflect a snapshot in time and may not fully account for future developments in quality improvement practices (Maharaj, 2019). Despite these limitations, the case study offers thick description, contextual authenticity, and actionable insights that can inform managerial decision-making in similar resource-constrained environments, thereby providing a balanced contribution to both scholarship and practice.

1.7 Delimitations of the Study

This study is delimited to the implementation of quality improvement projects within South African automotive firms, with a particular focus on a leading automotive manufacturer located in the Eastern Cape. The geographic and sectoral specificity allows for a deeper understanding of the contextual challenges and enablers within this specific region and industry. The research excludes comparative analysis with firms outside the Eastern Cape and does not consider financial performance metrics. Instead, it concentrates on factors related to human capital development, technological integration, and resource allocation (Black & Roberts, 2019).

The temporal scope of the study is limited to quality improvement practices within the past ten years. Historical developments prior to this period are excluded. Furthermore, external macro-level factors such as national economic policy shifts or global supply chain disruptions are beyond the scope of this research, as the study is focused on internal, organisation-specific dynamics (Makgato & Ojah, 2018).

The sample includes only stakeholders directly involved in the quality improvement process, specifically shop floor employees, middle to senior management, and digitalisation specialists. This purposive sampling approach ensures relevance to the research objectives but may not capture perspectives from external stakeholders or other segments of the broader automotive ecosystem.

1.8 Organisation

This dissertation is structured across six chapters, each contributing to the exploration of quality improvement initiatives within the South African automotive industry:

- **Chapter One** introduces the study by outlining the background, problem statement, research objectives, questions, significance, limitations, and scope of the investigation.
- **Chapter Two** presents a review of relevant literature, situating the study within existing theoretical frameworks and empirical research related to quality management, human capital development, technological integration, and resource optimisation.
- **Chapter Three** outlines the research methodology, detailing the research design, data collection procedures, sampling strategies, and analytical techniques used to explore the study's objectives.
- **Chapter Four** provides a systematic presentation and analysis of the empirical findings. It identifies key success factors and challenges encountered in implementing quality improvement initiatives at the selected automotive firm.
- **Chapter Five** discusses the theoretical, practical, and policy implications of the findings. It also offers strategic recommendations for industry stakeholders and policymakers aimed at improving quality practices in resource-constrained environments.

Chapter 2: Literature Review

2.1 Introduction

This chapter serves to provide a comprehensive review of the literature relevant to the implementation of quality improvement projects (QIPs) in South African automotive firms, with a focus on a case study of an Eastern Cape automotive manufacturer. The purpose of this chapter is to contextualise the research within the existing body of knowledge, identify gaps in the literature, and demonstrate how addressing these gaps aligns with the research objectives.

The chapter is structured to provide the reader with an understanding of the South African automotive industry's unique challenges. These theoretical frameworks inform QIPs and critical success factors for their implementation. Specifically, it explores how human capital theory, the resource-based view (RBV), and total quality management (TQM) provide a foundation for understanding workforce development, resource optimisation, and quality management practices. Furthermore, the chapter examines the challenges and opportunities inherent in the South African context, particularly within the Eastern Cape, and offers practical insights for bridging identified gaps.

Constructively aligned with the research objectives, this chapter aims to:

- establish the context for QIPs within the South African automotive industry;
- critically analyse theoretical frameworks relevant to the research; and
- identify key factors influencing the success of QIPs and address the specific challenges faced by an Eastern Cape automotive manufacturer.

2.2 Literature Review

Operating in a globally competitive environment necessitates South African manufacturers to adhere to stringent quality standards, innovate continuously, and optimise processes to meet customer expectations, while maintaining cost-efficiency (Oakland, 2003; Black & Roberts, 2019).

Guided by human capital theory, the resource-based view (RBV), and total quality management (TQM), this chapter explores workforce capabilities, organisational

culture, and technology's interplay in driving successful QIPs. These theoretical frameworks provide insights into fostering sustainable competitiveness and organisational excellence.

2.2.1 South African Automotive Industry Context

2.2.1.1 Overview of the South African Automotive Industry

The automotive industry is a vital contributor to South Africa’s economy, accounting for nearly 7% of GDP. The Eastern Cape serves as a key manufacturing hub, fostering regional economic growth. However, its expansion is hindered by global competition, inadequate infrastructure, and restrictive policies, which weaken the industry's ability to sustain long-term competitiveness (Black & Roberts, 2019; Maharaj, 2019).

Quality improvement methodologies, such as Six Sigma, lean manufacturing, and Kaizen, help mitigate industry challenges by reducing variability and aligning processes with sustainability objectives (Dombrowski et al., 2012; Jasiński et al., 2021). The integration of Industry 4.0 technologies, such as IoT and AI, amplifies their effectiveness by enhancing precision, efficiency, and real-time adaptability (Ligarski et al.,2021).

2.2.1.2 Challenges in the South African Automotive Industry

The South African motor vehicle industry is facing many obstacles that threaten its long-term sustainability and growth. According to Black and Roberts (2019), one of the greatest threats is the stiffening of competitors in the global market, with other emerging markets being at the forefront. Competition has also forced local producers to introduce innovation in their manufacturing processes and continuously improve them. The lack of infrastructure, inadequate energy supply, and transport networks was cited by Maharaj (2019) as one of the strategies that could interfere with the international competitiveness of the industry. Furthermore, according to Chigbu and Nekhwevha (2022), the trend is growing in the sector of automation; opportunities and challenges arise.

As machines and systems are advancing at such a rapid rate, the proactive side of management and strategic planning must increase. Another concern is that there is a poor skill base in the South African automotive industry, as studied by Ligarski,

Rożalowska, and Kalinowski (2021). Experience with the technology of Industry 4.0 requires a highly skilled workforce to maintain advanced manufacturing systems. However, training programmes today cannot yet address the requirements of advanced manufacturing, where management and professional groups therefore frequently confront large skill gaps (Jasiński, Meredith, and Kirwan, 2021). This mismatch is likely to create certain shortages in labour availability, defusing the industry's capacity to implement new technologies effectively.

Building competency will also ensure the adoption of quality improvement initiatives like 6 Sigma and Lean Manufacturing. It would be crucial to bridge these gaps by investing in vocational training and continuous professional development.

Coordination among all these stakeholders would meet the many challenges that the South African sector faces. As noted by Rajan and Dhir (2023), strategic alliances and partnerships have been identified as delicate weapons for production and efficiency. Pavlínek (2023) argued that switching to the production of electric vehicles may give South African manufacturers the upper hand in the industry around some niches. Catană and Toma (2021) concentrated significant attention on the idea that using a robust marketing strategy to combine society's internal and external marketing would enhance brand loyalty and trust. These strategies would help manufacturers navigate strict regulations and meet international standards.

2.2.1.3 Addressing Research Gaps in the Automotive Industry

In the writings provided by Black and Roberts (2019), it is evident that there needs to be a study that further examines the way in which global competition affects local manufacturers on a national basis. The most studied issue is apparel or economic challenges, leaving a lacuna regarding the difficulties faced by regional players, such as those in the Eastern Cape. It rests heavily on the suggestion revolving around more localised studies by Chigbu and Nekhwevha (2022) to give an overview of the unique dynamics from a South African perspective. These can help to come up with targeted policy interventions and business strategic decisions.

Quality improvement methodologies, especially Six Sigma, Lean Manufacturing, and Kaizen, have been given tremendous research space, where a great deal still needs to be learned about how these could be tailored to fit the South African context. As

mentioned by Dombrowski et al. (2012), they were tailored for different industrial settings and so would require significant contextualisation for their proper adaptation in South African settings. Jasiński, Meredith, and Kirwan (2021) highlight the necessity of such research, which sees the combination of sustainability goals and quality improvement initiatives. Studies like this help in aligning oneself with global trends and expectations from consumers against local manufacturing practices. In a parallel manner, these also delve deep into how local supply chains strengthen exposed methodologies that must be addressed.

The situation warrants research because it focuses on the human factors involved in using Industry 4.0 technology. Ligarski, Rożałowska, and Kalinowski (2021) emphasise the importance of human factors and knowledge in successfully integrating technology within an organisation. Research works by Rajan and Dhir (2023) suggest that this proves significant because such studies delve into the factors that contribute to alliance productivity and performance and offer insight as to how strategic alliances can make the industry more competent among the best competitors. Pavlínek (2023) and Catană and Toma (2021) highlight the installation of electricity cars, but do so with a different approach; they research corporate social responsibility and allied activities shaping the consumer perception, due to which EV adoption rates will enable the growth of the industry. The proposed research considers these challenges for the industry for future investments therein.

Adapting Kaizen to the Eastern Cape's smaller supplier networks has shown promise in reducing production delays while improving quality consistency.

2.3 Theoretical Frameworks

2.3.1 Human Capital

The theory of human capital implicates individual capabilities in terms of productivity to organisational goals. The set-up of competencies in terms of human resources would be desirable for most advanced manufacturing systems, primarily in the Eastern Cape, to be developed. Firdaus et al. (2023), for example, suggest that human capital management strategies are crucial for optimal organisational performance, especially for currently disadvantaged areas in terms of education and training, to take steps toward reducing such disparities. Makiwane, Gumede, and Zembe-Mkabile (2021)

mention the need to address some of the disparities that necessitate the constitution of a productive and efficient workforce preservation strategy for high-quality production. Nwachukwu (2024) again stresses that growth results from human capital investment as a major driver facilitating education and training enhancements, which further aid in enriching and developing workforce skills and labour capacity.

Nwachukwu (2024) further notes that the realisation and management of humans as a learning capacity concerning skill shortages, as well as employment-based continuous professional development, can be a considerable value equaliser. Maharaj (2019) stresses that training programmes ought to be suitably fashioned in order to befit the sector of automotive products to marry current staffing competencies against the backdrop of highly sophisticated areas of manufacturing technology. This alignment is critical to preparing employees to meet international quality standards and to raise the bottom line of organisational productivity. According to Firdaus et al. (2023), these efforts especially emphasise that strategic human equity management constitutes a necessary tool for ensuring long-term growth.

Leadership contributes greatly to creating a culture where work development and participation form strategic pillars. As Dombrowski et al. (2012) define it, leadership that enhances the facilitation of skills to lead the way in rising workforce participation and alignment of orientations to corporate goals is beneficial. Black and Roberts (2019) further argue that such structured programme development initiatives involving leadership could be continuous improvements. Powell (1995) points out that a facilitates quality and long-term operational efficiency results are important. Wujarso and Dameria (2023) further contend that an environment conducive to employee development leads to a motivated and capable workforce.

2.3.2 Resource-based theory and human capital

Resource-based theory suggests that a firm's long-term competitive advantage depends on its resources and capabilities (Barney, Ketchen, & Wright, 2011). Resource-based theory (RBT), which evolved from the earlier resource-based view (RBV), emphasises that a firm’s tangible and intangible resources are the primary source of sustained competitive advantage. A company secures this advantage when its resources are valuable, rare, inimitable, and non-substitutable (VRIN framework)

(Barney, 1991). Resources are categorised into tangible (e.g., buildings, finances) and intangible (e.g., brand equity, human capital) (Hitt et al., 2001). Tangible resources are measurable and have physical or financial value (Galbreath, 2005), while intangible resources provide non-physical value and do not deteriorate over time (Cohen, 2005). Intangible resources can be shared by multiple managers simultaneously and are often tied to their owners, making them key drivers of competitive advantage under the VRIN framework (Marr & Roos, 2005).

Human capital, an intangible resource, includes employees' skills, experience, and intelligence (Wright, McMahan, & McWilliams, 1994). Investing in human capital benefits individuals by enhancing their value and benefits organisations by improving knowledge and skills that boost the company's performance, including its triple bottom line, social, environmental, and economic dimensions (Crook et al., 2011; Slaper & Hall, 2011). This framework is often referred to as ‘the three Ps’, namely: people, planet, and profit.

The value of human capital increases with higher education levels. Organisations with educated workforces are more competitive (Blundell et al., 1999). Similarly, a country's human capital, as an intangible resource, impacts its ability to adopt new technologies, improve GDP, and enhance global competitiveness (Blundell et al., 1999).

2.3.3 Total Quality Management (TQM)

Total quality management refers to a holistic policy framework for embedding quality across the whole of an organisation's operations. Based on Deming (1986) and Oakland (2003), investments in customer satisfaction, employee involvement, and continuous improvement prove to be the major pillars to achieve success in terms of this quality programme. By TQM, automotive manufacturers get improved product quality, reduced waste, and improved operational efficiency, adding tools and methodologies. TQM is described as "integrated] with strategic and operational management [to create] synergies that tremendously increase the organisation's performance" (Alam et al., 2024, p.89) in certain countries like South Africa, where adaptation to indigenous circumstances is critical for overcoming resource constraints and logistical challenges. To Mabotja and Mavutha (2024), Lean Six Sigma increases the effectiveness of TQM practices.

Another source of standardisation, such as ISO 9001, is of major importance for the effective implementation of TQM. Standards such as the ones mentioned by Mohsin et al. (2024) provide a systematic approach to quality management and help any organisation realise an increased and sustained range of operations. According to Mabotja and Mavutha (2024), the Lean Six Sigma method complements TQM practices in improving order fulfilment and especially in resource-constrained settings such as those that exist in South Africa. Adoption of such practices improves the quality of the product. It makes the consumer happy in the automotive manufacturing context, as stated by Powell (1995) in their research work, ensuring the attainment of quality targets for the manufacturers. He further goes on to state that TQM, along with Lean Six Sigma integration, brings about significant effectiveness benefits.

Employee involvement is the most crucial aspect of TQM, which leads to remarkable improvements in quality and operational efficiencies. As interpreted by Dombrowski et al. (2012), a continuous improvement culture will improve the outcomes of quality products and the overall performance of organisations via the participation of employees in their improvement. Maharaj (2019) notes that this is a key attack for employee engagement in achieving TQM objectives, and this is also advocated by Black and Roberts in 2019, as it is deemed important to create an environment that typically supports continuous learning and development. Henriksen Nygaard (2008) echoes the foregoing examples, adding that the focus ought to be on sustaining long-term-engaged employees.

2.3.4 Lean Six Sigma

The driving force behind lean principles and Six Sigma is Lean Six Sigma, which aims to increase the effectiveness and efficiency of manufacturing processes as well as improve quality accuracy, cost-cutting, production speed, flexibility, and delivery time. This eliminates waste and reduces variability in order to enhance the overall operational performance of the production process. As identified by Mabotja and Mavutha (2024), the introduction of lean Six Sigma can improve order fulfilment approaches substantially in manufacturing companies and create increased resource utilisation and increased customer satisfaction. This is supported by Alam et al. (2024) who note that the contribution to the typical manufacturing company would be its integration with other management perfections for a holistic approach to quality

improvement. This has implications for automotive manufacturers in South Africa, where operational efficiency of the manufacturing organisation is often impeded due to resource and logistical constraints. Mohsin et al. (2024) point out that such integration will generate substantial performance improvements.

Designing, developing, and implementing contracts of any lean Six Sigma initiative into an enterprise requires a quarterback taking a holistic, systematic approach to the work-based improvements and blending smarter research studies and reform recommendations. Dombrowski et al. (2012) mention that a strong continuous improvement culture leads to improvement in quality and operation efficiency. For Black and Roberts (2019), leadership is a key driver in the transformation of lean Six Sigma, while Maharaj (2019) cites education and resources necessary to ensure proper training to equip employees with what is required to effectively institute these programmes. Firdaus et al. (2023) emphasise the importance of strategic human capital management in driving lean Six Sigma practices. They argue that in challenging situations, the development of strategic people and attitudes plays a crucial role. As a result, organisations consider human resource management essential for success.

Neutralising the research gaps in the implementation of Lean Six Sigma can be done through understanding the impact on organisational performance. Firdaus et al. (2023) indicate that optimising organisational performance through strategic human capital management could highly enhance the effectiveness of lean Six Sigma initiatives. Nwachukwu (2024) notes the need for further work on researching human capital development and its contribution to lean Six Sigma practices in those areas where there have been historical educational and training disparities. Wujarso and Dameria (2023) identify the most important issue for the research gaps as examining the best practices for competitive advantage through human capital management and lean Six Sigma. This closes research gaps and gives organisations the required strategies for the implementation of lean Six Sigma to reach their quality objectives. In less developed countries, human capital theory has a special relevance and usually becomes a shared vision in articulating industrial policy regarding skills development for national development.

2.4 Critical Success Factors for Quality Improvement Projects

2.4.1 Workforce Development

Workforce development transcends the skills, knowledge, and commitment of employees for an organisation's Quality Improvement Projects (QIPs) to take root and permanently grow. Even the most innovative training programmes in terms of quality management tools and techniques ought to empower employees such that they can identify inefficiencies and solve problems, while maintaining guidelines for consistent production and meeting frameworks (Adisa et al., 2020). This process of employee development should be promoted continuously in learning and adaptability, as Hijazi observed when he noted that such a learning organisation can significantly contribute to the quality improvement efforts. This kind of learning approach helps organisations channel their energies to better address market challenges and find innovative solutions. It also similarly infers that it is important to better align training programmes with Industry 4.0 competency models, as shown by Khang et al. (2023), which they claim makes training facilities relevant to today's modern manufacturing requirements. These models ensure that the employees are well-equipped regarding new technologies and processes. Also highlighted by Maharaj (2019), it has been said that a raised level of engagement means that there is also a need for learning on the job, so employees and the organisation effectively fill in those gaps in skill development and individual responsiveness, all of which can, in turn, foster positive morale and productivity.

Creating a quality environment in one's mind among employees could go a long way, especially in cases where it challenges high turnover rates and mismatched skills, as noted by Islam and Amin (2022). Such a proactive attitude to the development of such a mindset can only happen where technical training is made more interactive with a culture change aimed at fostering an understanding. According to Black and Roberts (2019), the quality of the mindset ought not only technically lead to such skills, but also establish ownership and accountability in the employees' high expectations, thereby leading to better quality outputs. As per Powell (1995), embedding such knowledge transfer practices within continued workforce development strategies stimulates more departmental cohesion. Further promotion of a continuous improvement process is thus secured as the teams become pressured into collective decision-making and collective problem-solving.

Hijazi (2023) argues that there must be skilled employees for proper inspection of quality and continual maintenance of all production standards, thereby enhancing the prospects of accomplishing long-term goals within the organisation, which has a role in bolstering its competitive edge in present-day global markets. Workforce development strategies also value collaborative learning and cross-functional training. These kinds of cultures signify a common understanding of the same parameters and operational inter-relations inside the process of manufacturing, as already noted by Khang et al. (2023). Indeed, this provides insight to employees on what the manufacturing ecosystem is and what the inputs and outputs are. The focus is, therefore, placed on employees interpreting the different kinds of interdependence within the project and operating within such parameters, supporting or encouraging quality outcomes. Integrating lean management principles into these training programmes, as proposed by Dombrowski et al. (2012), to improve productivity and the quality of outcomes. This process then aligns operational efficiency with strategic priorities. Additionally, Akpa and coworkers (2021) have suggested that fostering a learning environment could change resistance to organisational change and motivate continuous improvement, which is crucial in highly very dynamic sector such as automotive manufacturing.

2.4.2 Organisational Culture

Quality improvement facilitation requires a culture of collaboration, accountability, and innovation. It has been shown through research that organisations very strongly aligned culturally with principles of quality are most likely to possess the capabilities of therefore successfully implement TQM and related methodologies (Haffar, Maamria, et al., 2019). An adaptive and inclusive culture fosters resilience in the face of challenges faced by organisations, allowing them to sail through the demanding industrial landscapes of the 21st century, according to Akpa et al. (2021). Maharaj (2019) writes on such points of quality-centric culture that could cure some problems, including resistance to change, particularly in the regions of the Eastern Cape where the levels of diversity in skills pose a challenge. Both integrations are critical for organisations striving towards improving quality by providing services based on an inclusive and adaptable culture, and those who embrace continuous improvement.

Organisational culture informs knowledge-sharing and innovation for quality improvement, as described by Azeem et al. (2021), supporting both activities for improvement. This culture indicates how new methods and technology will be integrated into existing workflows. Akpa et al. (2021) went on to advise organisations themselves to ensure that their strategic plans include a cultural transformation meant for staff to align their values with the overall objectives of the organisation. This is more particularly important, especially when the manufacturers are in the Eastern Cape, aiming for international quality standards, as it emphasises uniformity in performance and outcomes.

Positive organisational culture extends support to adopt advanced behavioural theories and practices that integrate technology, as Dombrowski et al. (2012) argue. Beyond this, such assistance is highly crucial for breaking through barriers to technology introduction, nuggets of staff resistance, or simply skill lags. Azeem et al. (2021) mark the intrinsic embedding of quality in the culture of the organisation as the complete orientation for long-term improvement. South African manufacturers ought to introduce such a culture, to pass through resistance, for the proper transfer into continuous improvement, as a factor pivotal for them as competitiveness in the globalised market scope.

To conclude, resolving cultural barriers for manufacturers located in the Eastern Cape is to devise targeted interventions to promote a culture of collaboration and shared ownership in improvement. Promoting organisational citizenship behaviour through recognition and reward systems will improve employee-employer engagement. Maharaj (2019) highlights honesty and transparency in the process by which the goals of an individual harmonise with the goals of an organisation. Black and Roberts (2019) argue in support of high-quality standards and the participation of employees in decision-making processes, both of which are further essential for the sustenance of a culture of excellence.

2.4.3 Technology Integration

Certainly, modern manufacturing technology has great potential in conjunction with automated systems, constantly recording, sensing, and doing interactions with machinery and other components in production environments; this makes the manufacturing environment very dynamic. It has leveraged technologies like automation, data analytics, and IoT-based functionalities-real-time monitoring, predictive maintenance, and accuracy within manufacturing processes (Bousdekis et al., 2021). Effective management of the conversion of technologies and IT equipment helps maximise efficiency and minimise defects across production lines. This deployment and performance have altered the processes of these new system aspects in manufacturing. Integration of AI and IoT technology enhances operational efficiency and product quality, thereby making manufacturing processes smarter and more dependable. Maharaj (2019) highlights that the adoption of the technology must always keep in view the benefits a process accepts and balance them against the constraints.

All organisations-whether manufacturing or consulting firms-should thus work on harnessing IoT applications for improvements. The productivity tools are critical for the future success of the organisation.

Yet, it is increasingly evident that the integration of machine learning and IoT provides significant benefits to companies, particularly in optimising real-world applications. In this context, IoT-related operational challenges are minimised both on the production floor and in procurement processes.

Hofmann et al. (2012) highlight that the true value lies in education, emphasising the need to equip the workforce with the skills necessary to adapt to technological advancements. Furthermore, as noted by Tyagi et al. (2023), implementing strategic planning enhances safety and provides mechanisms to mitigate cyber risks, particularly in high-risk industries.

For South African manufacturers, the application of technology introduces unique challenges and opportunities. As highlighted by Hijazi (2023), aligning technology investments with organic strategy enables optimal utilisation of resources for the best possible improvements. This level of harmony leads toward the strictest certification cases. E-commerce, with intelligent technologies, can also create a quality

improvement as actionable insights, enabling companies to detect errors before they happen. Benn et al. (2012, 210) note that IoT and machine learning applications are bound to bring about improvements in quality by producing real-time data and maintaining information for analysis, decision-making, and higher process quality.

Overall, bridging the gap in research between firms and technology integration to such essential elements as strategy, human-related readiness, and stakeholder engagement can lead to a holistic view, as Ryssel et al. (2004) put it. Collaborative platforms can bring institutions together to look at the facts across varied team environments, as understanding transfers to solve problems. Maharaj (2019) notes the importance of stakeholder cooperation in actualising technology uptake, linking the benefits that investment provides to that quality goal, an extended vision for the entire organisation. Undoubtedly, Tyagi et al. (2023) also note the role of cross-industry cooperation that could cure mutual technology problems, but he would move more to foster a culture of innovation within industries. The way is also paved for the future.

2.5 Challenges in Implementing QIPs in South Africa

2.5.1 Resource Constraints in the Automotive Industry

The South African automotive industry faces important limitations concerning the availability of resources for the implementation of quality improvement practices. There are limits to the availability of financial and infrastructural resources that make it difficult for companies to adopt some quality management systems that are compared to benchmarks in quality, as highlighted by the OECD (2021). Another challenge is the high cost of acquiring state-of-the-art technology needed for every potentially effective QIP, exemplified by Powell (1995). Furthermore, the lack of resources often causes short-term successes to be considered as an improvement of quality in the long run (Oakland, 2003). The lack of capital also makes it difficult to invest in research for development, which plays an essential role in innovative quality-enhancing initiatives.

Financial constraints deeply affect the opportunity cost associated with updating human resources, which is crucial in maintaining the quality setup. This was often very challenging in small firms in the sector in which the resources allocated are such that it has comparably fewer opportunities for the fulfilment of international quality

benchmarks (Maharaj, 2019), as stated by Black and Roberts (2019). Such investment is often lacking in infrastructure, particularly in relation to automated production systems (Dombrowski et al., 2012). As machinery is frequently outdated or has not been technologically upgraded, firms often face the need to shut down operations temporarily in order to maintain or repair equipment, thereby disrupting production continuity.

The absence of resources is perfectly reflected by the least support for the development of a supplier. Numerous obstacles, such as constraints in the provision of material resources, are manifestations of the lack of resources in the industry, as highlighted by Hijazi (2023). Overcoming this issue, modernisation in existing supply chain systems needs to be continued through investment (Khang, Jadhav, and Birajdar, 2023). Organisational culture has a noteworthy role to play, since much less resources are invested in fostering Q-focused mindsets among employees (Akpa, Asikhia & Nneji, 2021). The lack of proactive approaches can make it impossible for firms to meet the shift in the dynamic demands of the automotive sector in the future.

For this, they must explore innovative funding options and public-private partnerships-just like Azeem et al. (2021) suggest. This can result in the financial and infrastructure support necessary for the implementation of QIPs. Engaging these projects means that the available incentives and grants provided by the government for quality improvement projects will alleviate these limitations on resources, as cited by Widarko and Anwarodin (2022). Creativeness could be possible when all stakeholders collaborate and have much better financial planning and more resource-efficient allocations than is otherwise possible.

2.5.2 Workforce Challenges in Quality Implementation

Several South African automotive industries have workforce issues that prevent the implementation of QIPs very successfully. Skill gaps emerge as a core problem, and many employees do not have the required technical skills for modern quality management systems. High employee turnover rates deepen the issue, as noted by Dombrowski et al. (2012). There is no continuity in the quality initiative. The enormous challenge is that, as Maharaj (2019) noted, manpower development schemes rarely fit in here with industry requirements. These factors hinder organisations from

establishing a strong and skilled workforce that would be capable of maintaining quality.

There is another challenge of workforce development caused by the fast pace at which technology is advancing in the industry. What Tyagi, Mishra, and Kukreja (2023) identified is that Industry 4.0 also necessitates companies to have specialised human resources, which many of the entities are trying to build up. The situation is further complicated by a lack of adequate investment in employee training and development, as Hijazi (2023) showed. Another problem is that companies don't have good systems for sharing information, so it's difficult to learn from successful methods. Understandingly, in the absence of such, firms cannot forge institutional memory and thus maintain long-term capability.

Such high rates of turnover mean that they also greatly affect the smooth running of QIPs. Retaining employees means continuity in maintaining quality at top levels, as suggested by Khang, Jadhav, and Birajdar (2023). However, many firms in South Africa face significant challenges in competitive compensation packages and opportunities for career development, as highlighted by Akpa, Asikhia, & Nneji (2021). Organisational culture can amplify this situation as it fails to prioritise employee engagement and retention (Widarko & Anwarodin, 2022) and eventually leads to high leakage of capable staff.

All these challenges can be mitigated through comprehensive workforce development strategies. Azeem et al. (2021) offered that these strategies could include focused training programmes and strategies for developing an organisational culture committed to continued learning. It would involve, in addition, collaboration with government strategies around partnering with educational institutions to bridge that skill gap and leverage the capabilities of the workforce, as stated by Pavlínek (2023). These strategies would only increase job satisfaction but would also invest in the long-run quality objectives.

2.5.3 Supplier Variability and Supply Chain Disruptions

Supplier fluctuation is one other significant challenge posing a notable hindrance when it comes to practicing QIPs in the automotive industry in South Africa. Normally, alterations in the quality of suppliers lead to flaws in the quality of what is produced, as pointed out by Maharaj (2019). Some of these alterations are further complicated

by repeated disruptions in supply chains, which slow down the supply of quality materials on time, as noted by Dombrowski et al. (2012). Moreover, most enterprises do not have noteworthy supplier development programs. This may compromise the evenness of quality across supply chains for different firms regarding their suppliers (Black & Roberts, 2019) and lead to delays in production and high operational costs.

Additionally, the internationality of global supply chains raises some challenges, such as discrepancies in international quality standards for suppliers. That is further compounded because most commodities bought cheaply are usually of questionable value qualities-like what is denoted by Khang, Jadhav, and Birajdar (2023). Poor two-way communication and lack of coordination with the suppliers are some major hurdles to the effective implementation of QIPs (Akpa, Asikhia, and Nneji, 2021). The gaps that exist for this reason bring about inefficiencies in the supply chain that affect the product's overall quality.

There are also significant problems in supply chain disruptions, which would result from geopolitical events and economic instability. In most situations, as demonstrated by Azeem et al. (2021), this leads to increased costs and delays in the entire product quality and or production. Furthermore, this problem can be aggravated by a lack of proper planning for contingencies and risk management concerning the supply chain, as highlighted by Tyagi, Mishra, and Kukreja (2023). Also, many times companies are either deficient in resources or have difficulties in implementing higher technologies like IoT and AI within their supply chains (Widarko & Andrin, 2022). Given that void in technology, companies cannot achieve their most efficient supply chain.

Regarding developing robust supplier development programmes and advanced supply chain technologies, Bhatt, Agrawal, and Bisen (2024) argue that the use of digital tools increases the visibility of a supply chain and coordination with suppliers. Strategic partnerships with important vendors also help to ensure quality throughout the supply and to minimise the effect of such disruptions (Pavlínek, 2023). These measures increase resilience and deliver efficacies for supply chains that quite support QIP objectives.

2.5.4 Regulatory Compliance and International Standards

For South African automotive organisations, one of the major challenges must deal with meeting international quality standards. Oakland (2003) notes this as rather expensive in terms of necessary training and upgrading of internal quality systems to meet regulatory requirements. Meanwhile, Maharaj (2019) has pointed out the complexity of international standards and required levels of expertise and resources. In addition, international regulations are not 'in sync' with these South African ones, leading firms into additional compliance barriers. Misalignments such as these can create confusion and inefficiencies in the compliance process.

Companies were mandated by Hijazi (2023) not only to be in touch with the standards, as regards their dynamic nature, but also to keep updating their quality management practices. However, since there are only a few programmes aimed at international quality benchmarks, the question of update becomes further complicated, as explained by Khang, Jadhav, and Birajdar (2023). Most of the smaller players, however, tend to shy away due to the high compliance costs (Akpa, Asikhia, & Nneji, 2021). Indeed, investment in improvement measures is omitted when companies are deprived of the financial resources involved in quality compliance. In general, the main aim of the total quality management programme ought to be evident through its target orientation and process orientation.

Fiscal and Operations executives are the starting point through which board leadership can guide the installation of an automated control programme that undertakes the transformation of throughput, labour costs, safety record quality, and controllable overhead production costs while visiting plants as described by Qin et al. (2022).

Such points of attention may affect how a company decides for or against the corresponding factors, while investing in the implementation of the control programme. In general, the operation-focused costs of changeable products are within the structures designated for varying products or services, leading to insignificant deviation on the expenses.

2.6 Opportunities for Improvement

2.6.1 Benchmarking Best Practices

Benchmarking the best practices can take place only when lessons are learned from the best organisations regarding using effective strategies related to management quality. Maharaj (2019) believes that the embodiment of globally accepted standards provides a basis for aligning or giving synchronisation to local practice with international benchmark standards, which is a key dimension in the alignment of quality practices. Khan et al. (2022) also emphasise the identification of models for quality improvement that succeeded from top performance organisations provides a very useful insight for sparking lean and improving operational effectiveness. Similarly, Dombrowski et al. (2012) referred to competitors' strategies, and they were of the view that applying them within an organisational framework could lead to innovation and quality improvements. Global benchmarking not only tells everyone what needs to improve, but it also develops a sense of learning. To rollick in the words of Powell (1995), it may be possible to rehabilitate for those innovative accelerations within the company construct, but with a secret release relating to improving rates of commentary through learning.

Indeed, understanding market direction and consumer preferences via benchmarking is done by making the best out of their products by staying competitive. For instance, in a South African automotive manufacturing company, having an insight associated with such activity is likely to yield a more significant positive advancement toward quality goals. In addition, to bridge present gaps in quality enhancement programmes, benchmarking provides one very feasible strategy. Oakland (2003) implies that effective benchmarking does not only include the replication of successful activities but also customisation to fit the needs of the organisation.

The role of advanced technology in benchmarking is unparalleled. As mentioned in Akpa, Asikhia, and Nneji (2021), technology integration in terms of quality improvement practices allows for on-the-go assessment or benchmark monitoring. However, Khang, Jadhav, and Birajdar (2023) note in regard to such tools that they must still be recognised in this aspect, where real-time changes in market demand can sometimes demand agility in response aptly sounded by Widarko and Anwarodin (2022).

2.6.2 Collaborative Partnerships

Stakeholders will have the obligation to create synergy to develop the workforce through technology adoption as well as establishments in collaboration with educational institutions and the government. These partnerships, says the OECD (2021), will grant workers access to training programmes in specified fields, so that they have the requisite skills needed for advanced manufacturing techniques. Khang, Jadhav, and Birajdar (2023) reiterate that innovation and technology development as agriculture-academic links have crucial importance. In the same way, Maharaj (2019) believes that joining heads of departments with regulatory bodies creates opportunities for keeping the fulfilment process matching with changing quality standards. Through forging relationships with one another, organisations would be encouraged to pull resources and knowledge of one another from which synergy is nurtured, allowing problem-solving methods to be more intricate. According to Black and Roberts (2019), the partnership ought to enhance the development of new products or services for new businesses involving activities with research institutions. Dombrowski et al. (2012) argue that among other influences, a cross-sector partnership creates an experience necessary to result in superior process optimisation, as well as enhancing product quality.

The government's involvement in formulating incentive policies can further accelerate advancements in technologies and attract cutting-edge technology. Public-private partnerships would open the doors for the integration of AI and IoT into their SPF, and significant results can be seen in the manufacturing industry towards enhanced operational efficiency. Widarko and Anwarodin (2022) suggest that involvement with the policymakers would be crucial for ensuring national alignment in terms of national development plans, thereby securing a conducive environment for growth. Furthermore, the embrace of collaboration creates a platform for continual learning and development.

2.6.3 Focus on Sustainability

The sustainable aspects of quality improvement can also be demonstrated by integrating the two vital currents of standards and brand uplift. As the scholar points to the value of reducing costs of operation, going green enriches stakeholder trust more.

Kaiser et al. (2022) contribute to the debate through their strong support for the idea that one might see the financial performance of sustainable manufacturing processes in the very long run better than that of less sustainable, conventional manufacturing processes. Furthermore, Maharaj (2019) maintains that placing sustainability into corporate culture will ensure the consistency of the quality and environmental targets referred to therein. Sustainability can also enable innovations. Therefore, organisations that prioritise sustainable practices have come up with new ways of resource optimisation. For example, according to Azeem, Ahmed, and Haider (2021), sustainable practices give organisations another vector of innovation opportunity.

Black and Roberts (2019), on the other hand, argue that going green in manufacturing process will not only better the quality of the items, but also reduce the impact of the environment. Meanwhile, Tyagi, Mishra, and Kukreja (2023) consider the importance of AI-enabling environmental monitoring, which may comply with regulations, as well prevent global environmental standards being enforced as a condition of market access.

As observed by Dombrowski et al. (2012), companies have increasingly been using connections to the environment and resources in compliance with the highest international standards. Widarko and Anwarodin (2022) have underscored that these sustainability steps ought to align with international norms. Catană and Toma (2021) claim that this alignment shall create consumer trust, leading to market positioning of the brand.

For maximum success, it is important to involve stakeholders in the efforts toward sustainability. According to Widarko and Anwarodin (2022), this signifies that all employees, suppliers, and customers must share the same vision on the impact of implementing quality enhancement projects. Similarly, Akpa, Asikhia, and Nneji (2021) also state that aligning sustainability aims with corporate strategies is a catalyst for not-so-huge organisational capability levels, ensuring sustained growth or excellence.

2.7 Conceptual Model and Summary

The literature reviewed in this chapter provides a coherent basis explaining the conditions under which quality improvement projects (QIPs) succeed in South African automotive manufacturing firms, the empirical case studied being pertinent to the Eastern Cape. Sector pressures such as the threats from extended global competition, insufficient infrastructure and skills, fulfilment of the rising expectations in terms of recurring improvement are all preconditions for having QIPs strategically rather than operationally required (Black & Roberts, 2019; Maharaj, 2019). Conversely, it seems evidence-supported that the locus of quality methods lies now in technology integration, with Industry 4.0 (IoT and AI) technologies delivering heightened forms of precision, efficiency, and responsiveness in real-time when facilitated by recommended human and organisational capabilities (Ligarski, Rożałowska, & Kalinowski, 2021; Jasiński, Meredith, & Kirwan, 2021).

To bring these insights together, a conceptual structure connecting three theoretical principles with specific organisational and contextual elements that influence the implementation of QIPs and their outcomes is suggested. This structure aims to picture the payback of human capital investments (education, training, leadership-enabled development), for building a resourceful workforce for advance quality systems and technology-enabled manufacturing (Firdaus et al., 2013). It extends from a perspective that competitive advantage is entirely contingent upon strategic assembling of resources that are valuable and not easily imitated, in particular human capital and technology, within the VRIN of the resource-based perspective (Barney, 1991; Barney & Ketchen, 2011).

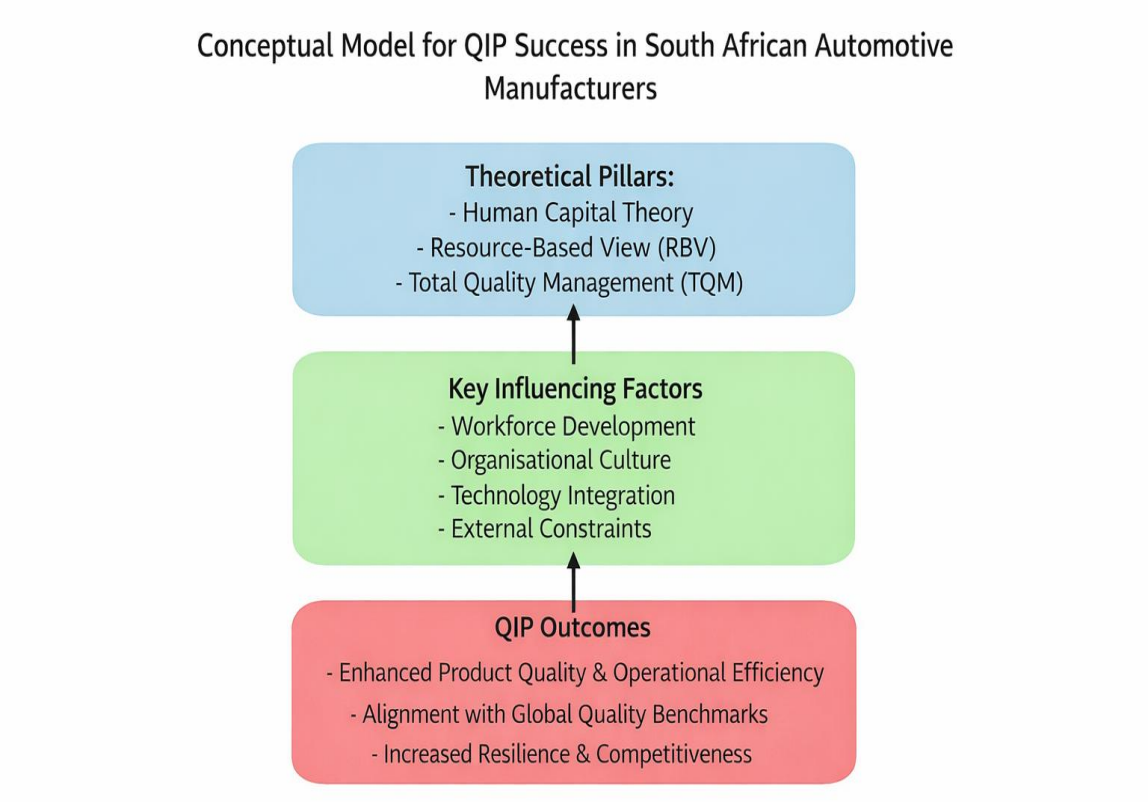

Figure 2.1: Conceptual Model for QIP Success in South African Automotive Manufacturers

2.7.1 Theoretical pillars underpinning the model

According to human capital theory, QIP success can be attributed to workforce capability, continuous learning and the alignment between skills and knowledge required under current manufacturing industry conditions. In this context, human capital strategies become increasingly critical when disparities in education and training constrain the development of technical capabilities. Such strategies also foster leadership approaches that encourage employee participation, training, and continuous improvement orientated learning behaviours (Firdaus et al., 2023; Dombrowski et al., 2012).

The resource-based view/theory (RBV/RBT) further supports QIP success by emphasising the combined strength and synergy of tangible and intangible organisational resources. These resources are considered valuable, rare, inimitable, and non-substitutable. From this perspective, human capital and organisational explicitly are not merely elements of change initiatives but strategic assets that

contribute to sustained economic performance and support lifelong learning practices (Barney, 1991; Hitt et al., 2001).

The entire process of Total Quality Management (TQM) is to include quality extensively in organisational processes by focusing on the interests of the customer, involving the employees, and continually improving. The literature reviewed presents a link between TQM approaches and the results of product quality enhancement, greater reduction of degradation book waste, and an increase in efficiency because of standardisation (e.g., quality systems that are aligned with ISO) and in tandem with other quality improvement tools like Lean Six Sigma (Deming, 1986; Oakland, 2003).

2.7.2 Key influencing factors

Indeed, attaining a higher workforce has often been taken as the basis for sometimes capricious QIP implantation. The fact that wider skill gaps are a running program to leave and forget it undermines the success of reaching the ongoing enterprise enhancement worker. This was found in studies on the employment of Industry 4.0, where it was proven that skill requirements were increasing. Conversely, great training, mutual learning, and a thematic strengthening of the capacity of the sector are consistently placed as enablers of quality behaviour over time (Lubbe, 2012; Dombrowski, 2012; Tyagi et al., 2023).

Organisational culture acts as a social background for the success of QIP. Scholars refer to the kind of culture supportive of accountability, collaboration, innovation, and inclusion as ultimately fostering activities of quality programmes without resistance. These are the indicators of knowledge-sharing, which, as they point out, is vital for learning. Quality culture is hence considered one of the driving forces behind enabling organisations to apply TQM-related strategies, be it within the margins of the mindset that induces continuous improvement as a daily practice in organizations according to Haffar, Maamria, et al. (2019), Akpa, Asikhia, and Nneji (2021), and Maharaj (2019).

Technology adoption has been considered an enabler and a capability challenge. The current literature suggests that IoT, machine learning, and other digital technologies can, through real-time data generation for analysis and decision-making, promote quality by one or more of the following: faster fault detection, increased process

control. However, these benefits will accrue only when technology investments are strategically aligned with the readiness of the concerned organisation, including stakeholder coordination and skills availability (Benn et al., 2012; Hijazi, 2023; Maharaj, 2019).

External limits are built into the present QIP implementation within the real structural sites; the constraints that resources—financial, infrastructural, and human—incur, deter firms from adopting fancier systems and further investing in value-adding projects for the long term, supply disruptiveness, and rate variability, among other features, such issues to consistencies for quality and adding costs. Also, the costs and complexities of regulatory compliance and international standards represent more barriers to what can or cannot be achieved and how fast improvements can be institutionalised (OECD, 2021; Oakland, 2003; Maharaj, 2019; Dombrowski et al., 2012).

2.7.3 Outcomes of effective QIPs

The basic approach of the model is that effective QIP causes product quality and operational efficiency enhancement, and overall organisational resilience and competitive positioning will be revealed subsequently. The South African automotive industry's empirical findings may show the imperatives behind achieving a global foothold with evolving customer expectations and technological and compliance demands (Black & Roberts, 2019; Khan, Khan, & Haleem, 2019).

The conceptual framework of the research consolidates three theoretical pillars (human capital theory, RBV/RBT, and TQM) with four influencing factors (workforce development, culture that brings success to the organisation, technology integration, and external constraints) to account for the probable success of QIPs in the South African automotive manufacturers. The empirical part of the study was drawn from the case of an organisation in the Eastern Cape, while at the local level, the framework aims to interpret and overreach the Eastern Cape Mercury and refine case-based evidence therein to refine and contextualise the various relationships.

2.8 Conclusion

This chapter has provided a detailed review of the literature relevant to the implementation of quality improvement projects (QIPs) within the South African automotive industry, with a specific focus on the Eastern Cape. It has highlighted the theoretical underpinnings of human capital theory, the resource-based view, and total quality management as critical frameworks for understanding the factors that drive successful QIP implementation. Furthermore, it explored the unique challenges faced by the industry, including resource constraints, skill gaps, and the integration of advanced technologies.

The purpose of this chapter was to establish a foundational understanding of the context and factors influencing QIPs, which aligns closely with the research objectives and questions. The conceptual model developed in this chapter will guide the empirical investigation and ensure a structured approach to data collection and analysis. Looking ahead, the next chapter will focus on the methodology employed to address the research questions. It will detail the research design, data collection methods, and analytical techniques that will be used to investigate the themes and gaps identified in this literature review.

Chapter 3: Methodology

3.1 Introduction

In this chapter, the methodological design that was applied in probing into the critical success factors of implementing quality improvement projects (QIPs) of South African automotive manufacturing firms was explained. Consisting of metrical evidence against analytical requirements relevant to the study, the methodology was embedded in a positivism paradigm and operatively utilised a cross-sectional quantitative research survey. Respondents to be quantitatively surveyed were deemed fitting because the problem called for interpretation of patterns across operational groups or ranks; associate variables following given a priori amounts were explored using standardised instruments (Taherdoost, 2020; Daniel, Harland & Wald, 2006).

Decisions on the methods are further guided by the extent to which the research plan aligns with the objectives of the research, the type of data required, and the intended steps of analysis (Sahaan et al. 2024, Mishra & Alok 2022). This chapter would, thus, describe the research procedures and methodology, which include the detailed protocol regarding the population and sampling strategy, the survey tool which was adopted for gathering data, and the statistical plan. Ethical concerns are also worth further consideration—hence the steps to ensure validity and reliability in the collected data.

3.2 Research Design

In this study, the design adopted was a cross-sectional quantitative survey method; data were collected from one source at a particular time using a structured questionnaire administered on a specified sample. Apparatus adapted for organisational research, cross-sectional designs provide a snapshot of attitudes, practices, and perceived outcomes for descriptive and comparative analysis across other respondent categories (Stopper, 2022; Daniel, Harland & Wald, 2024).

Regarding this study paradigm, it has been observed that a quantitative method was best suited to undertake this research. The research problem of this study indeed demands a measure for the presence of key determinants like workforce development, organisational culture, technology integration, and external constraints, etc., and their

relationship with perceived QIP outcomes. Also, quantitative designs enable consistent measurements across respondent bases and therefore support transparent statistical inference with predictors defined a priori (Agarwal & Alok, 2022; Saharan et al., 2024).

Constructed as responding to the South African automotive manufacturing sector transferring systematically comparable responses both from those involved in QIPs and in the range of discussions regarding clearly stated scopes, limits, and samples. (Daniel et al., 2014; Taherdoost, 2022).

3.3 Research Approach

Typically, the research design used in this study relies on a quantitative approach sustained by structured measurements, numeral representations of constructs, and statistical data analysis. This complements a positivist orientation in the sense that organisational phenomena are examined through indicator observation, while patterns and relationships are resolved via an organised set of procedures (Taherdoost, 2022; Saharan et al., 2024).

The principal forms of inference being used in the study are primarily deductive since the conceptual model formulated from the literature governs the projection of variables and the consequent structuring of the questionnaire. Reasoning by deductive logic is usually employed in contexts that involve the transformation of concepts into measurable items for tests of the appearance of certain patterns in the data (Grafton, Prakash & Bidgood, 2022; Daniel, Harland & Wald, 2024).

Hand in hand, the results of statistics are interpreted using abductive intuitions, where unexpected or elusive quantitative patterns require the most possible explanation based on the conceptual model and what has already been investigated in relevant literature (Conaty, 2021; Daniel, Harland & Wald, 2024). Also, abduction supports the explanation for interpreting and refining any types of input in this study, which is still a quantitative design.

3.4 Population and Sampling

Interrelationships among the audit from quality consciousness, knowledge on QIP, and the measurement of organisational culture could sharply focus on the response culture and spiritual intent in an unknown area. If we assume the mean of operational variables engaging the latter (Step 2032), they would presumably encapsulate levels of herald of quality orientation and awareness, as well as an appropriate understanding of the QIP literature and practice (Singhanania et al., 2021).

For each one-on-one meeting, the primary aim is to conduct a deliberate survey into an existing research gap, thereby eliciting positive responses concerning participation in a quality improvement project. This approach employs a purposeful sampling design, which is recognised as valid for organisational research. Should access be achievable solely through professional contacts, it will necessitate engaging respondents who possess relevant experience and contextual understanding of the pertinent issues (Daniel et al., 2024; Marupeng et al., 2023; Kock & Lynn, 2023). Proof (2013) argues that it is beneficial to ensure representation across various functional perspectives. This considers, for example, the distinctions between functional and operational roles versus technical and managerial positions. This is predicated on the assumption that the dataset will facilitate subgroup comparisons that align with the analytical rationale from a self-assumed standpoint; it enables the exploration of sub-cluster dynamics that can promote further development and collaboration, even when underlying trends may not be readily identifiable (Mishra et al., 2012; Saharan et al., 2017).

Chapter 4 opens with a discussion of sample size. The study prudently uses a moderate-sized dataset (n=70) for frequency profiling, cross-tabulations, and comparative analysis of mean scores across respondent categories for issues around transparency in explaining the set; such data analytics are highly recommended since they rely on frequency representation for analysis before further considerations toward respondent category comparisons (Mishra & Alok, 2022; Daniel, Harland & Wald, 2024).

3.5 Data Collection Methods

A structured self-administered questionnaire was used to collect data to answer standardised responses; all of this was considered valuable for statistical analysis. Standardisation in questionnaires maintains that comparability across respondents through consistent wording, sequencing, and response options is assured and guarantees strengthened measurement precision in quantitative studies (Mishra & Alok, 2022; Saharan et al., 2024).

The questionnaire was developed with the conceptual model and objectives of the study in mind, which resulted in sections on demographics (such as position, experience, and involvement in QIPs) and on several construct sections that operationalise the key factors of influence and outcomes. The items were measured on Likert-type scales to enable computation of frequencies, mean scores, and comparative statistics across groups (Taherdoost, 2022; Daniel, Harland & Wald, 2024).

A pilot test was conducted with the aim of assessing clarity, interpretability and suitability of response scales. Pilot testing is an established quality control procedure intended to reduce ambiguity, fortify face validity, and enhance the usability of survey instruments before full administration (Saharan et al., 2024; Mishra & Alok, 2022). Thanks to the feedback from the pilot, minor changes were introduced to ensure that the wordings were consistent with the intended constructs.

The administration of the survey followed ethical rules set by the institution. The participants were informed about the study procedure under which they agreed to take part. The consent form was also provided alongside this information, with discussion on the voluntary nature of the participants' involvement, the assurance of confidential protection, and their right to withdraw without penalty prior to their submission of participation (Daniel, Harland & Wald, 2024; Saharan et al., 2024).

3.6 Data Analysis Methods

Quantitative analysis begins with a pertinent analysis, which is performed with statistical packages operating stage by stage from the study objectives and the data structure. Data screening and cleaning are carried out at the first stage to scrutinise all infirmities of data, such as completeness, entry errors, and transformation of variables for analysis. This preliminary phase is a critical task in quantitative research to ensure accurate and usable results (Mishra and Alok, 2022; Saharan et al., 2024).

Secondly, descriptive statistics are employed to elaborate upon the characteristics of respondents and allocation of responses in crucial variables. It involves frequencies and percentages when dealing with categorical variables, means and measures of dispersion in terms of items measured on Likert scales and composite indicators, where applicable (Taherdoost, 2022; Mishra and Alok, 2022).

Lastly, contingency tables are employed for scrutinising patterns of one kind of variable against another (e.g., job category against QIP involvement level); mean comparisons, on the other hand, are aimed at testing if there are differences in mean scores across the various respondent demographics. Mean comparisons are implied by the data structure. Interpretation normally suits the measures and measurement approach under the study (Mishra & Alok, 2022; Daniel, Harland & Wald, 2024); if composite scores are used, the results will be interpreted in relation to the latent model and the extent to which the research's onsets align with the perceived QIP outcomes.

The presentation of results aims to offer a statistically grounded explanation that enables both descriptive and comparative analysis, in line with a quantitative study design to evaluate clear measurement and reporting, involving the descriptive research method of models (Taherdoost, 2022; Daniel, Harland & Wald, 2024).

3.7 Ethical Considerations

Ethical practice in quantitative organisational research entails disguised participation, informed consent, confidentiality safeguards, and good governance of data. Information accompanied by an explanation of the purpose of the study, the nature of participation, and the use of their responses was given to participants. Informed consent from the participants gave them an opportunity to denounce their participation

at any time and. The outcome is that the use of the data got governed by ethical considerations. (Daniel, Harland, and Wald 2024; Saharan, et al. 2024)

The security of the confidentiality was provided by not collecting identifying information that was not necessary for the analysis of the data and by dissemination in aggregated form. Data were stored with suitable security and access restrictions to safeguard the participants and the organisation(s) involved. It is important for such ethical safeguards to have secure storage and restricted access for data of such nature, especially when dealing with workplace perceptions that could be discomforting if revealed (Chaudhary, 2018; Mishra and Alok, 2022).

The principle of minimal harm is also taken into account because survey data items avoid asking inappropriate personal/financial information, and it is well communicated that the result dissemination will be for academic only, where no person will be attributed (Daniel et al., 2024; Saharan et al., 2024).

3.8 Validity and Reliability

The concepts of validity and reliability illuminate common problems in the field of research, whose prominence lies in the evaluation of the outcomes of quantitative surveys. The application of either valid or reliable measurement may be enough to withhold scrutiny. The validity of the measurement is largely based on the conformity of the instrument to the standards of the field of study; in the practical sense, the levels of measurement are more concerned with the constructs. This factors substantially into the design of the questionnaire, where words used there represent the constructs. Still another way of assessing the instrument is through reliability discussed earlier or by divergent and convergent validity appraisal (Taherdoost, 1995; Sarhan et al., 2024). Validity was additionally confirmed through item clarity examination (content validity) and scaling practices (face validity) using some students as a pilot test group. The pilot tests have subsequently reduced the ambiguity of the items and have made responses relevant for the organisational and temporal environment needed. (Mishra & Alok, 2012; Danesh, Harland, & Wald, 2014).

Reliability of a measure refers to consistency across items and respondents. However, standardised data collection improves reliability; the same instructions and format

were utilised where the validity and reliability of assurance were taken care of for two groupings: instrument and method (Mishra & Alok, 2022; Saharan et al., 2024). Internal consistency assessment relies on accumulated scores and hence can vary per reliability test method; nevertheless, it is required diligence for study results to be accurately interpreted within the framework of theory. Thus, the authors recommended the test for studying this beautiful method (Taherdoost, 2022; Daniel, Harland & Wald, 2024).

Consequently, the abductive perspective facilitates interpretative validity by its ability to explain observed quantitative findings in the most agreeable way to theory and context, without generating interpretations unsupported by the data (Conaty, 2021; Daniel, Harland & Wald, 2024).

3.9 Conclusion

This chapter outlined the methodological approach used to fulfil the objectives of the study and defended the positivist, cross-sectional quantitative survey design. Items here depict the research design and approaches, the target population and sampling strategy, the questionnaire-based data collection, and the statistical analysis procedures in generating descriptive profiles, cross-tabulations, and mean comparisons. Ethical parameters were taken into account, and items in support of validity and reliability were written and explicated with reference to the general standards of quantitative research (Taherdoost, 2022; Mishra and Alok, 2022).

The next chapter presents the results and reviews of the survey data according to the outlined objectives of the research and has to be authored securely by statistically grounded reporting (Daniel, Harland & Wald, 2024; Saharan et al., 2024).

Chapter 4: Results and Analysis

4.1 Introduction

This section describes the findings in relation to the research objectives and the concepts introduced in Chapter 2. The empirical results in question are about the questionnaire feedback from those exposed to quality improvement efforts in an automobile manufacturing business situated in the Eastern Cape. The findings will serve as a channel between the University of South Africa, the company and the employees regarding the nature and dynamics of quality improvement within the South African context of automotive applications.

The second section provides a working methodological structure. First, respondent attributes are summarised to provide it with the needed backdrop for the explanation. Second, descriptives (frequencies, percentages, means, and dispersion) are presented regarding the enabling conditions and the perceived effectiveness of QIP. Using a third lens is the breakdown of reports on some implementation hitches and the adoption by a certain percentage. Fourth, there is some understanding regarding the impact of comparison between different respondent groups (like role category and experience bands) and towards bivariate associations pertaining to some great variables under a cross-sectional survey (Taherdoost, 2022; Mishra & Alok, 2022; Daniel, Harland & Wald, 2024).

4.2 Demographic Data

The sample achieved the planned balance across operational, managerial and technical roles. Shop-floor employees form just over two-thirds of respondents, followed by managers and a small cohort of digitalisation specialists. Table 4.1 summarises the distribution by role.

Table 4.1: Respondents by role (n = 70)

Role	n	%
Shop-floor employee	50	71.4
Middle Manager	10	14.3
Senior Manager	5	7.1
Specialist in digitalization	5	7.1

Experience bands show a workforce with a strong backbone of mid-career staff. A little more than a third report three-to-five years, while roughly a quarter are in the six to ten years range with about another quarter having over a decade. The early career employees with zero-to-two are the remaining few that present an entry pipeline of entrants that will need more support to embed quality practices. The distribution is given in Table 4.2.

Table 4.2: Respondents by experience band

Experience band	n	%
3-5 years	25	35.7
More than 10 years	17	24.3
6-10 years	17	24.3
0-2 years	11	15.7

The participation rate in formal quality improvement work is high. Approximately seven out of ten respondents report having been directly involved in at least one quality improvement project. This supports the relevance of the responses to QIP implementation conditions and perceived outcomes within the study setting. Table 4.3 presents the distribution of direct QIP involvement.

Table 4.3: Direct involvement in quality improvement projects

Involved in QIP	n	%
Yes	49	70.0
No	21	30.0

4.3 Findings

4.3.1 Perceived enablers and overall effectiveness

The core enablers of quality improvement were assessed using five-point agreement scales. Overall, the mean scores cluster between moderate and high levels of agreement across most dimensions. Management commitment received the highest rating (M = 4.00), followed by employee engagement (M = 3.84) and the use of advanced technology (M = 3.57). In contrast, the adequacy of resources (M = 3.43) and the effectiveness of communication (M = 3.40) were rated somewhat lower, indicating areas where the operational foundations for quality improvement could be reinforced.

The effectiveness of quality improvement in the plant is rated at a mean of 3.27, with a standard deviation of 1.01. This relatively high level of variability suggests significant differences in experiences and outcomes across departments and roles, highlighting potential inconsistencies in how quality improvement initiatives are implemented and sustained throughout the plant.

Table 4.4: Descriptive statistics for enabling conditions and perceived effectiveness (1–5)

Measure	Mean	SD
Q4_Management_commitment_1to5	4	0.88
Q4_Employee_engagement_1to5	3.84	0.85
Q4_Adequate_resources_1to5	3.43	0.99
Q4_Effective_communication_1to5	3.4	0.89
Q4_Advanced_technology_1to5	3.57	0.88
Q4_Quality_culture_1to5	3.47	0.9
Q5_QIP_effectiveness_1to5	3.27	1.01

The pattern would indicate an organisation that has at least articulated a quality vision and organised a mobilisation process reasonably well, but still suffers from inconsistent resources and information flow across interfaces. The consequence of these gaps is the dilution of intent-to-results translation of what is measured. Commentaries from respondents give colours to these figures. There are several people who note that communication works best when the daily meeting cadence is disciplined and that the data from the line are visible on time and provide just enough information for quick decision-making. Conversely, whenever defect detection or a process deviation signal comes late, or is split among various systems, resolving issues becomes slow and re-introduction of errors becomes a real possibility. The relative strength of scores for commitment and engagement implies that people are not the bottleneck; rather, the fistful of constraints sits in the system linking people with problems, data, and authority.

4.3.2 Constraints to implementation

The recurrent barriers, or hindrances, respondents saw became the subject of their slow-moving or frustrated quality improvement work. Lack of training is the single most prevalent constraint at 55.7 percent. Another half of the sample betrays a lack of resources, and 47.1 percent admits resistance to change. Time pressure, poor communication, and insufficient communications affect 41.4, 38.6, and 10 percent of local concerns such as tardiness in supplier response and backlog in IT ticketing systems, respectively.

Table 4.5: Reported implementation challenges.

Challenge	n	%
Inadequate Training	39	55.7
Lack Of Resources	35	50.0
Resistance To Change	33	47.1
Time Constraints	29	41.4
Poor Communication	27	38.6
Other	7	10.0

Training and resource adequacy re-emerged as recurring themes in both the structured responses and the open-ended commentary. The overall message is clear: although employees demonstrate willingness to participate and leadership maintains visible support, gaps remain in skill depth and took availability. These capabilities are misaligned with the scale and ambition of quality improvement projects.

Resistance to change often arises when process owners are either replaced or constrained by tight production schedules. In such contexts, teams tend to default to established routines as a means of safeguarding output and minimising the risks of downtime or scrap. This behaviour should not be interpreted as opposition to

improvement, but as a pragmatic response to the prevailing operational reality, where schedule adherence continues to be the dominant performance measure.

From a managerial perspective, these insights suggest the importance of structuring improvement initiatives to include explicit provisions for learning. Campaigns should allow time for employees to acquire and consolidate new skills, and rollout processes should be staged to ensure that new work instructions are introduced gradually. Providing adequate shadowing, mentoring, and post-launch support can help to sustain engagement and reduce the risk of reversion to prior routines.

4.3.3 Digital quality tools and technology uptake

The survey looked at technologies in use on the lines and in support functions. Most often cited by 28.6 percent of respondents were tools for machine condition monitoring, Andon signalling, and a mobile Kanban application. About one-in-six respondents have the use of barcode scanners, Andon boards and digital work instructions. Vision systems and error-proofing sensors feature in just about one in seven responses, while statistical process control software and torque tools with data capture are barely acknowledged by slightly more than one in ten. The profile is consistent with a plant that has put into place basic visual controls and traceability in key areas and is now piloting more advance detection and analytics across some processes.

Table 4.6: Technologies in use (multiple mentions allowed)

Technology in use	Mentions	% of respondents
Machine condition monitoring	20	28.6
Andon	20	28.6
Kanban app	20	28.6
Barcode scanners	12	17.1
Andon boards	12	17.1

Digital work instructions	12	17.1
Vision inspection cameras	10	14.3
Error-proofing sensors	10	14.3
SPC software	8	11.4
Torque tools with data capture	8	11.4
Additional items	4	5.7
Other	4	5.7

Respondents rated digital technologies for quality improvement. Highest scores go to the digitalisation specialists who, logically, stress the connected tooling and data. Managers and shop floor staff do see the importance of technology, yet in their comments, the usefulness is coupled with reliability, ease of use, and integration into the workflow. From real experience, technology reward actually depend on whether the devices and software decrease cognitive load on the operator and produce clean signals for problem solving, as opposed to introducing yet more scrolls and screens that have to be maintained.

4.3.4 Benchmarking and continuous improvement practices

Most respondents hold benchmarking in good esteem. A score of 0.77 was reported by the benchmarking item on a 0-to-1 scale. Three written comments refer to activities such as layer tier meetings and layered process audits as part of its problem-solving cadence to ensure attention is given to quality metrics. Where these processes mature, the improvements solidify. If these processes are in flux, the same problems emerge for different reasons: either the corrective actions are not cemented, or the learning does not cross shifts. The motivation to do benchmarking seems to exist, but the institutional absorption and diffusion mechanisms to enable learning are unevenly strong.

4.3.5 Variation by role and project exposure

Effectiveness perceptions varied meaningfully by role. Digitalisation specialists believe in the highest effectiveness of quality improvement at 3.80, with middle managers at 3.50 and senior managers at 3.40. Shop-floor workers report fewer effectiveness at 3.16, which is in line with their much closer exposure to day-to-day obstacles. Eighty percent of managers and all the specialists indicate direct involvement in projects versus 64 percent of shop floor respondents. These patterns are unpacked in Table 4.7 and Table 4.8.

Table 4.7: Perceived QIP effectiveness by role

Role	Mean	SD	n
Middle Manager	3.5	0.97	10
Senior Manager	3.4	1.67	5
Shop-floor employee	3.16	0.98	50
Specialist in digitalisation	3.8	0.45	5

Table 4.8: Perceived QIP effectiveness by project involvement

Involved_in_QIP	Mean	SD	n
No	3.1	0.83	21
Yes	3.35	1.07	49

The gradient in the perception of effectiveness is compatible with the differences in enabling conditions reported by each group. Specialists rank management commitment and, more notably, advanced technology higher than the other groups. Shop floor respondents report lower adequacy of resources and weaker communication, plausibly lowering their rating of effectiveness. Senior managers point out a different pain point. They mention poor communication quite frequently, suggesting that cross-functional alignment and clarity of hand-offs need more deliberate attention at the departmental interfaces.

4.3.6 Relationships among enabling conditions and effectiveness

The bivariate correlation is modest but still informative between the enabling condition and perceived effectiveness. Effective communication has the strongest positive correlation with perceived effectiveness r = 0.17, followed closely by employee engagement at r = 0.14 and management commitment at r = 0.08. Much smaller correlations are found between advanced technology and effectiveness, at r = 0.05.

Interestingly, the correlations for adequate resources and quality culture are weaker and, in some cases, slightly negative. This outcome is likely because of measurement artefacts. In particular, resource allocations are often concentrated in areas already experiencing operational challenges, which can temporarily depress satisfaction scores. Similarly, perceptions of quality culture may reflect uneven implementation across departments, obscuring the longer-term impact of cultural enablers on sustained improvement.

Table 4.9: Correlations with perceived QIP effectiveness

Predictor	Correlation with QIP effectiveness
Q4_Effective_communication_1to5	0.17
Q4_Employee_engagement_1to5	0.14
Q4_Management_commitment_1to5	0.08
Q4_Advanced_technology_1to5	0.05
Q4_Adequate_resources_1to5	-0.03
Q4_Quality_culture_1to5	-0.1

The pattern indicates that communication emerges as the keystone variable in this context. When messages are clear, timely, and bidirectional, employee engagement is more readily converted into disciplined execution. Communication also serves as the primary channel for disseminating lessons learned and embedding standard work practices across shifts and teams, thereby amplifying organisational learning.

Technology can enhance this effectiveness by improving the accuracy and timeliness of information. However, when system integration is incomplete or when data is not

readily accessible at the point of use, these technological benefits remain underutilised, limiting their potential to reinforce quality improvement efforts.

Table 4.10: Perceived QIP effectiveness by experience band

Experience_band	Mean	SD	n
0-2 years	2.91	1.22	11
3-5 years	3.2	1	25
6-10 years	3.41	1	17
More than 10 years	3.47	0.87	17

Experience appears to be substantive. The perception of effectiveness increases with years of service, from 2.91 among personnel who had been there less than two years to 3.47 among those who had been there for more than ten years. This stands to reason, where workers are aware of production rhythms and have an institutional memory of what worked and what did not. They have stronger informal network connections and hence can diagnose quality problems more easily and navigate the organisation for help, whereas early-career workers mostly rely on instructions to follow and mentor availability, which increases the negative impact of training deficiencies and inconsistent communication across shifts.

4.3.7 Insights from open-ended responses.

Open-ended feedback reinforces the quantitative signals and adds a texture of how improvements are sought after. Several respondents explain how cross-shift training is valuable to keep quality stable after changes, especially when new work instructions or a fixture is engaged for the middle of the week. Others stress the importance of there being only one instance of the manufacturing execution system from a traceability point of view so that it interfaces tightly with enterprise quality workflows wherein non-conformances, corrective actions and supplier responses are traceable without reconciliation across platforms. A smaller cohort asks for supplier-side analytics to be improved such that variations can be anticipated, along with instances of coaching for line leaders on structured problem-solving.

Successes are also described; these interventions prevent defects. For instance, a torque defect was eliminated through vision checking, poka-yoke redesign, and a disciplined layered audit cadence. In another example, a supplier containment issue was addressed by revising acceptance levels and harmonising change control processes, with reduced line stops as one result. A separate team asserts that a cycle time imbalance was corrected by line balancing and quick-change thinking concerning bottleneck set-up, with a consequent measurable uplift in overall equipment effectiveness. They follow the same storyline-the quality gets better once teams have very clear intent, timely data, and authority to trial countermeasures, such that gains are sustained.

Requests for more resources sound more pragmatic than generic. Black belt-level coaching alongside advanced SPC training gets requested for a handful of internal champions. Some request more camera coverage of critical features, portable torque verification devices for on-line validation, more licenses for corrective action workflow tools, and refresher courses on measurement system analysis. What glues these requests together is the desire to develop the human capital that will work alongside investments in fit-for-purpose tools and those connective tissues that enable smooth information flow across the system.

In addition to the closed-ended items, respondents provided brief optional comments that help clarify the quantitative patterns reported above. These comments are not treated as a qualitative dataset for thematic analysis; instead, they are presented as illustrative clarifications of issues already captured in the descriptive statistics and group comparisons.

Consistent with the high frequency of training-related constraints in Table 4.5, several respondents emphasised the operational importance of cross-shift learning and on-the-job reinforcement when processes change or new work instructions are introduced mid-cycle. In line with the reported emphasis on communication and system usefulness, some respondents highlighted the value of having a single integrated traceability and quality workflow to reduce duplication and improve visibility of non-conformances and corrective actions. A smaller number of respondents pointed to supplier-side variability and requested stronger upstream monitoring and analytics, which aligns with the external constraint profile reported earlier.

4.3.8 Synthesis

The results portray an organisation that has put in place most of the right building blocks for quality improvement; there seems to be leadership commitment and employee engagement; digitalisation is underway in targeted areas, and benchmarking routines do take place. On the other hand, the system is plagued by uneven training depth, pinch points in resourcing, and communication gaps, both horizontally and vertically. The analysis points to practical levers management may pull building on daily management routines, sharpening communication at the interfaces, and sequencing technology investments to reduce operator burden, while enhancing both the visibility and the usefulness of real-time quality data.

4.4 Chapter Summary

This chapter set out the characteristics of the respondents and the empirical findings on the conditions that influence quality improvement in the case organisation. The sample leans toward the shop floor personnel, with strong representation at the managerial and specialist levels. Most respondents have a midcareer tenure, and most have direct project experience. Enablers such as leadership commitment and employee engagement appear at moderate to very high levels, but goodwill on resources and efficacy of communication remain on the weak side, serving as constraints. Missing training is cited as the most common barrier. Time pressure, change resistance, and poor communication feature high on this list as well.

Technologies in use are signalling, traceability, error proofing and analytics, etc. Their value is most perceived when tools weave into work and make information transparent just at the right moment. Benchmarking and daily improvement routines are commonplace in many areas, while consistent application brings about successful problem solving. Effectiveness perceptions grow with seniority and are directly related to project involvement and are lowest where operators face daily friction in resourcing or in unclear lines of communication. Communication has the strongest correlation with perceived programme effectiveness, cementing its role as the channel through which engagement and technology deliver results.

The findings help focus the attention of the discussion in the next chapter on three priorities, namely: first, develop an integrated capability system linking training,

coaching and accreditation to the actual pattern of change on the lines. Second, close communication impediments through interface simplification and real-time quality information at the point of use. Third, scale those subsets of technology that are proven to improve detection, prevention and response, while avoiding burdening operators with tools that force them on maintenance tasks without aiding judgement. These three priorities set up the recommendations made in Chapter 5.

Chapter 5: Discussion, Implications, and Recommendations

5.1 Introduction

This chapter discusses and interprets the findings of the study in relation to the research objectives and the proposed conceptual model, with an emphasis on their practical relevance to managerial decision-making's discussion goes beyond the presentation of results to critically examine how quality improvement projects influence productivity, quality outcomes, and operational efficiency within a South African automotive manufacturing context. Drawing on the cross-sectional survey results presented in Chapter 4, the analysis integrates descriptive statistics, group comparisons, and correlation analysis to explain observed patters and organisational implications. Given that the study was conducted in a single automotive manufacturing firm in the Eastern Cape, the findings are interpreted within clearly defined contextual and methodological boundaries, with due consideration of potential bias and limitations to broader generalisation. The chapter concludes by translating the empirical insights into actionable managerial implications and context-specific recommendations relevant to quality improvement practice in resource-constrained environments (Taherdoost, 2022; Daniel, Harland, and Wald, 2024).

5.2 Summary of Findings

5.2.1 Objective 1: To evaluate the impact of quality improvement projects on productivity, quality outcomes and efficiency within the South African automotive manufacturing sector.

The survey results and descriptive statistics indicate that quality improvement projects provide modest yet real gains, with perceived impact varying across different roles and levels. The mean value of perceived effectiveness is intermediate at 3.27 on a scale of 1-5 with a 1.01 standard deviation, indicating a non-trivial dispersion across areas and lines of responsibility. Digitalisation specialists have the highest mean perception of impact at 3.80, whereas managers register the mean perception at about 3.50 and shop-floor workers at 3.16. Those rated above 10 years of experience attribute impact with the value of 3.47, whilst those below two years give 2.91. These gradients show that experience and vantage point matter for impact perception, both in daily

operations and in management dashboards. This seems to fall in line with the earlier argument that improvement takes place where routines are stable, data are timely, and there is clear authority to act-improvements staff with great experience can secure, quite commonly (Oakland, 2003; Black & Roberts, 2019).

Perceived effectiveness correlates strongly with effective communication at r = .17, followed by employee engagement at r = .14, management commitment at r = .08, respectively. This suggests a minor positive correlation with advanced technology at r = .05. These coefficients, albeit weak, are evenly instructive. These would imply that impact is less mediated by the abstract notion of commitment than it is by message flow quality and instant feedback given at the arena of the point of work. This observation cuts right through lean and TQM literature, where sustained gains are lodged in the daily management system, and not within episodic campaigns while stressing visual control and short feedback loops as shared mechanisms for problem-solving through which projects go from ephemeral to permanent in terms of performance (Dombrowski et al., 2012; Oakland, 2003). It thus builds the case that engagement becomes meaningful when people have information in good time for action and when managers act to smooth friction between interfaces, as opposed to generic campaigns for engagement (Crook et al., 2011; Black & Roberts, 2019).

Enabling conditions in their composition account for the impact profile under view. Management commitment has a mean of 4.00, with employee engagement at 3.84. Adequacy of resources and communication rank lower at 3.43 and 3.40, respectively. Quality culture ranks in the middle at 3.47. These means show us the picture of an organisation that has articulated its intent for improvement and has mobilised the people but struggles to provide the best tools right when they are needed and to keep messaging crisp across functions. When these bottlenecks are addressed, project effects tend to strengthen in output, first-pass yield, and rework reduction. This pattern channels the resource-based and sociotechnical perspectives that concentrate on fit amongst human capability, routines, and technology, and that caution against a technology-first strategy that dismisses skill depth and workflow design (Barney, 1991; Hitt et al., 2001). It also supports the SB findings that potentials are realised when managerial discipline in routines meets targeted investments in enabling assets rather than from wide-sweep proclamations of intent alone (Maharaj, 2019; Black & Roberts, 2019).

5.2.2 Objective 2: To identify and assess the critical success factors that influence the implementation of quality improvement initiatives.

The survey identifies a pragmatic cluster of barriers that commonly intervene in shaping outcomes. Inadequate training is felt by 55.7 percent of respondents; lack of resources by 50.0 percent; resistance to change by 47.1 percent; time pressure by 41.4 percent; and poor communication by 38.6 percent. When seen as a coordinate system, these five constraints model one single underlying mechanism operating across all cases. Improvement work competes with output targets on tight schedules. With thin skills and little coaching, teams resort to familiar routines, delay surface at interfaces, and resistance is couched as risk management, rather than obstinacy. This interpretation broadly corroborates well-established findings that competence development, stable routines and visible leadership are the key courses of success towards sustainment, rather than one-off project launches or purchases of technology on their own (Dombrowski et al., 2014; Oakland, 2003). Several South African and emerging economy studies already show how resource constraints increase the costs of trial and error and force changes to be carefully staged with time for learning protected (see for example Makgato & Ojah, 2018; Maharaj, 2019). Performance scores for enabling conditions appear to fit well with this mechanism. Management commitment and engagement are not the limiting factors. Bottlenecks exist in training, resourcing, and communication quality.

The issues of correlation thereby strengthen communication as the keystone through which engagement becomes effective and learning works across shifts. Literature is unambiguous on transparent information flow supported by tiered visual management keeping improvements on track by making visible the current condition, the gap, and the owner for action at cadence, which coheres well with respondents' description of daily meetings functioning well or otherwise in practice (Dombrowski et al., 2012; Oakland, 2003). Broadly speaking, clusters of resources complement these findings by stating that firms win if they configure their human capital and process routines in ways that their competitors have difficulty in imitating, meaning here accredited problem-solving skill, cross-training, and solid hand-offs that survive through turnover and tectonic schedule volatility (Barney, 1991; Crook et al., 2011). Digital tool uptake remains a success factor, because it reduces the costs and speeds up detection and response. The next most common tools, each at 28.6 percent of respondents, were

Andon, machine condition monitoring, and Kanban App, while barcode scanners, Andon boards, and digital work instructions were next at approximately 17.1 percent; vision systems and error-proofing sensors were shown at roughly 14.3 percent. These adoptions cannot be discounted, as they can provide for signalling and traceability and, if integrated, help operators to act on the right information at the right time. The picture painted by our correlation, however, indicates a very slight impact of technology. This finding aligns well with those studies from the Industry 4.0 where it is reported that isolated equipment amounts to little if it does not produce clean signals and if human-system interaction increases workers' cognitive load rather than reducing it by providing context (Bousdekis et al., 2021; Ligarski et al., 2021). Consequently, it is the integration of technology into usability measures along the rhythm of work which constitutes the critical success factor.

5.2.3 Objective 3: Develop an empirically grounded quality-improvement framework for South African automotive manufacturers, informed by evidence from an Eastern Cape case study.

The proposed framework is derived from the quantitative patterns observed across the enabling conditions, barriers, technology uptake measures, and perceived effectiveness indicators. Specifically, the framework prioritises the variables that show the clearest alignment with perceived programme effectiveness in this sample, together with the most frequently reported implementation constraints. In this way, the framework is empirically grounded in the case evidence while being formulated for application to South African automotive manufacturers more broadly, subject to contextual adaptation and further testing in additional settings.

Since this structure springs forth from the data, not a template, the strongest association in the survey is between communication quality and perceived effectiveness, which anchors Layer 1. The next most common constraint is training inadequacy, which anchors Layer 2. The positive association on technology and the pattern of tool mentions set the anchor for Layer 3. The framework is consistent with socio-technical design theory that sees performance improvement when the technical system and the social system are designed jointly and not when either dominates (Hitt et al., 2001; Oakland, 2003). Layer three reflects resource-based reasoning that values configuration and complementarity over individual assets, here exemplified by

how training, routines, and technology complement each other toward reliable problem-solving (Barney, 1991; Crook et al., 2011). Lastly, it recognises the realities of South African plants where budgets, skill supply, and supplier responsiveness impose constraints that dictate staged change and hence practices that hold under pressure (Maharaj, 2019; Makgato & Ojah, 2018).

5.2.4 Objective 4: Propose actionable recommendations for managers and policymakers to enhance quality improvement outcomes in resource-constrained environments.

From these findings flow five programmatic moves that the managers can adopt for the next planning cycle. First, it is necessary to stabilise daily management by standardising tier meetings and visual boards, with explicit owners and closure discipline. The second aspect would involve pushing an accreditation ladder for core quality skills, with a small internal faculty of coaches who carry on assessments in the workplace interlinked with project milestones. Third would be to minimise cross-functional friction by clarifying hand-offs for change control, non-conformance management, and supplier response, and by aligning KPIs so that schedule adherence does not swamp defect prevention. Fourth would be to invest in the barest digital spine that ties in Andon, incident logging, camera checks, and very simple mobile workflows. Fifth would be to protect learning time by scheduling shadowing post-changes and by recognising resistance as often reflective of schedule risk rather than of outright indifference. Such levers correspond to the enabling condition profile of the plant and to what the literature insists on-healing communication, capability, and straightforward technology integration offer the surest amplification in intervention-limited setups (Dombrowski et al., 2012; Bousdekis et al., 2021). Policy makers and sector bodies can put flesh on these bones by funding targeted capability programmes, facilitating benchmarking networks, and supporting vendor-neutral platforms that small and medium-sized suppliers can embrace without a punitive lock-in (Makgato & Ojah, 2018; Ligarski et al., 2021).

5.3 Discussion of Implications

Two-fold are the implications for theory: the results do confirm the core propositions of resource-based and socio-technical analyses but indeed highlight communication as a key capability. The data establish leadership intent and engagement as preconditions, but insufficient to guarantee action; rather, the means of turning intention into action is through good-flow messaging at the point of work experiences, enhanced minimally, but reliably, by digital integration. This weighs communication routines strongly enough to elevate them to a theoretical construct mediating between resources and performance-fitting, but extending lean and TQM explanations of daily management (Barney, 1991; Dombrowski et al., 2012). The framework presented here thus goes further than earlier models by privileging the design of communication as that medium through which human and technical assets become productive in volatile environments (Oakland, 2003; Crook et al., 2011).

Direct practical implications ensue. A manager must first stabilise daily management activities and coaching, then technology that directly lessens cognitive load and closes the loop between detection and response. A technology project progressing with no parallel redesign of routines or skill development is unlikely to bear results, just as the almost non-existent correlation between technology and effectiveness implied. Policymakers and industry bodies ought to support shared capability initiatives and straightforward interoperability standards in order to help plants and suppliers co-evolve. Many faults and delays cascade across firm boundaries. In short, the implication suggests avoiding mounting grand platforms and instead to develop disciplined routines, targeted skills, and a light digital spine making quality information viewable to people who have to act upon it (Bousdekis et al., 2021; Ligarski et al., 2021).

5.4 Recommendations

Recommendations for practice follow from this three-layer framework and from the specific constraints reported by respondents. Managers may wish to codify and enforce a daily management cadence that facilitates rapid learning. Area heads should conduct a short tier meeting at a fixed time with a visual board juxtaposed against the previous day's performance, current gap to plan, top three quality issues with owners

and due dates, and status of countermeasures. The meeting closes open actions before assigning new ones. This routine cascades upwards at one level, so that unresolved cross-functional causal issues are raised for ownership by the next tier. This recommendation derives directly from the correlation of communication and effectiveness-well underpinned by actual lean practices for sustained gains (Dombrowski et al., 2012; Oakland, 2003).

Capability development ought to take the form of an accreditation ladder comprising short modules online and face-to-face, with practical assessments on live projects. The first tier covers problem definition, basic data collection, visual analysis, and standard work. The second addresses root cause analysis, measurement system analysis, and error proofing. The third level prepares an internal coach cadre that supports teams and mentors new staff. Human resource departments ought to reward accreditation in performance reviews. This way, human capital is treated as a strategic resource that loses its value until embedded in routines and relationships, consistent with resource-based theory (Barney, 1991; Crook et al., 2011).

Cross-functional handoffs ought to be simplified and enforced. Change control must require only one form affected by all functions as to explicit approval states and roll-back plan. Non-conformance and corrective actions ought to be done for a single system with their statuses, owners, and due dates visible without reconciliation over the platforms. Supplier response times must be bound-side and escalated through recognised pathways. These process modifications shorten detection-response times, which were noted in open-ended answers as a constant pain point, and respond to the 38.6%, who cited poor communication as a constraint. They also curb the contextual situations that make resistance justifiable as risk management.

Technology investment ought to adhere to the maximum first principle of min-connectivity instruments. Plants should link Andon to incidents that note a small root cause map and due date, such that signals will not get lost in production highs. Camera checks ought to focus on critical features with the longest history of defects and simply push an accepting or rejecting signal to the operator and the tier board. Mobile-oriented forms should bridge detection and logging distances and trigger escalation if due times fail. Following this, sophisticated and forward-thinking analytical processes are then undertaken. In this way, usability comes before breadth, saving the trouble of

multiplying screens and manual entries that continue to burden without delivering timely intelligence (Bousdekis et al., 2021; Ligarski et al., 2021).

Policymakers and sectors can support practice by underwriting shared training for small and mid-sized firms, convening benchmarking networks that come together once every quarter on the plant floor instead of conference halls, and encourage vendor-neutral interoperability for incident and quality records so that suppliers and assemblers can share signals with no lock-in. This approach acknowledges that a value chain is only as strong as its weakest information node, and that a lot of South African suppliers carry the same resource constraints as the focal plant (Makgato & Ojah, 2018; Maharaj, 2019).

Recommendations for further research naturally emerge from the study's scope and methods. Cross-sectional surveys capture perceptions at a fixed point in time. Longitudinal design following a specific improvement project across its life cycle would assist with stronger inference on decaying causality. Mixed method studies, joining sensor traces, and incident logs to ethnographic observation on the line, would shed light on how information flows and why some countermeasures persist while others fade. Comparative studies across plants with different product mixes and supplier networks would illuminate what parts of the three-layer framework are universal, and which are contextually defined. Finally, intervention research, which tests the accreditation ladder and the minimal digital spine in a controlled implementation, could define effect sizes and offer practical playbooks for plants in similar constraints (Creswell & Creswell, 2018; Taherdoost, 2021).

5.5 Limitations of the Study

Several limitations should be taken into account when interpreting the results. Firstly, the data was gathered from the respondents in one automotive manufacturing organisation that is found in the Eastern Cape. This limits the external validity of the findings and calls for the results to be generalised cautiously to the wider automotive sector of South Africa. Replication in numerous plants and locations would provide secure belief in the sturdiness of the patterns under observation (Daniel et al., 2004; Saharan et al., 2004).

Secondly, the study used three types of self-reported variables to measure enabling condition, barrier, and predicted effect, respectively, showing that the measures are good enough to capture organisational conditions that are not directly observable from operational records; however, they suffer from response bias and a threat from common method variance. Future investigations should consider inference strength by matching their survey responses with some objective indicators of defects, rework, downtime, cost of poor quality, or audit results (Taherdoost, 2022; Mishra & Alok, 2022).

Thirdly, the cross-sectional design has little capacity for causal inference; the instances of relationship statistics given in Chapter 4 give association, not directionality, thereby preventing proof that a given factor causes another. A longitudinal design or repeated measures over improvement cycles would provide better support for causal claims regarding temporal analysis of implementation effects (Taherdoost, 2022; Daniel, Harland & Wald, 2024).

Another gap that the technology inventory reveals is merely a descriptive representation of the tools in use across the case studies and gives an indication of perceived usefulness, but it does not capture the depth of integration, quality of configuration, or maturity of use, all factors that also may influence realised performance. Therefore, further research may want to operationalise integration maturity more explicitly and test its relationship to QIP effects (Saharan et al., 2024; Mishra & Alok, 2022).

So, the framework has been empirically verified for the study design and endorsed for its close alignment to the conceptual model. Yet, it requires further testing across several South African organisational contexts to confirm its robustness and cross-usage applicability to various other setups in the South African automotive manufacturing industry (Conaty, 2021; Daniel, Harland & Wald, 2024).

5.6 Conclusion

This study was initiated to analyse an automotive plant in South Africa regarding the applied quality improvement projects and to determine the critical success factors affecting implementation with which to construct a context-sensitive framework and provide managers and policymakers with concrete recommendations. The various strands of evidence stitch together into one coherent picture. There is some commitment at the leadership level and a willingness to engage. However, training depth, resource availability, and quality of interface communication form the primary bottlenecks. A good perception of effectiveness is gained through a long tenure and hands-on exposure to projects. Communication in its practical sense demonstrates the strongest association with effectiveness, then follow engagement and leadership commitment, while technology standing alone shows limited effectiveness. Digital technology within this context needs to be something that is connective and usable in-the-flow-of work. The three-layer framework of daily management, capability and connective technology was proposed and derives directly from these findings, reinforcing established theory while making communication the foreground through which resources become results (Barney, 1991; Oakland, 2003).

These contributions are of a dual nature, encompassing two distinct aspects. Empirically, this study extends South African evidence of what makes improvement stick in resource constrained plants and provides a pragmatic framework that managers can implement without the wait for big budgets. Theoretically, it lends support to the idea that message flow is a strategic capability in sociotechnical systems and that the measured value of digitalisation depends on integration with routines and coaching. The recommendations themselves are specific and actionable, and posit sector bodies and policymakers in the role of building shared capability and interoperability. The limitations of the study, though real, together with their implications for further research planning, capable of testing and refining the framework, present an important research agenda. The value of this research rests in its unapologetic clarity and insistence that disciplined routines, focused capability, and lightweight connective technology can sustain quality improvement within the actual resource constraints of South African manufacturing. That is an agenda both practitioners and researchers can collaborate in the next reincarnation of work (Bousdekis et al., 2021; Ligarski et al., 2021).

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Appendix A

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30 July 2025

Mr Mongi Ka-Siphiwo

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Review Reference: 2025-7707-10084

Dear Mr Mongi Ka-Siphiwo,

Title: Implementing Quality Improvement Projects in South African Automotive Firms: A Case Study of an Eastern Cape Automotive Manufacturer.

Researcher: Mr Mongi Ka-Siphiwo

Supervisor(s): Mr Evert Knoesen

This letter confirms that the above research proposal has been reviewed and **APPROVED** by the Rhodes University Human Research Ethics Committee (RU-HREC). Your Approval number is: 2025-7707-10084

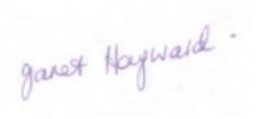
Approval has been granted for a period of one year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying you when the annual report is due.

Please apply for a protocol amendment should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Email your request to ethics-committee@ru.ac.za.

Please submit a brief report to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of.

If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloguing number allocated.

Sincerely,



Dr Janet Hayward

Chair: Rhodes University Human Research Ethics Committee (RU-HREC)