Leadership challenges experienced by engineers transitioning into management roles in manufacturing in South Africa

21818992

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

7 March 2023

Abstract

The literature suggests that the transition from self-leadership to leading others is a complex and challenging one for leaders, particularly the transition from engineer and technical professional to manager. The difficulty of this transition is attributed to the shift from a functional role to a leadership role, as well as the need to develop new skills, acquire new knowledge, and gain experience in leading people. Additionally, the leader may also encounter resistance from their team during this transition, which can manifest in different ways, including difficulty in delegating tasks and creating an effective team dynamic. As a result, it is essential for leaders ascending from the ranks of technical divisions to be cognizant of the various aspects of this transition and develop strategies to effectively manage it.

A qualitative study comprised of twelve semi-structured interviews with engineers and technical professionals who had successfully made the transition was conducted. The research analysis yielded several key insights, which can provide individuals and organisations with the necessary guidance to assess which factors are crucial when transitioning from one role to another. The results suggested that the most important element is to possess the right balance of technical capabilities and leadership competencies. Moreover, the participants in the study also indicated that receiving mentorship, having the opportunity to observe effective leadership, and having advisors can provide support during the transition, while feedback from peers and superiors can also help new leaders become better acquainted with their new role. Additionally, evidence supported the notion that a successful transition requires individuals to be open to change and be willing to learn from their mistakes.

This research provides a model that can effectively support South African engineers and technical professionals in their leadership journey. Additionally, it can provide guidance to South African engineers and technical professionals and organisations on how to best prepare for, or plan for, a successful transition to leadership roles. Finally, this research encourages further investigation into similar contexts, thus allowing for the transferability of these results to other sectors as well.

Key words

Career transition, leadership development.

Declaration

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

Student number: 21818992

Date: 07 March 2023

Table of Contents

List of Tables

List of Figures

Appendices

Chapter 1: Definition of problem and purpose

1.1 Introduction

Business-to-business spending on manufacturing in Africa is projected to reach $666.3 billion by 2030, $201.28 billion more than in 2015 (Signé, 2018). For any given country, the importance of industrial development lies in its ability to generate employment opportunities, provide educational opportunities, encourage advancement, and better utilize resources. Consequently, industrial development is highly beneficial to both a population and its local economy which are especially important for South Africa given the country's high levels of unemployment and poverty (Kruse, Mensah, Sen, and de Vries, 2021).

South African leaders and managers need to prioritize industrialization in order to expand the manufacturing sector. However, an organization is only as good as its leaders and managers, and it is essential to have the right leaders and managers who will enable industrialization.

Generally, the leaders and managers in the manufacturing sector come from engineering and technical professional backgrounds. Engineers who become managers often find themselves unprepared for the next level of management, which is primarily about people. Engineers and people with strong technical skills find the transition into management especially difficult (Wilde, 2009). Reh (2018) argues that while not every excellent engineer or technical specialist goes on to be an outstanding manager, it is thus all the more crucial for organizations to assess and identify management potential of engineers early on in their career. This enables a smoother transition in the long term, with less negative impact on the organization.

The purpose of this study is to investigate the difficulties engineers come up against when they move into management and leadership positions in the manufacturing industry in South Africa.

1.2 Background of the research topic

A typical manager in manufacturing spends a large portion of their time interacting with people, therefore an understanding of human behavior is more critical for them than knowledge of technical details. Typically, they are more team oriented, and they direct and coordinate the work of others to reach the goals set by the organization (Nittala and Jesiek, 2018, October). According to Custovic and Insaurralde (2016), a lack of effective leadership is detrimental to organizational sustainability, but effective leaders in the manufacturing sector are in short supply.

According to a report by Deloitte in 2019, only 35% of manufacturing executives rated their leadership development programmes as excellent or very good. Additionally, a study by

McKinsey & Company found that only 16% of frontline leaders in the manufacturing industry felt that their training and development programs fully addressed their needs (Schwartz, Hatfield, Jones, and Anderson, 2019). These statistics demonstrate that there is a critical need for effective leadership in the manufacturing sector, but organizations are struggling to provide the necessary development programs. As the South African manufacturing industry struggles to regain its footing amidst various challenges such as Covid-19, power disruptions, and economic downturn, it has experienced a noticeable dip in recent times. It is against this backdrop that the need for new managers to be equipped with the right knowledge and skills cannot be overemphasized. Indeed, new managers in the manufacturing industry must grapple with the task of navigating the industry's growth trajectory, which is not always straightforward (Bhorat, and Rooney, 2017). Therefore, it is crucial that these managers have an accurate understanding of the current state of the industry, as well as the strategies and tools needed to overcome the various challenges it presents. While it may seem that the rate of growth is rapid, compared to other industries, the statistics show a decline. As engineers and technical specialists transition into leadership roles to manage this growth, it is crucial that they are equipped with the necessary skills to lead effectively. Without proper preparation and support, this transition can lead to unsuccessful outcomes, which can be detrimental to the industry and the economy as a whole (Nittala, and Jesiek, 2018, October.

As the manufacturing sector, expansion occurs at a rapid rate. Engineers and technical specialists must transition into leadership roles at a correspondingly quickened pace, but this transition is often unsuccessful (Nittala and Jesiek, 2018, October). When an engineer or technical specialist is promoted to a more senior level in the organization, they will assume more responsibilities and experience a leadership transition. As Custovic and Insaurralde (2016) have noted, this may present various challenges, which include the expectation that the incumbent will be able to "hit the ground running", deal with increased levels of complexity and uncertainty, exhibit a greater level of emotional intelligence, work with longer time horizons, and step out of their comfort zone as a specialist to take on strategic challenges. The challenge engineers or technical specialists experience is in preparing for the transition to higher leadership levels.

The success of an engineer's transition is significantly impacted by the scope of organizational support they receive. Providing support to engineers or technical specialists during the transition into senior leadership levels allows them to focus their time and energy on issues they can influence. For South Africa to improve economically and have success on the international economic stage, organizations need to extend this support. Many studies have shown that there is a lack of knowledge about the challenges that engineers and technical professionals face during their transitions to new roles. This lack of understanding is

further complicated by the limited support that organizations provide during these transitions. According to a report by the Society for Human Resource Management, despite a general acknowledgement of the importance of supporting employees through transitions, only 27% of organizations have a formal career transition programme in place (Cohen, 2007). This lack of programmatic support puts the onus on individual employees to navigate these significant professional shifts without adequate guidance or resources. Additionally, research by the Center for Creative Leadership has shown that employee frustration and stagnation can significantly increase during times of change, potentially undermining the long-term success of both the transition and the organization itself (Harris, 2009).

The guiding research question for this study is: what are the experiences of engineers and technical professionals during the transition into leadership and management positions?

1.3 Research problem

South African manufacturing companies need entry level managers who can work in multi-functional and multi-cultural teams, lead small work groups, and understand the business and societal impact of engineering decisions in order to stay competitive in the global economy. The field of engineering is ever-evolving, and it is essential for every engineer to keep up with the latest skills and technologies to prosper in their career. Organisations may need to understand the importance of skill development, especially considering the mounting pressure to meet the requirements of digitisation and globalisation (Harris, 2009). Many engineering graduates are being urged to take up roles that demand proficiency in skills such as critical thinking, communication, problem-solving, and team collaboration to drive innovation and project success. As such, individuals, educational institutions, and industry players must work hand-in-hand to raise well-rounded engineers equipped with the skills needed to meet the demands of the future job market. The career of a traditional engineer has typically been split into two deferent paths namely technical and managerial. The focus of engineers is mainly on things that are technical or scientific. They solve problems by using known procedures that are based on physical laws. They are autonomous and their achievements come from completing one project at a time. It is not until at least five years into their career that an entry level engineer would elect to pursue one path or the other. Consequently, it is usually not until they have entered a leadership role that only a minority of engineers who have the desire to develop skills in management and leadership. The objective of this research is to enhance the comprehension of the difficulties encountered by engineers or technical specialist when they enter management roles, so that businesses can more accurately target the development of key leadership and management skills.

1.4 Research relevance and motivation

According to a study conducted by Harvard Business Review, many individuals struggle with the transition from technical specialist to manager or leader (Zaleznik, 2004). There are new behaviors and competencies required for this transition and therefore, when this transition goes poorly, it has a negative implication for both the individual and organization (Aucoin, 2018). Without the necessary skills for management, it becomes more of a challenge to successfully transition into a leadership role. The research problem at hand is the difficulties experienced by engineers who have proven themselves effective at specialist roles, and are required to take on a leadership role involving others, for which they lack the necessary skills and experience. By understanding the challenges and factors involved in a successful transition, engineers can reach their career progression goals and help organizations support their employees more effectively, which will translate to successful organizations.

The goal of this research is to gain more insight, particularly from the perspective and experiences of engineers and technical professionals who have transitioned into a management and leadership role. The research design sought to make additional contributions to the current body of knowledge in order to provide key insights to both individuals and organizations about successfully transitioning into a leadership role from a specialist role. Additionally, the research aims to offer recommendations to organisations and individuals who face challenges during this process. The difficulties organizations and individuals endure during leadership transitions are still frequent and often culminate in failure despite the wealth of literature and theories on the topic.

Furthermore, the purpose of this research will be to provide information to engineers and technical professionals and the organizations that employ them, regarding the factors necessary to support them during their leadership journey. The research will investigate both the challenges that engineers and technical specialists face, as well as the supporting factors in their leadership transition journey. Continuing with the investigation into the challenges faced by engineers and technical specialists during their leadership transition journey, this research builds on previous literature reviewing the factors that contribute to their success in these roles. Specifically, the researcher aimed to contribute to academic debates by analysing the impact of mentorship and training programs on the leadership skills and mindset of these individuals. By identifying the most effective methods for supporting and preparing technical specialists for leadership roles. Additionally, the researcher aimed to provide insights into the factors that determine a successful transition, identify potential interventions that can be leveraged to mitigate challenges, and make recommendations for future research opportunities in this field. Ultimately, this research aims to contribute to the body of knowledge on leadership transition and provide practical tools for companies to support their technical specialists' progression into management roles.

1.5 The purpose of the research

The research study was primarily focused on identifying the leadership challenges experienced by engineers or technical specialist transitioning into management role in manufacturing in South African. The secondary purpose of the research was to understand how organizations manage the career transition for engineers or technical specialist. Furthermore, identifying the managerial potential of engineers and technical specialists transitioning into management roles in the manufacturing industry is essential for organizations to make informed decisions regarding promotions and career development. Currently, many organizations lack adequate tools and assessments to identify an individual's potential for success in a managerial role. By understanding these gaps, organizations can develop targeted training, mentoring and support programs to assist these individuals in their career transition and overall success in their new roles. This research will contribute to existing literature on effective leadership development in technical industries and provide insights to organizations for improving their talent management strategies.

Chapter 2: Literature Review and Theory

2.1 Introduction to literature review

Engineers in the manufacturing industry are frequently promoted to managerial positions as a result of natural career progression (Rottmann, Sacks, and Reeve, 2015). According to Halliday's early research in 1996, engineers or technical specialists are frequently promoted to management positions within the first five years of graduation. However, due to individuals' lack of experience, promotion at this early stage in their career into leadership roles can result in poor performance for a range of reasons. According to research into engineers' advancement in management conducted by Thurasamy, Lo, Amri, and Noor, (2011), an individual's technical ability is insufficient to ensure their selection or promotion into a management role, as it does not guarantee that they will be an effective manager. Despite the fact that engineers or technical specialists frequently fill management roles in the manufacturing environment, the challenges of transitioning into a managerial position are frequently misunderstood (Aucoin, 2018).

This study's goal is to better understand the leadership challenges that engineers face when they take on management roles in South Africa's manufacturing industry. Though all young professionals will face career advancement, they frequently suffer from being unprepared to deal with the major challenges they face (Kelley, 2014). Being promoted into a leadership role typically comes with more work and responsibilities, not only for task execution but for performance of others. Often the first reaction of a technical manager promoted into a leadership position is to try to control every activity to mitigate the stress experienced through increased responsibility, but this approach is typically ineffective (Aucoin, 2018). As teams grow in size and objectives become more complex, task delegation by managers as a core leadership skill becomes more critical, and the inability to do this can result in catastrophic failures. Giving others the authority, responsibility, and accountability to act on your behalf is only one element of effective leadership. Leaders are also expected to make difficult decisions even when faced with uncertainty and ambiguity. To align teams behind a common goal, good leaders must also be able to empathize with those they lead while providing a clear vision of success and direction. Effective leadership necessitates a blend of wisdom, emotional intelligence, and critical thinking, allowing leaders to inspire their followers to strive for excellence and achieve their objectives (Kouzes and Posner, 2012). These are not typically skills which engineers acquire during their education and early career training and experience. This literature review will explore the discussions on the development of engineers and the challenges and enablers they experience in transitioning into leadership roles.

2.2 Engineering as a career

2.2.1 Global, African, and South African trends in the engineering profession

Globally, technological advancements and the need for greater efficiency and sustainability drive the engineering profession. As a result, new fields such as artificial intelligence, virtual reality, and robotics have emerged, opening up new avenues of exploration for engineers (Sultana and Turkina, 2020). The engineering profession in Africa is experiencing a surge in demand for innovative solutions to the continent's problems, such as water scarcity and access to healthcare. South Africa's sector has been bolstered by increased public and private sector investment, resulting in the rise of new areas such as advanced manufacturing, renewable energy, and transportation systems (Cumming, Shackleton, Förster, Dini, Khan, Gumula, and Kubiszewski, 2017). Furthermore, the global and African engineering fields have seen a significant increase in the manufacturing sector. Engineering labour in the manufacturing sector grew 5.1% in the United States (US), 5.2% in Africa, and 5.4% in South Africa in 2019 (Newfarmer, Page, and Tarp, 2019). This indicates an increase in demand for engineering services in the manufacturing sector, particularly in Africa and South Africa. Engineering advances in the manufacturing sector are widely regarded as critical for the continent's future economic development and prosperity.

While the United States' National Academy of Engineering (NAE) states that there is no single definition, they acknowledge that engineering is often referred to as "science application" and is the process of taking ideas and turning them into tangible products (Cheville, 2014, June). According to Jamshidi (Ed. 2017), engineering is the application of scientific principles to the creation of societally useful products and systems. The Accreditation Board for Engineering and Technology (ABET) in the United States supports these ideas, describing it as a profession in which one applies "knowledge of the mathematical and natural sciences gained through study, experience, and practice" to utilise natural materials and forces for the benefit of society (Ezeldin, 2013). Lobb (2021) believes that engineering is responsible for almost all advances in human civilization and that engineering should be used to benefit people and contribute to their well-being.

Manufacturing is a critical component of the engineering profession, both globally and in Africa and because of the increased emphasis on manufacturing in today's global economy, engineering managers are especially important (Casalino, Cavallari, Marco, Ferrara, Gatti, and Rossignoli, 2015). Particularly, there has been an increase in African manufacturing, with countries such as South Africa seeing an influx of new engineering positions. Because of the increase in engineering positions, experienced engineering managers are needed to oversee operations and ensure optimal performance. Furthermore, engineering managers are required

to provide personnel leadership and direction, coordinate resources, and provide technical project support. The number of engineers in Africa is expected to rise from 5.5 million in 2020 to 7.1 million by 2030, representing a 28% increase (Mukhi, Rana, Mills-Knapp, and Gessesse, (2020). To achieve this goal, countries in the region have been implementing a variety of initiatives to attract and retain engineering talent, as well as to create a conducive environment for engineers to thrive (Maheshwari, Gunesh, Lodorfos, and Konstantopoulou, 2017). Given the continent's abundant natural resources, engineering is a critical profession for ensuring economic development and stability. By properly training and incentivizing engineers to work in Africa, the region will be able to benefit from their knowledge and expertise in harnessing these resources and creating new jobs and investment opportunities. As a result, as engineers are empowered to create sustainable solutions for their communities, the quality of life in Africa may improve.

2.2.2 Engineering education and training

The engineering curriculum in South Africa is commonly known to be rigorous and demanding. In comparison to other majors, most engineering curricula involve a difficult course load, a heavy emphasis on mathematics and sciences, a fixed sequence of prerequisites, and limited opportunities to take courses outside the major (Lichtenstein, 2010). According to Desai and Stefanek (2017), 40-60% of students who enrol in an engineering programme will complete their studies within six years. As a result, engineering schools serve as a formidable barrier to entry into the engineering profession. Engineering courses are notoriously difficult, and as a result, engineering students frequently experience elevated levels of anxiety. When compared to other students, engineering students spend more time in their classrooms, labs, or study spaces, which fosters a sense of community among them while also creating a divide between them and their non-engineer peers (Seron, Silbey, Cech, E, and Rubineau, 2015). Engineering is frequently viewed as a highly technical and insular field that is not always welcoming to those outside the profession (Barabas, 2015). Such perceptions are supported by researcher Brunhaver (2017) who discovered that engineers create an engineering culture that is often perceived as isolating and unwelcoming due to their dedication to their studies, long hours, and commitment to independent workspaces. As a result, engineering is commonly perceived as a highly technical field that does not require the use of "softer skills" such as communication and collaboration (Brunhaver, 2017).

The engineering curriculum has come under fire for failing to adequately prepare students for today's job market. Overemphasis on technical fields such as science, mathematics, problem-solving abilities, and analytical abilities has come at the expense of social, communication, and other professional abilities. The academic debate started as early as in the 1990s, where the ABET collaborated with industry and academic leaders to create a new

set of engineering programmme standards. The standards were aimed at ensuring that engineering students learned the communication, collaboration, and critical thinking skills required to work effectively in today's increasingly complex and interdisciplinary sociotechnical workplace (Volkwein, Lattuca, Harper, and Domingo, 2007). To meet these standards, engineering programmes introduced leadership, problem-solving, communication, diversity, innovation and creativity, management and organizational behaviour, professional ethics, and other professional skills in addition to the previously required math, science, and technology foundation. Instead of adding to an already overburdened curriculum, it was anticipated that the content and activities required to achieve those objectives would be included in existing courses and instructional practices. Indeed the study by Volkwein et al. (2007) found a noticeable increase in collaborative work and student group projects in the majority of engineering programmes compared to the previous decade, with no reduction in the core curriculum; employers reported a slight increase in the communication and teamwork skills of more recent graduates. However, Brunhaver (2017) states that despite these changes in curriculum, a gap still exists between what industry requires and what engineering programmes provide. The gap appears to relate most substantively to the management skills that engineers require as they progress in their careers.

2.2.3 Engineering career progression to management

Engineering has long been viewed as a technical field, and management of technical fields, such as manufacturing, have traditionally been viewed as requiring that same technical knowledge. Recent literature by Custovic and Insaurralde (2015), however, has begun to call this assumption into question, suggesting that in order to effectively manage teams of engineers, a manager must also have adequate people skills. This shift in emphasis from technical to people-oriented is a significant challenge for engineering managers, who must now acquire both technical and people-management skills to effectively lead their teams. A study conducted by Müller, Geraldi, and Turner, (2011) demonstrated that the ability to understand engineering principles as well as manage interpersonal relationships is essential for a successful engineering manager. A deeper examination of this research revealed that certain personality traits, such as conscientiousness and agreeableness, were also linked to successful engineering management, emphasizing the importance of people-oriented skills in this field. As a result, if engineering managers are to excel in their roles, they must have a combination of technical understanding and social competencies.

2.2.3.1 From technical to people orientation

In manufacturing, technical management and team leadership face different challenges when it comes to technical and people orientation. Typically, technical orientation emphasizes

the development of technical skills, understanding the engineering process, and responding quickly to technological changes (Rybakova, Vinogradova, and Sizikova, 2020, January).

People-orientation, on the other hand, emphasizes a focus on interpersonal dynamics, relationship building, and collaboration facilitation. This type of orientation necessitates strong communication skills, a commitment to problem solving, and the ability to deal with complex human dynamics (Rybakova, Vinogradova, and Sizikova, 2020, January). Engineering managers must have a high level of technical expertise in addition to the interpersonal and administrative skills required for all management and leadership positions (Aslan and Pamukcu, 2017). Furthermore, technical ability is highly valued and required to maintain credibility with co-workers, subordinates, and other stakeholders. Technical knowledge is required to provide the necessary oversight and direction to the specific aspects of the work being done (Hartmann and Jahren, 2015).

Because of the requirement for an expert level of technical talent, the best technical performers may be chosen for managerial positions more frequently, and businesses are willing to accept a lower level of management competency. According to Aucoin (2018), there is a clear trade-off between managerial level and technical proficiency. Engineers who want to advance in the organization must learn more managerial and leadership skills as they move into managerial roles (Elsbach and Stigliani, 2018).

According to Rottmann et al. (2015), engineers have a natural tendency to rely on machines rather than humans when solving problems, often attempting to make tasks more efficient by replacing people with technology. This natural inclination can be detrimental, as machines are not always able to complete tasks in the same way that humans can. According to Harari (2014), machines lack the ability to think creatively and intuitively, which can be a critical factor when dealing with complex, unpredictable tasks. Therefore, engineers need to understand that a mix of human and machine elements is often necessary to optimize efficiency and results. To maximize efficiencies and outcomes, engineers need to appreciate the importance of combining machine elements with human capabilities, where possible. One example of this could be in the field of medicine, where diagnostic machinery can provide data and insights that are only possible with the use of advanced technology, but human medical professionals can utilize their critical thinking skills and training to make final diagnoses and decision-making.

By understanding the value of both people and machines, engineers can create systems that use each to its fullest potential. This assertion is especially pertinent when considering the advancement of engineering personnel to managerial or leadership positions. This is understandable given that it is estimated that between 30% and 50% of engineers will hold managerial positions at some point in their careers (Aucoin, 2018). Engineers who are more

at ease with machines than with people may struggle to manage teams of human workers. This highlights the difficulty that engineers face when assuming leadership roles, as they must adapt to a new and different working culture.

Engineers can, however, improve their interpersonal skills to supplement their technical abilities and succeed as managers and leaders (Rottmann et al., 2015). Furthermore, the complexity of engineering leadership in comparison to other professional disciplines stems from the need for a combination of technical, interpersonal, and administrative skills. Engineering managers may struggle to succeed and remain effective in their roles if this combination is not present (Aucoin, 2018). As a result, engineers must be prepared to transition from technical to managerial roles. This process entails incorporating managerial principles such as team building, motivation, decision-making, and communication into the company's day-to-day operations. Completing relevant courses, obtaining certifications and licenses, and networking to build relationships with industry leaders are also required.

In conclusion, the primary cause of engineer's lack of preparedness for management is most likely a lack of emphasis on interpersonal and communication skills in engineering curricula, combined with an organizational failure to provide adequate support for these skills. While organizations may have the resources to provide the necessary training to engineers, many are looking for shortcuts and may overlook the need for such training (Perry, Hunter, Currall, and Frauenheim, 2017). This perpetuates the feedback loop of engineers lacking the skills required to take on managerial roles, leaving them unprepared for positions of leadership. Furthermore, as engineering curricula increasingly emphasize technical skills while ignoring the importance of interpersonal and management abilities, the gap between what engineers need and what they are taught will widen, resulting in a shortage of prepared leaders in this field. These skills are difficult to develop during an engineer's normal working hours, particularly when engineers are expected to prioritize technical work over interpersonal development. This emphasizes the significance of giving engineers the opportunity and resources to improve their interpersonal and communication skills and an understanding of the mindset required for leadership, which may contradict the traditional engineering mindset of control.

Effective communication and leadership skills are essential for engineers to reach their full potential and succeed in today's complex and dynamic engineering environment. However, many engineers prioritize technical skills over soft skills, leading to a mindset of control where they are only concerned with the technical execution of their work. It is critical to shift this mindset and provide engineers with the opportunity and resources to develop their interpersonal and communication skills, as well as an understanding of the mindset required

for leadership. Continuing to emphasize these skills will ultimately lead to more successful projects and a more collaborative and innovative engineering community.

2.2.3.2 From managing and controlling processes to leading in uncertainty

Engineering has long been associated with the management and control of processes. As the world rapidly changes, engineers must adapt their leadership styles to prioritize a purpose-driven approach over a process-based one (Perry et al., 2017). Engineering in South Africa presents a unique set of challenges, such as failing infrastructure, political instability, and power supply disruption. As a result, engineers in this region must possess a particular skill set that exceeds those of their Western counterparts. These challenges also demand a deeper level of commitment to understanding the needs and values of their communities, as well as a willingness to collaborate with and empower local leaders. By approaching leadership with a purpose-driven mindset, engineers can make a positive impact on their communities and build a better South Africa.

To be successful in this new environment, a shift in thinking and behaviour is required. Leaders must be able to navigate the uncertainty and ambiguity of today's world, while also being willing to embrace change as part of the process. To do so effectively, engineers must have a thorough understanding of the environment, the people involved, and the processes, as well as the ability to collaborate, communicate, and solve problems using their technical expertise. Furthermore, they must also be willing to take risks and learn from failure, while remaining adaptable and open to change. Engineers can excel in their new roles as effective and successful leaders who drive innovation and maximize efficiency if they have the right skills and attitude (Ragsdell, 2000).

Engineers are frequently chosen for managerial positions based on their technical achievements, with little consideration given to their ability to manage effectively. The new manager's focus must shift from "things" to "people," from performing technical tasks to allocating and supervising them. Many engineers are hesitant to relinquish their technical responsibilities, preferring to remain in their familiar surroundings, which prevents them from developing the skills required to be an effective leader. Thurasamy, Lo, Yang Armi, and Noor (2011), provided a thorough examination of the distinctions between engineers and managers, shedding light on the challenges that engineers may face when transitioning to management positions. They emphasized the importance of changing perspectives, as well as highlighting people and achieving goals through the efforts of others. They also emphasized the importance of shifting away from using mathematical formulas, physical laws, and well-known methods to solve problems and toward using interpersonal skills such as coaching, negotiating, and communication, as well as shifting away from making decisions based on a

large amount of information and data and toward making decisions in more uncertain and ambiguous situations.

The practice of selecting engineering managers based on technical performance may result in a lack of role models for new managers to emulate (Custovic and Insaurralde, 2015). Additionally, mentors of these inexperienced managers may be unable to provide meaningful support due to their own lack of leadership abilities (Farr and Brazil, 2009). In the absence of necessary resources, such as management training, developmental tasks, or mentoring, the engineer turned manager is unprepared (Farr and Brazil, 2009). Because of the lack of support and guidance, managerial jobs may be viewed as less desirable or even intimidating (Harrison and Emlet, 2012). To ensure successful transitions and effective performance in executive positions, organizations should strive for a balance of technical and managerial skills. The technical job path is frequently constrained and offers few opportunities for advancement. The managerial career path, on the other hand, provides more opportunities for advancement and frequently results in higher pay, greater command, and more authority. Some engineers change careers for the sake of professional advancement rather than for the sake of leadership. According to Goldberg (2006), it has been suggested to create a dual career ladder that would allow engineers to advance in their technical sector, while maintaining some balance with the managerial track. Engineers who do not want to manage are not forced to do so if such dual ladders exist, which can help retain qualified engineers (Floyd, and Spencer, 2014).

The manufacturing context has a specific set of skills required of engineers, while the leadership demands of the industry are also unique, making it more challenging to offer the dual career ladder approach (Farr and Brazil, 2009).

2.3 Engineers and the manufacturing context

Manufacturing has always been an important part of the economy. It has aided in the advancement of innovation and the development of a more efficient way of life. Engineers have played a key role in shaping the manufacturing world we know today, from the assembly line to robotics. The manufacturing context and environment have evolved over time, but engineers have remained constant, adapting and creating new solutions to meet the needs of a constantly changing world. Engineers are an essential part of the manufacturing industry, accounting for a sizable proportion of the workforce. They create, construct, maintain, and operate complex machinery ranging from simple tools to sophisticated automated systems. The manufacturing industry would come to a halt if engineers were not present. Their expertise and knowledge enable the manufacture of goods that are dependable, efficient, and cost-effective (Daughton, 2016).

In the modern world, the definition of an engineer has evolved. Today, it not only includes the application of engineering principles, but also the management of people and projects. They now frequently have a management role, overseeing the people and processes involved in the production of goods, in addition to their traditional role of designing and building systems. This has enabled them to become more of a team leader and strategist, considering not only how to best design a system, but also how to ensure efficient resource use and collaboration among different teams. According to Nittala and Jesiek, (2018, October), the work of an engineer today is primarily based on knowledge, teamwork, and the development of specific skills. Custovic and Insaurralde (2015), also claim that the manager's role is so inextricably linked to the people on his team that any separation would result in poor engineering and management. However, engineers regard the need to form complex human teams, build relationships, and establish trust as onerous and unpleasant aspects of their job. Goodwin (2016) attests to this, claiming engineers are frequently portrayed as highly skilled but not very socially capable, preferring machines and processes over people if given the choice. Joyner et al. (2012) used a personality index to support the general opinion expressed by Thurasamy et al., (2011); that engineers appeared to have a distinct preference for technical and analytical practices. They prioritize tasks over social or interpersonal aspects, and when making decisions, they tend to lean toward rational and logical factors rather than emotional or person-centred factors. This orientation results in what Floyd and Spencer (2014) perceive as a technical specialist culture in the engineering field, in which technical, reasoned, and analytical abilities take precedence over social, emotional, and person-centred abilities. However, in order to thrive in today's workplaces, the current engineering workforce requires a "sociotechnical" amalgamation of classical technical knowledge and social and interpersonal capacities. This requires collaboration among engineers from various disciplines, technicians, customers, and other support personnel. The collaboration required is essential to achieve execution of the outputs necessary for a successful manufacturing process. Manufacturing managers and their ability to enable execution is probably the most critical role required of an engineer who has been promoted into a manufacturing leadership role. Perspectives from the literature on execution in manufacturing and how this relates to an engineer transitioning into management is explored further in this section.

2.3.1 Levels of execution in manufacturing

In his early work, "Technology and Organization", Hunt (1970) identified two distinct philosophies used to organize the production process: Taylorism and the mass production model. Taylorism, also known as scientific management, emphasizes the division of labour, efficiency, and standardization to increase productivity. The mass production model, on the other hand, uses standardized parts and assembly line techniques to produce large quantities

of goods. Despite their differences, both approaches focus on maximizing efficiency and minimizing costs. By understanding both models, it is possible to gain insight into the complexities of the production process and better plan for the efficient and cost-effective manufacture of products. This hierarchical structure of management allows for the necessary control and flow of the production process. Furthermore, it is important to ensure that each element within the hierarchy has the correct level of authority and responsibility.

Organisations generally build a hierarchical structure to demonstrate how accountability and responsibility levels rise as one ascends the leadership ladder. The complexity, structure, and number of execution levels may vary significantly depending on the type and size of manufacturing organisation. In general, small to medium-sized manufacturing organisations have three or four levels of execution, each with its own set of tasks and responsibilities.

The 3S model created by Dutta (2008), is a simple yet effective tool for better understanding the underlying dynamics of an organisation's operational structure and can be used to demystify the complexities of modern manufacturing. By dividing the organizational structure into three distinct components, namely strategy, systems, and situation, a more efficient and effective manufacturing process is enabled. Each of these three categories has its own set of functions and tasks that must be completed for the manufacturing process to take place. This model also enables a clear division of roles and responsibilities, which can be used to inform decision-making processes.

Figure 1: Dutta (2008) 3S Model

- S1- Strategic
- S2 – System
- S3- Situational
- Feedback Loops Linked to CAPA Management
- People and Process Alignment
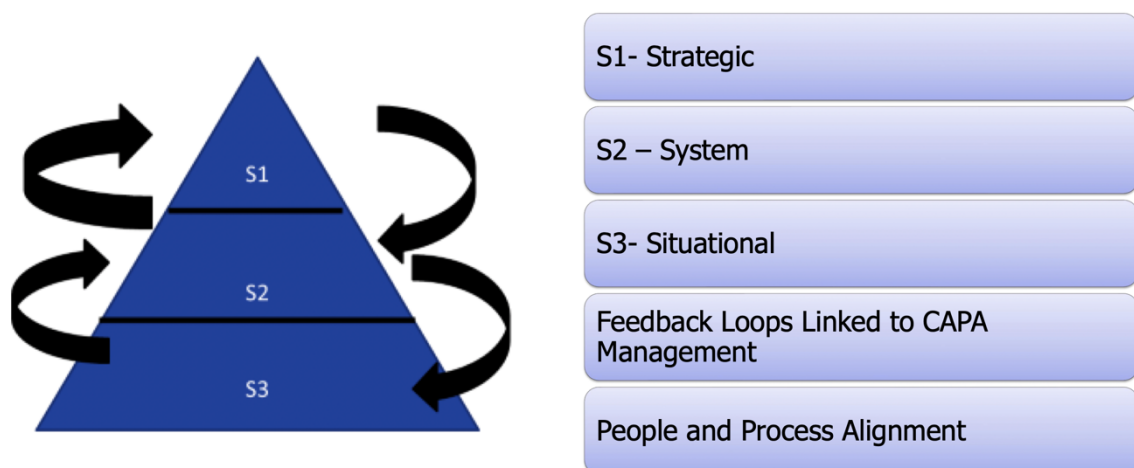
Source: Singh, K. 2022

The top of the 3S model pyramid is the strategic level, also known as the leadership level. This level is concerned with the organization's long-term goals and objectives, as well as the direction it intends to take. At this level, corporate objectives are defined, markets are chosen,

and the leadership philosophy is implemented. The system level, also known as the management level, is concerned with the methods and tools used to carry out the strategy. Systems are designed, designed, discussed, and implemented at this level. Every system is designed to ensure that everyone does their job and that the machines are operated safely (Singh, 2022). The S2 level connects the S1 and S3 levels. The situational level is the pyramid's foundation and focuses on both the current situation and how it will be impacted by the future state of affairs. These elements are considered when designing the organization. This level's emphasis is on execution, which is where the real value is added (Hamedi, Rahiminasab, and Pardis, 2011). This is where suppliers are dealt with, materials are processed, machines are operated, and customers are served. This level's front-line managers were given a set of goals and priorities and then asked to make decisions. This is where the 'systems,' such as safe operating procedures, work instructions, and the like, are put in place. The S3 level of the 3S pyramid is concerned with strategy, which is the overall plan used to achieve the overall corporate goal. The effectiveness and efficiency of the systems, resources, and decisions are then assessed. It is at this level that we must assess the outcomes of our efforts.

Execution in the manufacturing environment requires engineers to possess a unique set of skills and competencies. Those transitioning into a management role must possess a solid understanding of the technical aspects of manufacturing, while also having the ability to effectively manage personnel. In addition, engineers must be able to develop, modify and monitor operational systems that are essential to maintain productivity. According to Thurasamy et al. (2011), engineers or technical specialists are frequently promoted to management positions within the first five years of graduation, but due to individuals' lack of experience, this promotion can sometimes result in poor performance. Therefore, it is important that an engineer who is transitioning into a management role has the skills necessary to efficiently and effectively manage personnel and systems.

At the system level of the organisation's hierarchy, engineers are responsible for overseeing both the personnel and the systems employed during the manufacturing process. To do this effectively, they must have a thorough understanding of the roles and skills necessary to properly manage personnel and systems. An engineer that does not possess the requisite management skills can lead to disastrous consequences for both the engineer and the organization, such as a decrease in efficiency, a lack of productivity and, ultimately, a lower level of performance. On a personal level, the engineer or technical specialist may experience frustration, which can lead to a decrease in overall job performance. At a wider organizational level, the lack of management skills can result in decreased productivity and

efficiency. Furthermore, the rest of the organization may be operating below its potential due to the engineer or technical specialist's inability to properly lead operations.

2.3.2 Management of execution in manufacturing

A manager is someone who oversees a specific area of an organization's resources. It is the manager's responsibility to use these resources in the best interests of the company, or to "make people productive," in the words of Knight (2005). As one progresses up the corporate ladder, their involvement in day-to-day activities diminishes while their involvement in strategy and general coordination grows (Maccarthy, 2018). According to Heathfield (2017), managers are responsible for planning in order to achieve the goals set out for the division assigned in a way that correlates to the overall goals of the organization. In addition, the manager must organize processes, tasks, resources, and time while implementing necessary changes to meet targets, such as hiring and firing employees, training employees, and dealing with performance issues. Managers also guide, assist, coach, develop, train, and support resources to ensure they meet their goals, as well as provide feedback or recognition. Management responsibilities include providing clarity while establishing desired outcomes, measuring, addressing performance gaps, and conducting performance reviews. The measurement aspect of management responsibilities refers to the process of evaluating performance based on predefined goals and objectives. In order for managers to effectively measure performance, it is important to establish clear expectations and benchmarks for success. Additionally, managers need to track progress regularly, provide feedback, and adjust performance goals as necessary. Failure to effectively measure performance can result in missed opportunities, wasted resources, and subpar results. These responsibilities bring to light certain aspects pertinent to this research.

Engineers' and managers' responsibilities are fundamentally different in that engineers are much more technically oriented, and while they do work in teams, the responsibility of overseeing others is an addition. Managers must also give others direction, monitor progress, and evaluate others. The managerial role, in contrast to typical engineering roles, takes a broader view of the organization as a whole. With the key difference being task delegation, the role shifts the emphasis from specific design or project tasks to actual strategic implementation. Although it is not explicitly stated in the description, relinquishing technical control allows a manager to focus on overall control. The preceding section introduces us to the set of skills required to perform managerial responsibilities effectively.

2.3.3 Leadership of teams in manufacturing

While management of execution is essential for manufacturing output, this needs to be coupled with leadership qualities, and separating the two would be detrimental (Mallaby,

2014). The terms 'management' and 'leadership' are frequently used interchangeably in literature, but a distinction between the two and their complimentary qualities are essential for manufacturing managers (Algahtani, 2014). As a result, leadership will be discussed in greater depth in this section with specific reference to the challenges experienced by engineers transitioning to management roles in manufacturing environments.

Different works of literature define leadership differently, and while the term is frequently used, putting it into words is difficult. For the purposes of this research, leadership is defined as the ability to inspire others to collaborate toward a common goal (Wajdi. 2017). Simply put, "the leader is both the source of inspiration and the director of action" (Ward, 2017). A leader has certain characteristics and skills that inspire others to collaborate and follow them toward a common goal. The importance of these skills varies from person to person, but Ballance (2018) identified five skills that appear concurrently in literature. These five qualities required for effective leadership are; honesty and integrity, inspiration and motivation, communication, confidence, and consistency. Leaders must be honest and dependable, inspire and motivate those they lead to follow their lead, communicate ideas clearly, and foster respect. Motivating others is a key function of leadership, and motivating people is critical for achieving goals and objectives (Knight, 2005).

Leaders must also be confident in their decisions and consistent in their approach, because in hostile and uncertain environments, people will look to the leader for direction and guidance, so confidence is essential. Furthermore, according to Ballance (2018), in order for the team to achieve its goal, all of these skills must be used consistently. A consistent leader provides consistency in action and predictability based on specific outcomes. Employees become more stressed when there is inconsistency, and respect and trust are lost. Leaders struggle to be effective without these qualities, and followers struggle to have faith in their leader. Leadership is a dynamic and complex process, and those who master the five skills identified by Ballance (2018) will be well prepared to manage teams effectively.

Over many decades, leadership and its theories have evolved, and understanding and incorporating them was researched by Deloitte (Kane, Palmer, Phillips, Kiron, and Buckley, 2015). In the leadership maturity model, based on research from over 2000 companies, this study demonstrates that education is not the most important driver of leadership development. Only through a combination of education, experience, and exposure can leadership be made scalable, and only in the presence of a development environment can leadership be considered systemic (Knight, 2005).

Leadership theories have evolved as well, with transformational leadership theory emphasizing behaviours, charisma, ideology, values, vision, and inspiration (Mallaby, 2014). Every common theory adds to the debate over whether leaders are born or made. Avolio

(2009) argues that it is based on an individual's experiences rather than hereditary traits, which Mallaby (2014) supports. The leadership maturity model was not invented by Deloitte; instead, its origins can be traced back to the early work of Cook-Greuter in 2004. This text discusses the leadership maturity model and the importance of investing in leader development. The model emphasizes the evolution of leaders over time, with different stages of development representing increasing levels of maturity. To achieve higher levels of maturity and effectiveness, Deloitte recommends that organizations invest in leader development through training and coaching. This involves guiding leaders towards becoming visionary and strategic thinkers capable of driving their organizations towards success. Doing this is the quickest way to learn the necessary skills and knowledge needed to succeed in a leadership role. Furthermore, Deloitte found that these plans should include frequent feedback and performance assessments, which can help to identify potential leaders and provide them with targeted development programs (Kane, Palmer, Phillips, Kiron, and Buckley, 2015). Thus, it appears that a combination of educational experiences, exposure to relevant situations, and a constructive learning environment are key components to developing effective leaders.

2.3.4 Leadership progression in manufacturing

The literature analysis shows that a significant amount of research has been undertaken to understand the aspects that are crucial to successful leadership and the many types of leadership styles that influence the advancement of leaders within an organisation. For example, Charan, Drotter, and Noel (2001) developed a six-stage model that says organisations grow leaders at various levels and phases. As they advance inside the organisation, this builds a solid foundation of leaders. It is said that organisations do not necessarily adhere to all levels of this hierarchical structure; yet, many organisations frequently adopt certain components of this structure (Drotter, 2010).

Drotter's (1990) leadership pipeline model is similar to the pathways and crossroads theory discussed by Freedman (1998), as both describe the various stages of movement through the leadership hierarchy. Drotter's model suggests that individuals must develop specific skills and qualities in order to move through the various stages of leadership, while Freedman's theory focuses on external support for the individual in order to ensure successful transition.

The leadership pipeline model depicts a logical progression from one level to the next. Within a hierarchical organisation, the leadership pipeline concept assigns distinct degrees of leadership. The model delineates the transitions between levels and depicts the fundamental abilities and changes that an individual must adopt at each level (Charan, Drotter and Noel, 2010). Additionally, Drotter (1990) outlines specific strategies for developing the required skills and qualities such as coaching, training and mentoring and also emphasizes that an individual must have a vision and plan for the future.

Furthermore, Watkins (2012) theorizes that an individual must possess certain adaptive qualities in order to successfully transition between levels, such as self-awareness, motivation, and resilience. These qualities are used to facilitate leadership development and are considered to be important aspects of the transition process. The theory of adaptive leadership has been used to explain the role of an individual in successfully transitioning between leadership levels. It suggests that an individual must possess certain qualities, such as self-awareness, motivation, and resilience, in order to be prepared for their new role. These qualities enable an individual to develop their leadership capabilities and allow them to be mindful of their own strengths and weaknesses. Additionally, they must be able to anticipate and respond to any changes or challenges that come up during the transition process.

Figure 2: Drotter's Leadership Pipeline Model
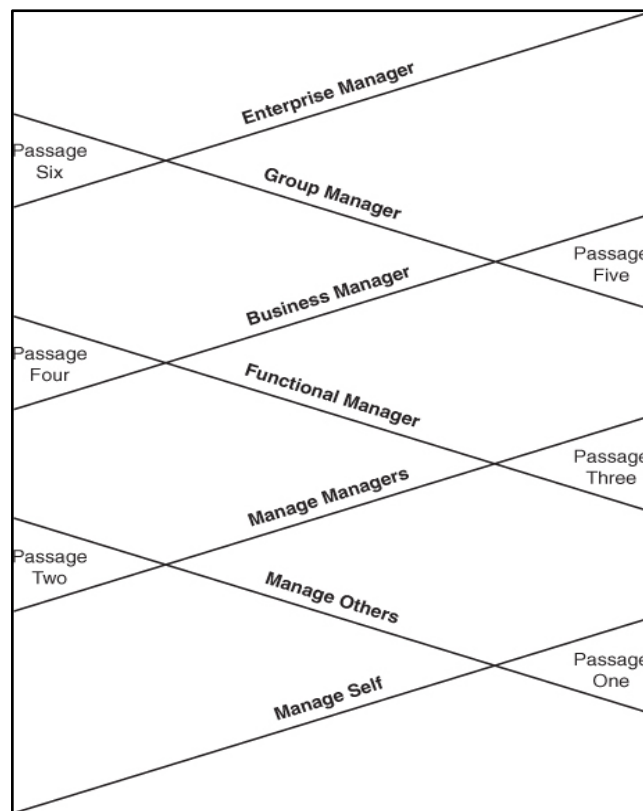
Source: Drotter, 2010

In contrast to the pipeline model, Freedman (1998) proposed a theory called "Pathways and Crossroads to Institutional Leadership," which is comparable to the leadership pipeline model. This notion outlines the many paths and forks to choose when growing inside an organisation. It delineates the many paths, beginning with an individual contributor road and ending with an institutional leader pathway. This model explicates the shift in accountability

needed between levels and elucidates the different principles that people need to bear in mind when assuming leadership roles. Freedman (1998) emphasizes the relevance of external support to obtain successful transition. Moreover, it is a convoluted process to examine oneself and adopt the principles necessary to be successful. Watkins (2012) agrees with Charan et al. (2001) and Freedman (1998) that the transition between different levels of leadership is difficult, especially when moving from a functional to a generalist one (Mallaby, Price and Hofmeyr, 2017).

Figure 3: The primary pathways and career crossroads to institutional leadership (Freedman, 1998)
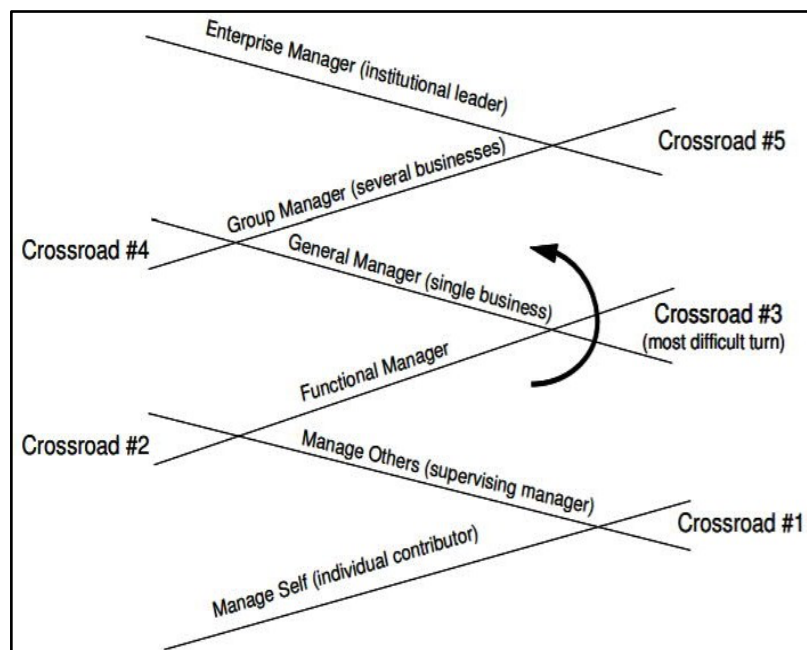
Source: Adapted from Freedman (2005).

Within the next section, the researcher will emphasize the knowledge gained from the literature review on the elements that are beneficial for a successful transition, as well as point out the potential risks of an unsuccessful transition into a leadership position.

2.3.5 Personal transformation in leadership transitions

According to Charan, Drotter and Noel. (2010), the leadership pipeline model outlines the essential elements necessary for each career transition, which typically focus on applicable skills, the proper utilization of time and the appropriate values of the workplace. Furthermore, Charan et al. (2010) asserts that each person must adjust their behaviour and work values in order to properly adjust to their respective career passage within the leadership pipeline model. Moreover, according to Charan et al. (2010), each person must adapt their behaviour

and work values to suit the demands of their career transition. This was corroborated by Arghode, Brieger and McLean, 2017 who suggested that in order for a person to effectively transition into a leadership role, they must alter their attitude and mindset from a technical and personal one to a more powerful and collaborative outlook. This involves delegating tasks, communicating effectively, and offering guidance.

A leader must also maintain their personal performance while managing the team (Freedman, 2010). According to the research, making the effective shift to a leadership role requires personal change in the form of obtaining practical experience, expanding one's knowledge, and sharpening new skills and competences (De Meuse, Dai and Wu, 2011; Mallaby, Price and Hofmeyr 2017).

According to research conducted by Freedman, (2010) in the field of personal transformation, there is a strong relationship between personal transformation and successful leadership transition. Specifically, personal transformation can enable leaders to better understand the needs of their teams, gain a clearer understanding of their own values and beliefs, and build the trust and confidence of their peers. Furthermore, personal transformation can help leaders gain greater insight into their own strengths and weaknesses, as well as the strengths and weaknesses of their team. With this insight, leaders can make decisions more effectively, while also inspiring greater commitment and loyalty from their teams.

The switch from self-leadership to leading others necessitates a distinct shift from self-reliance to directing the outputs of others, which requires adjusting one's mindset (Freedman, 1998). Furthermore, it necessitates the implementation of certain qualities or strategies which allow the people one leads to perform more efficiently. For subordinates to be productive, it is necessary for the leader to experience trust, transparency, inclusion and support, which necessitates a personal transformation (Charan, Drotter and Noel, 2010).

2.4 Engineers transitioning into leadership roles

Leadership transitions are complex and challenging, but as Custovic and Insaurralde (2016) suggest, there are many strategies, tools, models, and frameworks than can help overcome the challenges. The leadership pipeline model proposed by Charan et al. (2010) outlines six distinct passages and the challenges experienced by leaders transitioning between them. This model is based on the idea that each level of leadership requires different abilities and that leaders must be able to "transform" (Aucoin, 2018) their skills and understanding to the new level. The difficulties associated with this transformation are often underestimated, leading to an increased risk of failure and prolonged periods of adjustment. These transitions may require changes in perspective, competencies, and behaviour, making them highly complex and demanding for leaders. Manderscheid, and Ardichvili, (2008) also identifies five categories of challenges faced by transitioning leaders, cognitive, behavioural,

interpersonal, psychological, and systemic. Marshall (2003) suggests that these challenges can be addressed through organizational initiatives such as succession planning, mentor programs, effective communication, and training. These strategies help to ensure that leaders can successfully transition into new roles. Jaques's Stratified Systems Theory (1989) proposes that there are seven distinct levels of leadership within an organization. With each new level, the leader must possess new skills and abilities that correspond to that level. As a leader is promoted to a higher-level position, they must be able to adapt their previous skills and knowledge to the new level. Although it may be daunting, the important personal challenges posed by the transition to a management position offer an opportunity for leaders to undergo transformation instead of merely adapting (Aucoin, 2018).

2.4.1 Challenges to successful transition

According to Kaiser and Craig (2011), leader transitions can be difficult, with 87% of human resources professionals surveyed in agreement that they are the "most challenging times in the professional lives of managers" (Watkins, 2009). When a transition is unsuccessful, it can have a huge impact on the individual's career (Freedman, 2011) and a significant impact on the organization as a whole (Martin, 2015). When a transition is unsuccessful, the consequences on the transitioning manager may be removed from their position, whether willingly or unwillingly. Additionally, they may remain in the role but not achieve the expected standards of performance. The number of failed transitions varies depending on the managerial level of the transitioning manager and the criteria for deeming a transition unsuccessful, yet the numbers are bleak. Martin (2015) reported that 51% of surveyed senior-level managers had not achieved organizational objectives after transitioning. Wheeler's (2010) survey of 150 executives transitioning revealed that 30% of external organization members and 21% of internal ones had not met performance objectives within two years of their transition. Freedman (2011) stated that estimates indicated that between 50% and 75% of managers at any level of the organization were not effective. Plakhotnik (2011) did not provide an exact figure, but did emphasize that the failure rate for first time managers was remarkably high. The professionals surveyed gave a clear consensus attributing the difficulties of transitioning to the fact that appointed managers do not have enough organizational support and clarity with regards to their role expectations (Freedman, 2011).

Furthermore, the new leader's skills were unsuitable for the role, leading to a skills gap which could have been avoided if the individual had adequate training or development (Martin, 2015). This ultimately leads to the transition's quick failure. To rectify this, the individual may need to foster and extend their current talents in communication, collaboration, and problem solving. It often necessitates the gaining of additional skills, such as management and team building. This

allows the individual to proceed with the transition smoothly and make the most of the new position (Plakhotnik, 2011).

Based on the review of the literature on career transitions and the preceding discussion on engineers transitioning into management roles in manufacturing, the following eight themes have been identified as key challenges for engineers making these transitions. They include: business competition; lack of organisational support; role clarity and expectations; mismatched skills; lack of training and development; not letting go; multiple domains of learning and increased time demands.

2.4.1.1 Business Competition

Business competition provides a dynamic backdrop for transitions which can create uncertain outcomes. Because of the complexity of today's business environment, controlling the high rate of turnover for leaders can be a difficult challenge. In today's global economy, workplaces are increasingly diverse, with employees hailing from different ethnic, cultural, and national backgrounds. As a leader, it is important to appreciate and leverage this diversity, as it can lead to a broad range of perspectives, innovative ideas, and better decision-making. However, managing a diverse team comes with its own set of challenges, including potential communication barriers and cultural misunderstandings. To effectively manage such a team, leaders must work on fostering a positive and inclusive work culture, actively promoting cross-cultural understanding, and prioritizing effective communication strategies. Leaders must be able to adapt to ever-changing workplace realities and find ways to remain effective in the face of rapid changes in technology, regulations, and cultural norms. Furthermore, leaders must be able to foster a work environment that fosters loyalty and commitment to the company's overall goals. Because of the ever-changing nature of the modern business environment, the transition from individual contributor to leader has become infinitely more complex. Leaders must become adept at handling an influx of new employees from various areas, learn how to best utilize technology in the most effective way, and stay current with ever-changing regulations and cultural norms in order to properly manage their teams. Furthermore, an effective leader must be able to motivate their team with a shared vision and goal, while instilling a sense of loyalty and dedication to the organization's ideals. Finally, leaders must be prepared and capable of meeting the challenge of keeping up with the complexities of today's business environment.

2.4.1.2 Lack of Organisational Support

Transitioning from technical to business leadership roles can be difficult for technical professionals, often due to a lack of organizational support. This difficulty is exacerbated by the requirement for new skills and knowledge in order to excel in a leadership position. Martin

(2015) agreed and added a lack of resources, guidance from direct supervisors, and adequate time to successfully acquire an understanding of their new role, organization, and context. Emotional intelligence is an important factor in transitioning because it bridges the gap between technical skills and business acumen. With the right support and training, technical professionals can successfully transition into leadership roles and have a positive impact on the organization (Plakhotnik, 2011). Organizations that project a "sink or swim" attitude frequently leave transitioning employees feeling isolated, confused, and neglected. This can be extremely detrimental to morale and result in a significant drop in productivity. Organizations can foster a supportive and understanding environment for successful transitions by offering targeted training and mentorship programs (Freedman, 2011). Furthermore, giving employees access to resources like online communities, discussion forums, and online learning platforms can help them stay engaged and motivated throughout the process.

2.4.1.3 Role Clarity and Expectations

Another major challenge to a successful transition from a technical professional to a business leadership role, according to the authors Freedman (2011); Kaiser and Craig, (2011); Watkins, (2009); Martin, (2015); Sinar and Paese, (2014); and Plakhotnik, (2011); is role clarity and organizational expectations. When it comes to selecting a new leader, organizations typically have high expectations; however, these expectations are not always well communicated to the transitioning leader, nor are they always in accordance with the leader's understanding of the role and its demands.

Martin (2015) also discovered that organizations frequently fail to adequately capture job requirements in job postings and descriptions, which can result in the phenomenon of "role shock", which many transitioning leaders experience. It can be difficult for the transitioning professional to properly plan and execute their responsibilities if they do not have a clear understanding of the role. Furthermore, the individual may not be fully aware of the position's and the organization's expectations, which can lead to additional confusion and difficulty in navigating their new role (Sinar and Paese, 2014). Moreover, Human Resources departments can often be a crucial support system for employees experiencing uncertainty or confusion. By clearly outlining expectations, providing necessary resources, and offering guidance, they can help employees feel more confident in their roles and prepared for success. Additionally, HR departments can foster a positive organizational culture that values communication and transparency, further promoting a sense of stability and support within the company. Ultimately, investing in strong HR practices can benefit both individual employees and the organization as a whole.

2.4.1.4 Mismatched Skills

As employees advance up the corporate ladder and are expected to take on more responsibilities, they may quickly realize that their current knowledge and abilities are insufficient for the new position. Promotions to more advanced managerial positions are typically based on how well someone has performed in their current position rather than the qualifications required for success in the new one, which frequently results in a skills mismatch (Plakhotnik, 2011). While technical professionals may have the required knowledge and experience, there may be a skills mismatch between what is required for the role and what they are accustomed to. This could make transitioning to a new work environment and culture difficult, with difficulties arising from a lack of understanding of the new processes, difficulty adapting to new people, and a lack of understanding of the organizational goals and objectives.

Furthermore, the individual may struggle to manage teams and build relationships both internally and externally. According to Freedman (2011), the individual may not understand the nuances of a company's culture, which may lead to misunderstandings with colleagues. Finally, if there is no clear guidance and process in place, the individual may struggle to complete tasks and meet expectations. Furthermore, the individual may lack the necessary personal qualities such as creativity, communication, and problem-solving abilities to succeed in their new role, leading to additional frustration and difficulty in succeeding as a leader. This lack of adaptation can lead to a failed transition to a new leadership role.

2.4.1.5 Lack of Training or Development

When technical professionals decide to transition from their technical role to a leadership role within a business, they frequently face difficulties. A significant challenge for these professionals is a lack of training and development opportunities to adequately prepare them for the transition. Professionals may struggle to find success in their new roles unless they receive relevant and engaging training. They may also lack the necessary skills and experience to apply their technical knowledge in a business setting. According to Terblanche (2018), each tier of leadership in a company has its own set of characteristics, such as behaviours, values, perspectives, and skills, which can be distinct from those of the lower tier or require a higher level of proficiency. Unfortunately, many organizations do not provide ascending leaders with the necessary training or development opportunities to develop these new skills and behaviours. According to Freedman (2011), inadequate leadership development by organizations results in ineffective or dysfunctional managers at all levels. To make the transition successfully, those with technical expertise must be able to identify their current leadership strengths as well as develop new skills in communication, collaboration, and decision-making. As these skills develop, the technical professional can learn how to

effectively lead teams while also understanding the organization's business goals and objectives.

2.4.1.6 Not Letting Go

One of the most difficult challenges for technical professionals transitioning into leadership roles is the need to let go of strategies and behaviours used in previous roles. Without proper training, those transitioning may continue to use strategies and behaviours from their previous roles, which can be ineffective or even harmful in assisting their transition. As a result, the transition may be either successful or difficult. This can be extremely difficult because these strategies and behaviours may have served them well in the past and they may be reluctant to abandon them. According to experts, the abilities and mannerisms that led to a specific role may not be beneficial in the role itself. As a result, those in transition must abandon or unlearn previously successful practices or approaches. However, it is critical to recognize that the game has changed and that new strategies and behaviours are required for success in the new role. Organizations can assist technical professionals in successfully transitioning by providing resources, support, and an environment that fosters exploration and experimentation.

Finally, organizations should ensure that the transition process is tailored to each individual's needs, and that they have the resources and support they need to make the transition a success. As previously stated, Bridges and Bridges (2019) both advocate for the release of specific skills and behaviours as part of their transition models. According to Bebb (2009), successful transition strategies across all four perspectives; cognitive, behavioural, relational, and role, involve letting go of, and acting on, old rules while embracing new ones. A learning and growth culture can also help transitioning employees succeed in their new roles by allowing them to seek out the resources and advice they need to feel comfortable and confident in their new roles. Taking the initiative to explore and experiment with new ways of doing things, setting goals, and reflecting on and adjusting strategies to fit the new role are all examples of this.

Transitioners must evaluate their previous role to determine what to keep and what to let go, according to Hill (2007), Freedman (2011), and Elsner and Farrands (2006). This can be a difficult task because the thought of giving up familiar and cozy elements can cause anxiety, disarray, and grief. Furthermore, because the technological landscape is constantly changing, it is critical to recognize the need for continuous learning. Technical professionals can successfully transition into leadership roles and make an impact with the right resources, support, and a culture that encourages experimentation and exploration.

2.4.1.7 Multiple Domains of Learning

Transitioning into a new leadership role can be a challenging endeavour for anyone. From leaving behind the familiarity of their previous position to mastering the unique skills and competencies required for success in their new role, there are many obstacles to overcome. However, effective leaders recognize that mastery of these challenges is essential to achieving long-term success in their new position. With careful planning and a commitment to ongoing learning and development, leaders can successfully navigate the transition and thrive in their new role. Several studies have found that learning is an important part of the transition process for leaders. They must be able to quickly learn the organizational culture as well as how various groups interact with one another. Leaders must also be able to expand their understanding of their new role, especially in decision-making. Understanding the position's expectations and responsibilities is critical to successfully and productively leading the organization. Those advancing to positions of leadership must develop the leadership skills required to effectively carry out organizational goals and objectives by supervising the work of others and managing the necessary resources.

Transitioning employees must educate themselves on the people they will be working with in their new position, including subordinates, peers, supervisors, customers, suppliers, and other stakeholders. It is also critical that they understand all stakeholders' expectations as well as the organizational culture. Untangling an organization's culture is especially difficult for outsiders, but even insiders notice cultural undertones at higher levels of the organization (Terblanche, 2018). Leaders must be able to access available resources in order to gain the knowledge and skills necessary for effective leadership. In Terblanche's study, successful managers frequently used a combination of sources, including personal experience, observation, experimentation, and even literature reviews. Using a variety of methods, they were able to quickly learn the requirements of their roles and build a solid knowledge base. They also used evaluation and feedback to ensure that their decisions were founded on the most recent data and industry trends. To aid in the transition process, Manderscheid and Ardichvili (2008,) proposed a "relationship-building assimilation intervention". Positive relationships between the transitioners and the team were fostered as part of the strategy. This was achieved through the development of trust and mutual respect, as well as a shared understanding of team dynamics and roles. Furthermore, the intervention emphasized the importance of valuing individual characteristics, reaching consensus on decisions, and recognizing the strengths and weaknesses of each team member.

2.4.1.8 Increased Time Demands

Transitioners frequently face insurmountable challenges as a result of their increased workload and lack of prior training. The amount of learning and unlearning required makes the

job more difficult to complete in terms of time. This can have a negative impact on the individual, making it difficult to maintain a healthy work-life balance. A transition to a managerial or leadership role is frequently difficult due to the individual's unfamiliarity with the new skills, tasks, and outlooks. Without proper preparation and guidance from the organization, the individual may struggle to succeed due to the numerous uncontrollable obstacles that may be encountered throughout the process. Despite the numerous sources of failure, there are solutions that can be used to make the journey easier.

2.4.2 Enablers of successful transition

Organizations can provide better support to newly appointed leaders by accurately evaluating candidates' skill sets and attributes and comparing them to what is required in the position. Furthermore, organizations should provide training that focuses on the specific technical and interpersonal skills required for each level of leadership. According to Bebb's (2009) research, prior "stretch" assignments provided a level of preparation for subsequent roles for those who had gone through successful transitions. These assignments are frequently used in addition to or instead of formal training.

A structured intervention was discovered to facilitate this process and reduce the time required for the leader and team members to become acquainted with each other through mutual interaction. Mentors or coaches were especially recommended for higher-level organizational transitions. Even though these recommendations necessitate some level of organizational support, there are techniques that the transitioner can employ.

Self-awareness and introspection can assist the transitioner in identifying and adapting to the necessary changes. Strong self-confidence and self-awareness have been shown to reduce anxiety symptoms. Nonetheless, Freedman (2011) warned against relying on a false sense of security. Proactively soliciting feedback from all levels of stakeholders, being willing to take risks and learn from failures, and acknowledging the possibility of not being an expert in the new position and requesting assistance all played a significant role in easing the transition. Gabarro (1987) discovered that not asking for help was a root cause of failed transitions.

Finally, leaders must reach an agreement with their teams. Setting mutual expectations, ambitions, priorities, and standards allows the new leader to begin meeting organizational goals with the help of team members. This demonstrates that changes in leadership affect the organization's members just as much as the leader. Making the transition to a position of leadership or management is complex, involving a tangle of organizational, professional, societal, and cultural forces. These forces have an impact on the development of the necessary skills, attitudes, values, and behaviours for effective performance in the new role.

2.5 Conclusion of literature review

Due to a lack of alternative career paths, engineers and technical specialists often find themselves in management roles within five years of beginning their professional careers (Custovic and Insaurralde, 2016). First, they must determine the new level at which they will operate and perform within the organization. Following that, they must determine the skills required to support them in their new role. However, attempting to identify the skills required at this stage introduces complexity and increases the likelihood of failure. As a result, it is recommended that we identify and develop engineers and technical specialists for management roles early in their careers. One of the tools that can help engineers and technical specialists determine their level of expertise and experience is the 3S Model. Furthermore, the diamond leadership model assists the engineer and technical specialist by providing an understanding of the management and leadership skills required. As a result, this may aid in the engineer's or technical specialist's successful transition in the process. We hope that by conducting this research, we will be able to identify the pitfalls encountered by engineers and technical specialists during their transition to management and thus contribute to the body of knowledge within the frameworks.

Chapter 3: Research Questions

3.1 Introduction

The aim of the research was to gain insight into the challenges faced by South African engineers and technical professionals when transitioning into a leadership role in the manufacturing industry, and to examine the advantages and disadvantages that may affect the leadership transition. The research questions will seek to deliver novel insights into the topic being studied. According to the literature review in chapter 2, there is a need for more research into the challenges, engineers and technical specialists often face when making the transition from self-leadership to leading others. This study aims to provide a comprehensive analysis of these challenges with a focus on both the business and academic aspects. By examining the experiences of these individuals, we can create a framework for successful leadership development programs and identify the key competencies required for effective leadership in technical roles. Additionally, the findings of this study can facilitate a better understanding of the challenges faced by engineers and technical specialists and serve as a basis for the development of more tailored leadership interventions

3.2 Research questions

Research question one:

What is the experience of South African engineers and technical professionals in the manufacturing sector in transitioning into a leadership role?

The research participants were asked to identify the challenges they faced when transitioning to a job that required them to lead others. The question was designed to elicit responses from participants in order to discover the underlying obstacles they encountered when transferring into a leadership role. According to the literature study, individuals face a variety of challenges while transitioning into a leadership post. Furthermore, the literature implies that engineers in South Africa confront additional challenges such as diversity and inclusion. As a result, this research topic attempts to explore into these difficulties from the perspective of a South African engineer and their lived experiences, which may provide better insight into the subject.

Research question two:

What do engineers consider as enablers or barriers in their transition into leadership roles?

The inquiry posed to the research contributors was formulated to unearth the most supporting factors when transitioning from self-leadership to leading others as well as the obstacles in this transition. Comprehending these factors is indispensable for people who move into a leadership role, as the literature highlights both difficulties and enablers that leaders confront when transitioning into a leadership role.

Research question three:

What are the personal transformation experiences of engineers in their transition into leadership roles?

Engineers transitioning to leadership roles are typically confronted with a steep learning curve, as they are expected to take on a variety of new challenges, such as team management, strategic planning, and staff motivation. Literature has suggested that engineers must confront personal transformation experiences in order to make a successful transition into this role. One important aspect of personal transformation for engineers transitioning into a new role is the development of a growth mindset Dweck, C. (2016). This involves the belief that skills and abilities can be developed through hard work and dedication, rather than being fixed traits. Engineers who embrace a growth mindset are more likely to persevere through challenges and continuously improve their craft. Additionally, it is crucial for engineers to develop effective communication skills, as they often work on interdisciplinary teams and must be able to explain complex technical concepts to non-technical stakeholders. This usually results in arduous personal growth experiences as they must learn how to use their engineering know-how in the new position. This research question was formulated in order to acquire a deeper understanding of the personal transformation that research participants have experienced when transitioning into a leadership role, through their own perspective and the perspectives of others.

Chapter 4: Proposed research methodology and design

4.1 Introduction

The goal of the research study is to investigate engineers' experiences as they shift into management to develop a better understanding of the phenomenon. The primary research question is significant because, by learning about the challenges experienced by engineers and technical specialists during their transition into management. The objective of this research is to identify and analyse South African engineers' experiences when transitioning into management roles in manufacturing. The following questions are designed to determine whether engineers who are in leadership positions follow a traditional management model or if they change them to suit the organizations they are in charge of:

- What is the experience of South African engineers and technical professionals in the manufacturing sector in transitioning into a leadership role?

- What do engineers consider as enablers or barriers in their transition into leadership roles?

- What are the personal transformation experiences of engineers in their transition into leadership roles?

The research method described in this chapter was devised in order to answer the questions posed and reach the goals set for the research. The chosen strategy for this study is a narrative inquiry. A narrative inquiry is advantageous for qualitative research because it allows for the exploration and understanding of human experience. The research will be conducted by interviewing participants and focusing on the research question in order to have a more thorough exploration of the meanings people assign to their experiences (Maula and Stam, 2020). The main data for this research will be gathered through interviews with the selected participants. This provides an accurate depiction of information at a singular point in time.

4.2 Choice of research methodology

This research uses qualitative methodology instead of quantitative because it is trying to describe and understand experiences of transitions into leadership in human terms, rather than through quantification and measurement. By doing this, the researcher will be able to study these career transitions amongst engineer leaders in depth. The literature review emphasizes the importance of a qualitative approach, which is often undervalued in a management context. This is because qualitative research is seen as less 'scientific' than quantitative research. However, in this study, it is necessary in order to allow engineers and technical specialist to speak about their experiences in their own words. In recent years,

qualitative research has been used more often in fields such as social sciences, medical research, business, and management (Sinkovics and Alfoldi, 2012). Silverman (2010) argues that, instead of trying to determine which research methodology is better, we should instead be asking which methodology is most appropriate for the question being researched. Even though qualitative research is based on different assumptions than quantitative research, it should still be held to rigorous, critical standards.

The qualitative approach used in this study is narrative enquiry in order to understand the personal life experiences of individuals who have transitioned from self-leadership in technical roles to leading others in managerial roles (Creswell and Poth, 2018). In exploring the factors that contributed to an individual's successful transition from self-leadership to leadership of others as well as the obstacles they experience.   Narrative enquiry is a qualitative research approach which seeks to understand personal experiences and stories in order to gain insight into complex human phenomena (Clandinin, 2006). This method was chosen for this study because it allows for a deep exploration of the personal experiences and perspectives of individuals who have transitioned from self-leadership to leading others. The questions asked during the interviews were guided by the desire to understand participants' experiences and how they overcame challenges during their transition to leadership positions. This approach enabled the gathering of rich, detailed data which will contribute to a better understanding of the factors that enable or hinder the transition to a managerial role.

Data was gathered using semi-structured interviews, which allow for greater freedom in how questions are posed to study participants. Additionally, this strategy eliminates unnecessary debate and creates more strong replies (Saunders and Lewis, 2018). The method permits the research design to evolve rather than having a rigid plan from the start of the investigation. The interview process gave the researcher the opportunity to ask participants to tell the story of their personal experiences in their career transition to leadership and to shed light on the challenges and enablers that influenced their transition. According to Guest, Bunce and Johnson (2006), the goal of qualitative interviews is to comprehend the shared experiences of the research participants. This, in turn, allowed the researcher to uncover unknown elements in the subject domain (Denscombe, 2014) that contribute to the themes identified in the literature review.

4.3 Sampling methodology

4.3.1. Population

A population, as defined by Saunders and Lewis (2012), is a group of members who share common traits. Zikmund, Babin, Carr and Griffin, (2013) emphasize the importance of a precise definition of the target population at the beginning of a study in order to locate appropriate sources for data collection. The population for this study is composed of South

African engineers or technical specialists who have made the shift from self-leadership to leadership of others in manufacturing. To gain an understanding and answer the research questions, the population will be limited to those who meet all the following criteria:

- Live and work in South Africa
- Hold an engineering professional background or completed engineering studies
- Made a transition from engineer or technical specialist to a management role
- They are still in the management position and
- Work in the manufacturing environment

4.3.2. Unit of analysis

Individuals interviewed and their personal narratives are the unit of analysis in this study (Zhang and Wildemuth, 2015). The research drew on the unique views and insights provided by the research participants' living experiences. These encounters served as the foundation for the study (Saunders and Lewis, 2018).

4.3.3. Sampling method and size

Given the limitations on resources and time, it is not possible to interview the entire sampling frame. Sandelowski (2010) recommends that, for qualitative research, the sample size should be large enough to allow for a new and rich understanding of the research question, but small enough that it does not become unmanageable analysis of the research. The sample size of twelve was chosen as it is a manageable number for the researcher and is expected to provide the investigator with a good understanding of the research topics. The sample size was selected based on several factors, including the budget allocated for the research, the time and resources available, and the potential for saturation of themes in the data. Saturation of themes suggests that, when at least twelve participants have been interviewed, no new themes will emerge from further interviewing. This indicates that the most important and recurrent themes are captured within the sample size, and there is less likelihood of bias or missing data.

4.3.4. Measurement instrument

According to Maxwell (2013), in a qualitative study, the researcher or interviewer serves as the measurement instrument. To ensure data is collected consistently, interview guides will be used as a practical tool. The research guide was informed by the research questions and frameworks identified in the relevant literature to navigate discussions consistently across the participant group. Similarly, making the interviews flexible enables the research to glean more authentic responses from the participants. A pilot interview was conducted to ensure the questions flow naturally, were understood by the participants, and the interview provided the

needed insights. The interview questions were phrased broadly to prevent the participant from being influenced or lead in their responses (Ritchie and Lewis, 2013).

4.3.5. Data gathering process

The data for this study will be gathered through interviews with managers who work in the manufacturing sector in South Africa and have an engineering background. The data will be collected using semi-structured interview questions from the literature. The interview questions will be based on both primary and secondary research questions, but additional information that could inform the research may also be included (Park & Park, 2016). In addition, the research participants will be given an interview guide (see Appendix 1, pg. 88) before the interview to make sure that the conversation stays focused and on track. The importance of confidential information will be emphasised through the consent letter to ensure that the research participants feel comfortable sharing their insights and experiences (see Appendix 2, pg. 90). The interview guide was designed to address our primary research questions and draw out relevant information, while maintaining consistency across interviews. To ensure this, all interview questions were mapped to the consistency matrix, which was created as part of the planning process. The consistency matrix was used to ensure that questions followed the agreed upon research objectives and topics. Additionally, the matrix served as a reference tool that allowed us to quickly identify relationships between questions and topics. Data was collected cross-sectionally, at a single point in time (Rindfleisch, Malter, Ganesan and Moorman, 2008)

4.3.6. Analysis approach

When using the narrative enquiry method, stories told by respondents are reformulated to consider the context of each case and the various experiences of each respondent. Qualitative data analysis, as outlined by Braun and Clarke (2006), consists of three main phases applied to data obtained from interviews. The first step in the process is developing and applying code. Coding can be succinctly explained as the categorization of data. The second step is to identify themes, patterns, and relationships by summarising the data. This last stage must establish a connection between the research findings and the hypotheses or research aim and objectives.

4.4 Quality control

Noble and Smith (2015) admit that qualitative research is often subject to derision for its lack of scientific accuracy. Noble and Smith (2015) and Morse (2002) propose solutions for enhancing the trustworthiness of qualitative research data. These protocols are similar to those applied to quantitative research and include guaranteeing truthfulness and validity. Verification procedures, such as coherence, sample sufficiency, concurrent data analyses, and theory building, also provide assurance. Audit trails, software code, and member checks

were employed to address the concerns of validity. Verification and validity strategies were analyzed and employed where necessary, as declared. Despite the fact that these elements were considered one by one, the approach was incredibly iterative and interchangeable (Morse, 2002; Meadows and Morse, 2001).

4.4.1 Verification Strategies

To guarantee that the technique employed for data gathering and analysis is consistent with the anticipated outcome of the research topic, the research strategy should be in agreement with interpretative phenomenological analysis (IPA) techniques, such as semi-structured interviews directed by an interview guide. The same principle was extended to data analysis, which was a social process of research and coding instead of a synchronous evaluation (Morse, 2002).

When verifying data completeness and reliability, it is important to consider sample sufficiency. To guarantee that respondents had knowledge and expertise of the suggested matter, the sample population was explicitly specified. The sample size was determined using IPA academic recommendations, and saturation was accomplished for this study. This saturation point improved data dependability, as no additional insights were attainable (Morse, 2002).

The researcher began by conducting a literature review to ascertain what was already known about the topic of inquiry. Data triangulation and concurrent analyses were then performed in order to compare and contrast the data, while the researcher obtained deeper understanding through the collection of data (Alase, 2017; Morse, 2002).

4.4.2 Validity Checks

Meadows and Morse (2001) explored the importance of audit trails as a form of documentation that elucidates the researcher's decisions. Truth value acknowledges the presence of various realities and data should represent those points of view clearly. Consequently, to make sure that the researcher was mindful of their own prejudices as a result of their history as an engineer in manufacturing transitioning to a manager, personal remarks indicating a personal response were included with every interview, in addition to the video recording and automated transcripts to guarantee data precision. Moreover, for audit trails regarding data validity, the researcher employed record keeping as an additional strategy; all transcripts, video recordings, personal notes, and coding evolution were noted to minimize any potential bias.

Computer-assisted data analysis is a method of concluding a thorough data analysis process. The researcher's expertise restricts data analysis through software. For this reason, ATLAS.ti was chosen as a tool and the researcher self-trained to ensure the product was

utilized properly (Meadows and Morse, 2001).

Seeking opinions from members can be another helpful way of steering the researcher's opinion in the study. As the research progressed, the researcher's mentor with expertise in the relevant field acted as a member check for further deliberation of the investigation.

4.5 Limitations

Saunders, Lewis, and Thornhill (2009), emphasize the importance of avoiding interviewee bias during primary data collection to maintain the validity of the research findings. By keeping an open mind, the interviewer can avoid reacting too strongly to the responses of the interviewee. Acknowledging the researchers' identity as an engineer who has transitioned into a leadership role is a method of recognising the limitation of inherent bias that can occur in qualitative research. Other limitations that should be acknowledged in this qualitative study, it does not explore the impact of demographic differences on the outcomes of the research. In addition, the data obtained are limited to the opinions of the engineers interviewed, which may not be applicable to other contexts or groups. It is also important to consider the impact of the interviewing process on the responses provided by the interviewees, as well as any issues of non-verbal communication that may have been emblematic of the research context.

Braun and Clarke (2006) highlight the need for further steps to be taken when preparing for an interview, such as dressing appropriately and unobtrusively for the interview venue and selecting a private area for the interview. Additionally, Polonsky and Waller (2011) suggest that the interview should be planned in a timely manner and should be conducted in a stress free ambiance. Furthermore, it is imperative for the interviewer to create a tranquil environment and possess confidence.

4.6 Conclusion

The chosen qualitative research method for this research is phenomenology, which focuses on the lived experiences of individuals. This is particularly relevant to the research questions, which aim to explore the perspectives and experiences of a specific group of individuals. The use of this method will enable us to gain a deep understanding of the phenomenon being studied, as well as provide insight into how individuals interpret and make meaning of their experiences. Furthermore, this approach will allow for the development of rich and detailed descriptions and narratives, which will be invaluable in answering the research questions. The chosen research method will be effective to answer the research questions.

Chapter 5: Results

5.1 Introduction

This study attempted to listen to the participants' experiences as they told the journey that brought them to their present position, including the hardships and joys of the shift. This chapter presents the findings of the interviews performed to address the research questions posed in chapter three. This chapter also includes information on the research participants, a recap of the interviews, and data analysis that was used to generate themes.

The interview questions were written in response to the research questions. The first section of the interview guide was created to ensure that responses were provided without thematic prejudice. Participants in the study were originally asked to submit information such as their work title, industry, and length of time in a leadership capacity. Tracy (2010) proposed that openness is essential for increasing the rigor and, ultimately, the quality of qualitative investigations, including identifying any issues, obstructions, and revisions made during the study process.

5.2 Sample overview

A total of 12 semi-structured interviews with participants who all fit the criteria outlined in chapter four and had a leadership role in their organisation. Representing different industries, the participants' areas of work made it possible for the researcher to recognize common patterns amongst them.

5.3 Summary of interviews

Table 1: Interview summary details

No.	Details	Count
1	Total number of interviews conducted	12
2	The total duration of interviews	556 minutes and 57 seconds
3	Shortest interview	30 minutes and 8 seconds
4	Longest interview	68 minutes and 28 seconds
5	Average time	46 minutes and 25 seconds

Table 2: Details of research participants

No.	Gender	Current Job title	Manufacturing Industry	Number years as a leader
1	Male	Design Engineer	Petroleum	~10 years
2	Male	Senior Machinal Engineer	Pulp and Paper	~8 years
3	Male	Area Manager	Petroleum	~5 years
4	Male	Area Manager	Petroleum	~5 years
5	Female	Project Area Manager	Pulp and Paper	~8 years
6	Male	Maintenance Manager	Water Works	~6 years
7	Male	Regional Sourcing Manager	Pulp and Paper	~11 years
8	Male	Group Mechanical Engineer	Pharmaceutical	~5 years
9	Male	Engineering Manager	Pulp and Paper	~8 years
10	Male	Senior Operations Manager	Automotive	~11 years
11	Female	Reliability Engineer	Pulp and Paper	~5 years
12	Male	Mill Manager	Pulp and Paper	~11 years

Table 3: Interview details

Participant	Date of interview	Duration of interview (minutes)
1	06-Dec-22	37:13:00
2	06-Dec-22	54:50:00
3	06-Dec-22	30:08:00
4	07-Dec-22	32:57:00
5	08-Dec-22	46:12:00
6	08-Dec-22	34:16:00
7	13-Dec-22	36:47:00
8	14-Dec-22	40:22:00
9	16-Dec-22	68:28:00
10	17-Dec-22	63:59:00
11	13-Jan-23	61:40:00
12	03-Feb-23	50:05:00

Interviews were held virtually through a video teleconferencing programme, with each session lasting the allotted time as per the interview guide and participant consent form. The preamble and introduction phase of the interviews were included in the recordings, in which the researcher welcomed the participants and took the appropriate measures to create a relaxing atmosphere, being that it was a virtual interview. All participants confirmed that the interviews be recorded for purposes of transcription. The interview recordings were transcribed using an internal feature of Teams and further refined by the researcher. The inputted transcriptions were processed by ATLAS.ti, a programme that enables the analysis and documentation of data themes, thus facilitating the identification of patterns in meaning across the data set.

5.4 Presentation of results

The findings of the research are presented in line with the research questions outlined in chapter 3. The data from the interviews was subjected to specific coding in order to analyse it. Precise expressions and major topics were detected from the transcriptions of the interviews and noted down in a Microsoft Excel spreadsheet crafted by the researcher. All constructs were arranged according to a theme, after which the constructs were divided into subcategories, and the frequencies of these constructs were gathered to produce a ranking.

Research question 1

What is the experience of South African engineers and technical professionals in the manufacturing sector in transitioning into a leadership role?

Research question 2

What do engineers consider as enablers or barriers in their transition into leadership roles?

Research question 3

What are the personal transformation experiences of engineers in their transition into leadership roles?

5.4.1 Results of research question 1

What is the experience of South African engineers and technical professionals in the manufacturing sector in transitioning into a leadership role?

It is important to highlight that the shift to leadership roles can be a challenging experience for many individuals, regardless of their prior experiences and skill sets. The purpose of asking open-ended questions was to obtain a comprehensive understanding of the participants' experiences and perspectives around leadership transition. Based on the participants' responses throughout the process, key themes related to the obstacles faced when transitioning to a leadership position emerged. These obstacles varied from individual to individual, with themes including managing personnel, self-management, organizational culture, inequality, workplace dynamics, and winning over colleagues in a new role.

Table 4: Challenges experienced by new leaders during transition

No.	Theme	Mention Count	Interview reference
1	Managing personnel	12	1,2,3,4,5,6,7,8,9,10,11,12
2	Self-management	9	1,2,5,6,8,9,10,11,12
3	Organisational culture	9	1,2,3,4,5,7,9,10,12
4	Inequality in work place	6	1,4,5,6,8,12
5	Workplace team dynamics	6	1,2,3,8,9,12
6	Winning over colleagues in a new role (acceptance)	4	2,3,6,12

One of the challenges that engineers and technical specialist face when they move into managerial or leadership roles is managing different team dynamics and improving their own people-management skills. The research participants referenced several components of personnel management. In particular, the research participants emphasized that building trust with their team was among the most difficult tasks they faced. This required creating a safe

environment where team members felt they could express their ideas and opinions without fear of criticism or judgement. Establishing trust was further complicated by the fact that their teams consisted of a variety of different ages and backgrounds. The research participants also identified that delegating tasks to team members and allocating responsibilities appropriately was also a key challenge. Additionally, the research participants discussed the difficulty of adapting their own attitude and mindset to their new role and responsibilities. The following remarks about managing personnel are taken from the interviews:

"When individuals consistently make the comment that you do not leave an organisation, but rather a manager, it is due to the lack of resources available to managers to effectively lead a team. This is a concept I had to grasp when I transitioned to a leadership role" – Interview participant one

"Learning how to manage people can be a daunting experience, particularly for individuals from a technical background. However, it is a skill that can be learned over time and with practice." – Interview participant two

"Being unassertive may result in others perceiving you as lacking in confidence" – Interview participant three

"To create a safe environment as a leader, it is crucial to understand each individual's preferred communication style. This will help establish a psychologically safe environment" – Interview participant six

"One of the most significant challenges I faced was trust. It was challenging to trust those who were under my leadership" – Interview participant seven

Many of the responses given by the interview participants underscored the significance of possessing a robust sense of self-awareness and self-regulation as a component of the self-management procedure. Participants mentioned that they had to learn to think critically and objectively about their actions, to recognize their own strengths and weaknesses, and to develop their own solutions to challenges. Additionally, self-regulation was seen as a way to ensure that any decisions made by the individual were well-informed and in accordance with the values and goals of the organization.

Furthermore, participants stressed the importance of being proactive in developing strategies for dealing with difficult situations and for providing support and motivation for those

whom they led. It is evident from the research that self-management is vital for the successful transition into a new role. Self-management is not just about understanding the goals and objectives of the role but also being able to emotionally equip oneself to navigate the transition and effectively build relationships with team members and stakeholders. The following remarks about self-management are taken from the interviews:

"My focus had to shift from self-leadership to leading others and creating an environment that is conducive to their empowerment"– Interview participant two

"I was required to change my focus, from self-leadership to leading others – Interview participant four

"Leadership involves not just emotional intelligence, but a combination of cognitive intelligence as well, in a more formal tone"– Interview participant eight

"Adapting to my leadership role took a considerable amount of time" – Interview participant nine

Based on the interviews conducted, it appeared that the challenges mentioned regarding the organisational culture were reported by both male and female research participants. However, it was observed that women were more likely to voice their concerns regarding the patriarchal environment, which could be due to the systemic barriers and discrimination they might have faced in the workplace. The interviewees emphasised the need for promoting diversity and inclusion to foster a more supportive environment for all employees, regardless of their gender or background. Both female and male participants felt their decisions were not respected and were often second-guessed by their peers, which resulted in a lack of trust and recognition as a leader. Additionally, they found there was an invisible barrier in place that limited the career growth opportunities available to them. With these challenges in mind, the research participants also experienced moments of joy and growth as they managed to navigate the organisational culture. Some participants also reported feeling empowered and inspired by their leadership roles. The following remarks about organisational culture are taken from the interviews:

"Until proven otherwise, one is almost presumed to be incompetent and incapable. The greatest challenge for me has been overcoming this perception"– Interview participant one

"A key obstacle faced was the patriarchal culture in the workplace, which required women to assert themselves or conform to certain behaviours. In meetings, for instance, it was common to find oneself as one of only a few female attendees among a group of male managers" – Interview participant five

"upon entering an organization as a black female, one is often viewed as a threat"– Interview participant eleven

It was discovered through the research that many participants faced significant challenges related to organizational inequality. According to the responses from both male and female participants in the study, it appears that the disparity is largely due to a lack of recognition, racism, inequality, and unequal treatment compared to their male counterparts. Such disparities have become increasingly salient in the leadership community, and as such require further attention and consideration. In order to acquire a more complete comprehension of these issues, it is essential to contemplate the experiences of individuals who stem from varied backgrounds and confront various forms of inequality. Further, the findings showed that these issues of inequality impacted participants' ability to trust, engage and participate in their teams. The following remarks about organisational inequality are taken from the interviews:

"In a world where gender is still a common topic of discussion, it come as no surprise that I as a female professionals felt undermined and underestimated in the workplace. This is especially true in male-dominated industries like manufacturing where stereotypes and biases still persist. Despite this, I had not only succeeded but excelled in their careers through hard work, dedication, and resiliency"– Interview participant five

"Being a black leader in a manufacturing environment dominated by white afrikaners presents unique challenges. Achieving acceptance in this context requires significant effort over a period of time." – Interview participant ten

"Although the challenges of being a female leader in a male-dominated industry can seem daunting, there are strategies that can assist in gaining acceptance. One such strategy is to build relationships with colleagues by demonstrating genuine interest in their ideas and concerns. It's important to actively listen and consider recommendations from team members, and to allow others to lead in areas where they have specific skills or knowledge"– Interview participant eleven

"This industry is heavily male-dominated, and as a woman, one must work twice as hard to demonstrate their value" – Interview participant eleven

The workplace team dynamics were an integral part of transitioning into a leadership role for the research participants. They felt the need to modify their behaviour to succeed in the workplace. They reported the need to take on a different persona that did not reflect their natural personality or preferences. Some described having to be overly assertive and inauthentic in order to be taken seriously and respected by colleagues. They also discussed feeling fearful of non-conforming and having to conform to the expectations of the workplace. These dynamics also included taking on the responsibility of managing conflicts and having to shift from a technical to a leadership mindset. As they navigated these complexities, many of the participants found their experiences to be draining and challenging. Ultimately, they had to find ways to balance their own desires while also conforming to workplace expectations. The following remarks about workplace team dynamics are taken from the interviews:

As I transitioned to a leadership position, I had to adopt a more assertive demeanour, as I was perceived as lacking confidence when I did not assert myself" – Interview participant three

"Managing group dynamics is crucial to the success of any team. For instance, one of my team members had been with the organization for over 20 years and believed he would automatically receive the leadership position. However, I was able to secure the position after only one year– Interview participant seven

"As I transitioned to a leadership position, it was crucial for me to recognize the need to re-establish relationships with my colleagues. This was not because they did not respect my new role, but rather because the dynamic between us had shifted. Approaching these relationships with empathy and open communication is crucial to building trust and mutual respect. One tactic that was useful for me in that situations is to schedule one-on-one meetings with colleagues to address any potential concerns or changes in expectations"– Interview participant eight

The transition into a leadership role is often a difficult process, especially when it comes to garnering acceptance from one's peers. This can be particularly challenging when the individual taking on the leadership role has been part of the team for some time. The research participants revealed that the transition is often met with resistance and scepticism by those who were once in a similar situation. The individual must therefore take time to gain the trust

of their peers and build relationships that can be beneficial for the team. The following remarks about the winning over of colleagues in a new role are taken from the interviews:

"There was a lack of acceptance of me as a female leader, which further exacerbated the challenge of gaining recognition from my peers. It felt like my gender was being held against me even though I had the qualifications and experience to lead effectively. Over time, I realized that gaining acceptance required more than just doing a good job - I had to work harder than my male counterparts to prove myself and build trust with my team. Despite the initial difficulties, I persisted and eventually earned the respect and recognition that I deserved."– Interview participant five

"The most significant challenge was being acknowledged as a supervisor, top manager, or leader by my peers. Despite my greatest efforts, some of them struggled with this transition and saw it as an imposition, which damaged the friendships." – Interview participant seven

"Being recognised as a leader can be a difficult and arduous task, regardless of the industry or workplace. It requires not only the necessary qualifications and experience but also the ability to earn the trust and support of my team. However, when some team members struggle with the transition, it can lead to feelings of frustration and discouragement. As a result, relationships often get damaged or even fractured, making it even more challenging to succeed as a leader" – Interview participant nine

5.4.2 Results of research question 2

What do engineers consider as enablers or barriers in their transition into leadership roles?

The open-ended questions posed to research participants during their interviews were intended to elicit the most supporting variables while shifting from self-leadership to leading others. An open-ended inquiry was performed to investigate the research participants' experiences and identify the favourable elements. After analysing sixteen different codes, nine distinct themes were determined, and frequency analysis was used to establish the most and least strong factors.

Table 5: Factors that enable successful transition to leadership role

No.	Theme	Mention Count	Interview reference
1	Practical leadership experience	12	1,2,3,4,5,6,7,8,9,10,11,12
2	Personal growth and development drive	11	1,3,4,5,6,7,8,9,10,11,12
3	Mentorship and sponsorship	8	1,2,3,4,5,7,9,10,12
4	Organisational culture	8	2,4,5,6,8,9,11,12
5	Structured training and development	8	1,2,3,4,6,8,9,10
6	Targeted coaching	6	4,7,8,9,11,12
7	Consistent manager support	4	1,2,11,12
8	Internal support and guidance system	3	1,4,12
9	Leadership structure and leadership pipeline	2	2,1

Through the analysis of the interviews, it became apparent that there were three different levels of importance. The primary tier consisted of two major components; the capacity to utilize leadership abilities through experiential learning, and the individual's own effort and capability. The second tier of support included guidance on corporate culture, training, and improvement. Lastly, the third tier was made up of various forms of help, such as tutoring, line manager assistance, internal assistance, and a strict authority structure.

The research participants highly valued the experiences they were able to gain through their leadership roles. They identified that through experiential learning, they were able to develop their leadership skills, become more confident in their decision-making and better understand the organisation's strategy. Furthermore, they felt that having the chance to put these skills into practice and receive feedback enabled them to make improvements in their performance and increase their leadership capability. Lastly, they reported that personal effort and abilities were also essential for successful leadership transitions. This result suggests that providing employees with opportunities to apply their leadership skills is the cornerstone of a successful leadership transition. Opportunities to practice their skills in a supportive environment are especially beneficial as they give employees the support they need to develop and hone their skills. The following remarks about having adequate opportunities to develop and apply leadership skills are taken from the interviews:

"As I ventured into the world of leadership, I was afraid of making mistakes and possibly failing those that I led. However, the more I practiced, the more comfortable I became with making decisions and taking charge of various activities. As a result, my confidence began to grow, and I realized that being a leader isn't about being perfect, but rather about learning and

growing from the challenges that arise. With time, I began to trust myself more and develop a natural intuition for making the best decisions for my team."– Interview participant four

"It's no secret that knowledge and theory are important for learning. However, when it comes to leadership, practical implementation is equally critical. Without applying the principles learned in real-life situations, leaders are unlikely to succeed. This lack of exposure to practical experience has taken a toll on many leaders, causing them to fail or struggle unnecessarily"– Interview participant six

"Continuing my journey as a leader, I have come to understand the importance of implementation and application of learnings. In my experience, practical application of theoretical knowledge is the key to perfecting one's leadership skills. The platform provided to me allowed me to experiment with various techniques and hone my strengths while addressing areas that required development. As a result, I became more confident in my abilities and was able to lead my team to achieve greater success."– Interview participant seven

"After attending several leadership workshops and training sessions, the opportunity to implement my learnings came my way. I was excited to have a platform to put what I had learned into practice. It started with small tasks such as organizing team building activities and leading small group discussions. As I successfully executed these responsibilities, I was given more significant opportunities to lead teams and projects."– Interview participant two

"One of the most profound ways to learn is through the mistakes that we make. When I come face-to-face with a mistake, I have the opportunity to learn from it and avoid making similar errors in the future. Mistakes can be powerful teachers and has shaped my leadership skills. I viewed them not as obstacles but as opportunities for growth, and I embraced the lessons they tough me"– Interview participant twelve

The research participants discussed the importance of drawing on various personal assets to succeed in a leadership role, such as confidence, communication skills, and resilience. These individual efforts allowed them to navigate the transition from a follower to a leader, with the majority of the research participants noting that their personal efforts were one of the major factors that allowed them to move into a leadership role. The participants also discussed the importance of taking risks, setting goals, and being proactive in order to be successful in a leadership role. Moreover, the research highlighted that the participants had an active role in the transition to a leadership role and that they were capable of being successful through

their personal efforts. Furthermore, participants highlighted the need to develop new skills and knowledge, to seek out mentors and to have confidence in their own abilities. Finally, the participants commented on the importance of building and leveraging relationships as part of the process of transitioning into a leadership role. The following remarks about personal growth and development drive are taken from the interviews:

"One of the most crucial factors in succeeding in a male-dominated industry is having a strong support system. It is also important to cultivate a sense of self-confidence and resilience, in order to overcome any obstacles or setbacks that may arise. By remaining proactive, focused, and dedicated to their goals, you can break down barriers and make meaningful progress in your respective fields." – Interview participant five

"In this environment, success hinges on having a winning mentality. This means asking questions regularly and being open to learning. These elements have been essential to my growth as a leader" – Interview participant ten

"Having a resilient spirit and thirst for knowledge is crucial for success not only in a manufacturing but in any industry. It requires continuous learning, dedication and hard work. It means being willing to face challenges and overcome obstacles with a positive mindset. With each accomplishment, confidence grows, and the ability to lead effectively becomes stronger." – Interview participant ten

"Whether it's overcoming imposter syndrome, self-doubt or fear of failure, as a leader you need to have a strong sense of self-awareness and continuously work on your personal growth. This means being open and willing to learn from failures and mistakes, and taking steps to address any weaknesses you may have. A leader who can conquer their internal battles is better equipped to lead and inspire others, creating a positive impact in their organization and beyond." – Interview participant twelve

It was found that having a mentor and sponsor during the transition was essential to success. This was considered the third most important factor for successful leadership transitions and was highlighted in several interviews. Mentors provide a valuable source of guidance and advice, allowing those in transition to learn from the experiences of others in managing such complex and challenging roles. They can be a valuable asset in offering support and advice, which can build confidence and provide assurance in times of uncertainty. On the other hand, the research also found that access to mentors and sponsors who can

provide necessary support and guidance when transitioning to a leadership role was lacking. To ensure successful transitions into leadership roles, organizations must put measures in place that provide mentorship and guidance to individuals. The following remarks about mentorship and sponsorship are taken from the interviews:

"For me, mentorship has had a greater impact because my mentor understood the unique challenges that came with my field of work. His guidance helped me navigate through difficult situations, learn from them, and ultimately grow both as an individual and a professional" – Interview participant four

"Our mentor-mentee relationship was built on mutual trust, respect and a shared motivation to succeed. Thanks to his support and guidance, I have been able to develop and implement effective strategies to overcome obstacles, flourish in my field and pay it forward by mentoring others"– Interview participant nine

"Having a mentor can be invaluable in navigating the complexities of one's professional environment. In the manufacturing industry, this rings especially true. The rapidly evolving landscape and constant need to innovate presents its own unique set of challenges. A good mentor can provide a sounding board to bounce ideas off of, offer industry-specific insights, and provide guidance on navigating professional relationships within the confines of a manufacturing environment.– Interview participant nine

My mentor not only provided guidance and support, but also opportunities that helped me to grow in my field. He connected me with experienced professionals in the industry and provided me with exposure to different areas of the field. Through his network, I was able to attend workshops and conferences, and this exposure helped me to gain a broader perspective and elevate my skills. I am grateful for the boost that he gave me and I am committed to paying it forward by providing similar guidance and opportunities to the next generation." – Interview participant 12

The fourth factor that was discussed was the importance of having an inclusive and diverse company culture. This includes creating an environment where employees from different backgrounds and with diverse perspectives are respected and encouraged. It also means making sure that everyone is able to contribute to the conversation and feel heard. The research participants felt that having an open dialogue with employees about what is working and what needs to be improved is essential for any successful organization. Moreover,

creating a culture where everyone is respected and accepted can help promote productivity and innovation. This demonstrates how important it is for businesses to recognize and celebrate diversity in the workplace. The following remarks about organisational culture and environment are taken from the interviews:

"Patriarchal systems can result in a lack of diversity and inclusion, which can stifle creativity and limit progress. Despite these challenges, there are opportunities to challenge and change patriarchal systems, and individuals must continue to fight for greater equity and empowerment" – Interview participant nine

"I truly believe that the environment and culture of a workplace is heavily influenced by the qualities of its leader, especially in the manufacturing industries. As a field that is centered around efficiency, productivity, and results, the leaders who can create a supportive and motivating work environment can make all the difference. In my previous industry, the leader's facilitation of a conducive work environment enabled me to thrive professionally."– Interview participant nine

"Facing patriarchal environments is unfortunately a common experience for many individuals, particularly women, in various aspects of life, including the workplace, social settings, and even within their own homes. This type of environment undermines confidence, create a feeling of isolation, and limit one's ability to attain their goals" – Interview participant eleven

Structured training and development was the fifth-ranked factor in supporting successful leadership transitions, according to research participants. Participants found attending training sessions, workshops, and lectures beneficial in their transition from self-leadership to leading others This enabled them to develop their technical knowledge, skills, and confidence in their new leadership role. Additionally, the training helped them to become more aware of the organisational context which allowed them to make better decisions. It also provides a platform to practice and develop new skills in a supportive environment, enabling leaders to build their confidence and capability.

Through the research, it was established that organisations have a vital function during the transition into a leadership role. For the purpose of acquiring knowledge about the role that formal learning played in preparing the research participants for the transition, the researcher asked the interviewees about the resources provided by the organisation in order to determine which inputs had the most impact on the transition. The research found that out of the 12

participants interviewed, four had obtained formal education and eight had obtained informal education. Formal education included leadership courses, certificates, and degrees relevant to their field of work, while informal education included mentoring, coaching, job shadowing, and other on-the-job experiences. The participants who had received formal education reported feeling more prepared and confident in their leadership abilities, and their colleagues noted their leadership skills had developed over time. These findings underline the importance of providing formal training and development opportunities to aspiring leaders in organisations. Consequently, the percentage of those given formal education was quite low. This agrees with the low ranking earned for this factor as observed in table 6 (below).

The following graph shows the split of the number of research participants who obtained formal education versus informal training and development. It is apparent that, compared to those obtaining formal education, 67% of the research participants acquired informal development.

Figure 4: Formal versus informal training

 ■ Formal traning and development   ■ Informal traning and development
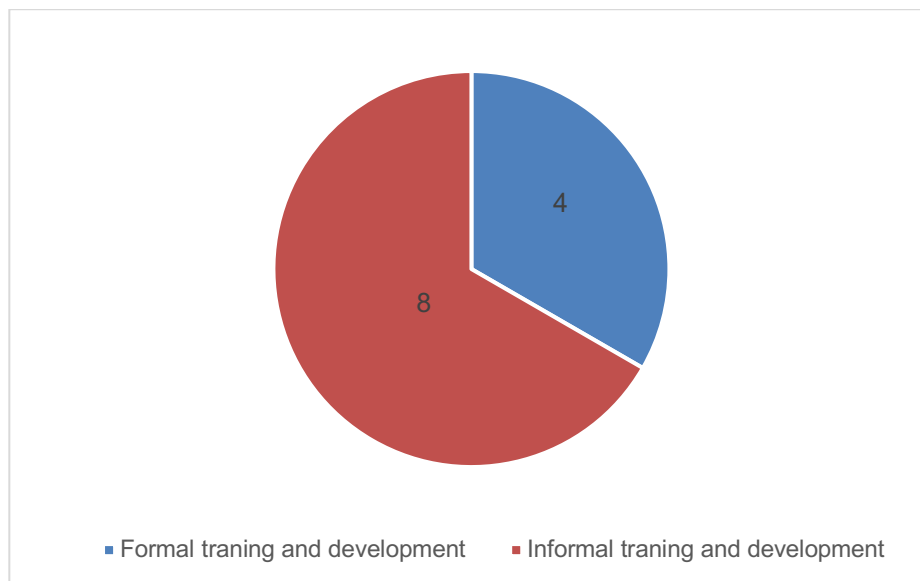
Table six illustrates the various formal and informal trainings to which the research participants were exposed. It appears that the highest number of mentions among the twelve participants was those who had received leadership development training from both internal and external sources. Developing and honing leadership skills can benefit both the individual and the organization. Notable mentions include consistent line managers, unstructured mentorship, and inclusion in a structured and formal leadership pipeline program. It is critical to understand that powerful leadership stimulates a constructive workplace culture and propels successful outcomes. Investing in leadership development programs and mentorship

opportunities can assist prospective leaders in realizing their full potential and having a significant impact within their organization. By incorporating these initiatives into a leadership pipeline program, organizations can construct a structured path for leadership development and succession planning.

Table 6: Types of formal and informal training and development

No.	Type of training	Formal/Informal	Mention Count	Interview reference
1	Internally developed and led leadership training programme	Formal	4	6,7,9,11
2	Externally developed and led leadership training programme	Formal	4	1,3,4,12
3	Consistent manager support	Informal	3	5,7,9
4	Unstructured mentorship	Informal	2	2,4
5	Peer support and guidance	Informal	2	8,1
6	Structured leadership pipeline programme	Formal	1	12

Leadership training, according to study participants, boosts self-assurance while making judgments. As noted in the chart above, organisations may have adopted additional leadership development training to help in the transition into a leadership post. The research concluded that both formal and informal training might be beneficial when shifting into a leadership capacity. Nonetheless, there were questions made about the training's quality, including scheduling, relevance to leadership, and adequacy. The following quotes from the interviews relate to formal and informal training and development:

"Training is a vital component in developing leadership skills. At its core, training provided me with the knowledge and tools I needed to navigate the complexities of my leadership journey" – Interview participant seven

"Whether it's through formal training programs or on-the-job learning experiences, the investment in training is essential for fostering strong, effective leaders. By receiving training, individuals are able to gain a deeper understanding of their own strengths and weaknesses, and develop the necessary skills to effectively lead and motivate others"– Interview participant nine

"While training undoubtedly plays a crucial role in developing leadership skills, it's important to acknowledge that it alone may not be sufficient to attain mastery. The leadership journey is complex, and there are many nuances to understand and navigate." – Interview participant eleven

"While training can provide a foundation, true mastery requires consistent practice and application of knowledge in real-world situations. There is a limit to what formal learning can offer, and it's up to the individual to continue their growth by seeking out new challenges and experiences"– Interview participant eleven

According to interview results, learning through experience is the preferred method for developing leadership skills among employees. The interview results found that 100% of participants agreed that learning through experience supported their transition into a leadership role. This overwhelming support underscores the importance of providing opportunities for employees to gain hands-on leadership experience. Not only does this approach produce competent leaders, but it also fosters a culture of growth and development within the organization.

Table 7: Participants who support learning through experience

	Agree	**Disagree**
Mention Count	12	0
Interview reference	1,2,3,4,5,6,7,8,9,10,11,12	0

The following remarks about learning through practical experiences are taken from the interviews:

"As a leader, it's essential to be confident in your decision-making abilities. The more experience I gained by actively involving myself in a variety of activities and making decisions, the more confident I become in my leadership role" – Interview participant one

"A leader who lacks confidence tends to hesitate, which can lead to missed opportunities and ineffective outcomes. Therefore, becoming more confident in one's leadership practice is crucial as it helps you take charge and make impactful choices with conviction, resulting in better outcomes" – Interview participant nine

"With each situation that I encountered as a leader, whether it was a challenge or a triumph, I learned something new about myself and my abilities. I found that the more I pushed myself outside of my comfort zone, the more my confidence grew. It was through making decisions and taking action that I realized my capacity for leadership. Of course, not every decision I made was perfect, and I have made mistakes along the way, but I learned from those mistakes and it only helped me to further develop my skill set."– Interview participant ten

"The ability to harness previous experiences can be tremendously helpful in addressing new challenges. Experience cannot be bought underscores the value of every leadership opportunity, particularly those that push one beyond their comfort zone. Ultimately, leadership is a skill that develops over time, and every decision, good or bad, has the potential to contribute to its growth.– Interview participant twelve

The research findings indicate that there is room for improvement when it comes to organisations facilitating their employees' transition into leadership roles. Despite the availability of leadership development programs, many participants still felt that their organisations could have done more to support them in this process. This suggests that there may be a disconnect between the programs offered and the actual needs of employees. Therefore, it is important for organisations to not only provide leadership development opportunities, but also to actively seek feedback and make adjustments to better meet the needs of their employees.

Building on the previous paragraphs which emphasised the importance of feedback and guidance, coaching emerged as the sixth-ranked factor with six mentions in the research. Both internal and external coaching were highlighted as instrumental in aiding employees' transition to leadership. Internal coaching provided insights and suggestions specific to the organization and its structure. Meanwhile, the coaching from external sources provided a fresh perspective and impartial advice, helping employees to navigate the significant changes and challenges involved when transitioning to a leadership role. Additionally, the coaching was seen as a way to gain knowledge from experienced professionals, which enabled them to develop their skills and confidence. The research participants pointed out that the coaching they received from sources outside the organisation provided them with a non-biased and independent perception of their problems. This gave them the opportunity to rethink and contemplate different viewpoints as they faced the multiple difficulties they were confronted with. The following remark about learning through structured and formal coaching experiences are taken from the interviews:

"I believe that having a personal coach can be a worthwhile investment of both time and money, especially if you're feeling lost or stuck in your personal or professional life. A great coach acts as a guide, leading you towards your goals and showing you the way forward. – Interview participant eleven

"Having a coach can be a truly transformative experience. Not only do they guide and lead you through the process of personal development, but they also provide a fresh perspective on your situation that you may not have considered before"– Interview participant twelve

When transitioning into a leadership role, the support from one's line manager is ranked as the seventh most important factor. Despite this ranking, it continues to be vital in assisting employees to adapt to their new responsibilities. Line managers not only have a deep understanding of the organization but also have direct experience in leading teams. As such, they can offer unique insight into the specific challenges that come with a leadership role. Additionally, they can provide valuable guidance on how to navigate the politics and culture of the company, as well as offer feedback on performance and development opportunities and pose questions without fear of judgment. Additionally, the line manager serves as a sounding board for new leaders, providing feedback and guidance to help them build their skills and confidence. This type of support is invaluable in the development of leadership skills and ultimately helps individuals make a successful transition into their new role. The support that a line manager provides is especially crucial in the early stages of a leadership journey, when an individual is still unfamiliar with their new role and responsibilities. Through on-the-job training and guidance, the line manager creates a safe environment where the individual can make mistakes and ask questions without fear of judgement or reprimand. By creating a supportive environment, line managers can ensure that the individual is able to hone their leadership skills effectively. The following remarks about learning through line manager support and guidance are taken from the interviews:

"When I reflect on my leadership journey, it becomes clear that the support of my line manager was a pivotal factor in my growth and development" –Interview participant five

"Having a supportive line manager can make all the difference when it comes to career growth and development. Not only did my line manager help me acquire the necessary skills and tools to transition into a leadership role, but they also provided ongoing support and guidance throughout the journey" – Interview participant seven

It can be concluded that research participants found their own efforts and capabilities to have the most positive influence on their transition to leadership roles. Having the opportunity to apply new skills in a real-world setting was also appreciated by the participants, who overwhelmingly cited a supportive environment, good communication, and adequate resources as contributing heavily to their success. Furthermore, most of the participants felt that feedback was essential for personal growth and development. Therefore, the research demonstrated that having the opportunity to apply newly acquired knowledge and skills was an essential prerequisite for successful leadership.

5.4.3 Results of research question three

What are the personal transformation experiences of engineers in their transition into leadership roles?

Engineers transitioning into leadership roles often face a steep learning curve. They're tasked with a variety of new challenges, such as managing teams, strategic planning, and motivating employees. In order to successfully progress in this transition, engineers must embrace personal transformation experiences. These experiences can include developing effective communication and interpersonal skills, being able to set realistic objectives, and learning to take calculated risks. This often leads to difficult personal growth experiences, as they must learn how to apply their engineering know-how to the new position. It is not always easy, but making the transition to a leadership role can be highly rewarding and beneficial for all involved.

During the interview, the participants were asked several questions related to the changes that had occurred since they entered their new role. They were firstly asked to comment on the changes they had seen in themselves; secondly, they were asked if their view of themselves as a leader had been modified; and finally, they were asked how a person close to them would describe the changes that had been made by the participant. The responses to these queries constituted the basis of the question three discoveries, and were supplemented by accounts of transformations several of the participants discussed while narrating their narratives.

Individuals involved in the research noted various changes such as demeanour, conduct, connections with others, and personal health. Nonetheless, three of the individuals did not feel like they had changed at all. Those who noticed a difference in themselves as a result of their transition reported varying levels of apprehension and favourability. The following remarks about self-perspective are taken from the interviews:

"As an independent contributor, I used less emotional energy on the work. And now I'm always concerned about my team, who have become like my children, I'm concerned about

them even when I'm not with them " – Interview participant two

"Physically and mentally, I am a much more productive person now that I am in a leadership role within the company. Previously, my work was more solitary, and I was only responsible for myself and my own performance. Now, I still have those responsibilities, but I must also be cognizant of the team's wellbeing and how their actions will affect the whole team." – Interview participant five

"Personally, I'm in a much better place mentally since transitioning. This sense of responsibility and the knowledge that my team is relying on me makes me proud and gives me a sense of purpose in my work." – Interview participant eight

I have learned to not trust quite so easily. I've learned to just take things with a little more grains of salt than I would have previously. – Interview participant 10

As they relayed their journey, the participants outlined how they perceived adjustments to their own leadership abilities and methods. The research participants expressing a change in themselves in relation to a trait that is commonly seen as vital for leaders and managers, like delegating, problem-solving, deciding, and providing feedback. The following remarks about changes to leadership experienced by participants are taken from the interviews:

"Before transitioning into this leadership role, I was hesitant to give bad news or to confront people with challenging situations. I thought it would be difficult and demoralizing, but in actuality, I have been surprised by my own ability to deliver difficult news with grace. I have learned that having the right tone and approach can make a significant difference in how the news is received. The most important thing is to always be respectful and to convey my message in a way that is clear and concise." – Interview participant one

"There is much that gets focused on the technical side, and rightfully so. Technical skills are essential for this role, but I think the interpersonal skills are as equally important. I have learned the value of listening to and understanding the needs of my team, and working with them to establish a shared solutions... It's all about influence and communication..."
– Interview participant three

"I am still working on my ability to lead through others and delegate tasks effectively. I have found that I need to rely on my team more. I have to trust that they will complete tasks in a

timely manner and to the best of their ability so.... I should stop looking over their shoulders all the time. I am always striving to become a better leader, and this is one area that I'm consistently focusing on." – Interview participant seven

The effects of role transition are not confined to the individual; those closest to them may also recognize changes. Generally, family members are the first to observe the difference, but friends and other close people can also perceive alterations, both beneficial and detrimental. When going through a transition, an individual may experience many changes, such as changes in mood or behaviour, lifestyle decisions, relationships, and performance in their new responsibilities. The changes made by participants often have an effect on those closest to them outside of work, such as family and friends. These close people notice and often remark on the changes they observe in the participant. The following remarks from experiences from other's perspective are taken from the interviews:

"My friends have told me they've noticed a shift in me - I have become more focused and driven. I have become more goal-oriented." – Interview participant four

"I think my husband would say that I'm more stressed in this new role than I
was previously, hence I run allot." – Interview participant 11

"My close friends have seen the most difference in me. They tell me that they can see my enthusiasm when I talk about my work. They recognize my dedication and passion when I am working on projects. They see me doing what I love at work, and it is inspiring to them." – Interview participant 12

5.5 Conclusion of findings

This chapter focused on collecting data through the qualitative approach and outlining the approach employed. The semi-structured interview process was outlined and the justification for selecting this method was due to the exploratory nature of this study. This chapter presented the research methodology, including the selection of sample and explanation for the interview tools. The data collected was evaluated objectively by distinguishing themes and accurately representing the views of the interviewees. In order to further guarantee accuracy, some of the respondents were quoted directly in this chapter, minimizing the risk of biased interpretation. The demographic indicators were discussed in the interpretation to demonstrate the population division based on various variables. It was ascertained that the population adequately represented the chosen segment and complied with the set requirements.

Based on the findings of the research, engineers who successfully transition from self-leadership to leading others have several specific factors in common. These include a willingness to take on new challenges, excellent communication and interpersonal skills, and a clear understanding of the importance of team-building. Despite these shared traits, many engineers still face significant challenges as they try to transition into leadership roles, including difficulty balancing competing demands and overcoming resistance from team members who are not used to seeing them in a leadership capacity. Additionally, the research provides insights into the factors that facilitate a successful transition from both an individual and organizational perspective. The next section aimed to recognize the factors that influenced the career transition to management and identify the beneficial outcomes. The distinct findings and interpretations will be examined in the following chapter.

Chapter 6: Discussion of Results

6.1 Introduction

This chapter will take the research questions from chapter five and discuss their results in relation to the literature review of chapter two. The findings of this discussion will help to better understand the factors that contribute to the successful transition of engineers and technical professionals in the manufacturing sector in South Africa from self-leadership to leading of others.

By understanding these factors, individuals, teams and organisations can create a comprehensive process for successful leadership transition. Such a framework should include processes for the selection and development of future leaders, as well as for the recognition and reward of successful transitions. It should also consider the factors that can contribute to unsuccessful transitions, and how to minimise the risk of failure. Finally, it should consider the impact of the changing South African manufacturing environment on leadership transition, and how to prepare and adapt accordingly.

Based on the findings, it was apparent that the majority of engineers who made the transition into management were feeling uncertain and uneasy due to their newfound authority. The initial two questions highlighted the same underlying challenges that were observed among the respondents. All of the research participants spoke about elements that were associated with the management of people in either of the two questions. The difficulty encountered in managing people is a major factor in the establishment of a new manager. The perception of others towards the individual undergoing the transition, the abilities to manage those perceptions, and the aptitude to competently take over the new duties as a manager is thought to be a definite factor in their transformation.

Additionally, the lack of adequate management training during the transition and the difficulty in embracing a new title and responsibilities were repeatedly noted by all research participants as challenges. This can be attributed to the inexperience and lack of knowledge on how to deal with a group of people. Further, the pressure of having to live up to the expectations of others, and the temptation to retreat to their previous role, was noted by many of the research participants.

Lastly, an overall sense of being overwhelmed and unprepared for the transition was a common theme. These findings suggest that a thorough understanding of the skills needed to transition into management is necessary.

6.2 Discussion of results: Research question one

What is the experience of South African engineers and technical professionals in the manufacturing sector in transitioning into a leadership role?

Research question one sought to comprehend the obstacles that engineers and technical professionals in South African manufacturing face when they move from self-leadership to leading others. The identified challenges will offer an understanding of the hurdles that hinder the successful transition to a leadership role. Section 5.4.1 provided the results for research question one. An analysis of the data obtained through the interviews pointed to a number of challenges pertinent to the research participants. These findings also shed light on the most frequently encountered difficulties by engineers in manufacturing in South Africa while advancing into a leadership role. The research participants discussed how the transition into leadership was made more difficult due to the need for proficiency in new skills, particularly managing people and developing their own people-management skills. Other challenges mentioned included managing interpersonal relationships and understanding team dynamics. Furthermore, the research highlighted the importance of cultivating trust within teams, delegating roles effectively, and providing team members with the necessary support. Without having strong interpersonal, conflict management, and supportive competencies in place, transitioning into a leadership role can be a challenge.

6.2.1 Managing people and managing relationships

The research participants highlighted the importance of having good interpersonal skills when transitioning into a leadership role. They indicated that understanding the nuances of people, such as their needs and motivations, was essential to being an effective leader. They further noted that the ability to effectively manage relationships with subordinates and peers was a necessary skill for the successful execution of any task.

Acknowledging the importance of communication and understanding the team dynamics were also important aspects of managing interpersonal relationships. According to Charan (2010) and Freedman (2011), even with the right set of skills, a leader might lack the interpersonal skills needed to collaborate with their team and peers. To this end, Freedman (2011) suggested that a transition must be made and new skills must be developed in order to lead effectively. This sentiment was echoed by six of the respondents in the study, who pointed out the importance of managing one's relationships in the recently acquired leadership role.

The respondents noted that the authority and responsibility of the new role presented certain difficulties, which had an impact on the transition process. Additionally, they identified a significant differentiation in relationships with other staff members. They also felt that they were treated and perceived differently, which highlights the need for a more formal management approach to address and mitigate these differences. In order to

effectively manage the effectiveness and sentiments of subordinates, peers, and other colleagues, it is necessary for a manager to take on the associated accountability. However, this transfer of responsibility can also create a sense of uneasiness in managing these relationships.

Establishing and understanding expectations is likewise an element in role changes (Hill, 2019; Plakhotnik 2019). For the participants in this study, these expectations included establishing personal and professional boundaries. Howard (2003) noted that participants had a tendency to set professional boundaries by distancing themselves from former peers and changing how they interact with them. This is analogous to participant 3's remark, "we can't have that conversation anymore." Furthermore, in establishing their personal boundaries, participants also made sure to designate specific hours for family obligations. As reported in the Nittala (2020) study, male and female participants communicated their availability or unavailability during certain times to their supervisors and colleagues.

The strategies the respondents used to manage subordinates, such as delegating, prioritizing, and setting expectations, are commonly seen in leadership roles and have been noted previously in literature on transitions (Thurasamy, Lo, Yang Amri, and Noor, 2011). The participants in this study acknowledged the need to share the workload by delegating tasks to others, rather than attempting to carry out all of the responsibilities by themselves. Several of them remarked that it was difficult for them to detach from certain tasks. Research participant four declared that "it pains me within when the engineer they delegated to, 'makes mistakes.' " Likewise, research participant six had difficulty letting go, expressing that it was "hard for [them] not to do a task [they] know [they] can do faster," while research participant 12 stated that they "probably waited too long" in distributing some tasks, resulting "obviously [in] stress." Aucoin (2018) identified that delegating, particularly for engineers, was a factor in how easy, or even successful, the shift to a leadership role might be. Engineers in Howard's (2003) study cited delegation as one of their primary challenges, which was in line with the results of Nittala's (2020) study. In accordance with the findings from this research, DeKrey and Portugal (2014) determined that careful management of the many demands faced was a difficult but necessary strategy. Allocating resources appropriately to improve task roles was also established by Manderscheid and Harrower (2016) and was an important part of transition studies. The research participants employed structures and processes to reduce their workloads, those of their colleagues, and strengthen the efficiency of their tasks. Demonstrating the initiative to amend existing structures or processes reflects a sense of self-efficacy and authority, which helps cultivate an identity as a leader.

6.2.2 Self-management (Letting go of old and embracing new)

The second most prominent challenge that the research participants confronted was self-management. They highlighted certain self-management challenges, such as owning up to their actions as a leader, looking after their health and wellbeing, and motivating those whom they lead. Additionally, they acknowledged that the new role would not be a success without collaboration, and that a leader's success relies on not only their intelligence but also their emotional proficiency. It was pointed out by the participants that making the change from a functional or technical role to a leadership role requires a conscious transition in mindset. In accordance with the literature, changing from self-leadership to leading others necessitates a transformation in work skills, time utilization, and work values (Charan, 2010). The findings are in line with the literature.

The apprehension of relinquishing past roles is a natural human reaction to uncertainty (Mobbs, 2015). Individuals require faith that others can complete the tasks with the same level of quality. The situations described by the respondents entailed trusting in others, forfeiting the security of the technical calculations as well as general control. When first moving into a leadership role, the focus must change from oneself to aiding others, and for engineers, this means transitioning from a focus on objects to people (Aucoin, 2018).

Two of the participants in the study recalled the shift they went through when they assumed their first leadership position. When both research participant 4 and 9 assumed their first leadership role, they had to begin taking care of other people's careers, instead of just focusing on their own. This shift was also noted by first-time engineering supervisors in Howard's (2003) and Nittala's (2020) studies, who needed to transition from a focus on objects to people.

The findings from this study indicated that the participants had a deep regard for others, which has led to the second finding that "letting go of the previous role to focus on others" is necessary. This finding indicates the participants acknowledge the need to actively adapt to the competencies and perspectives required for leadership as they move up the hierarchical structure of their organizations. Kaiser and Craig (2011) discussed the necessity of learning new skills, forging new connections and embracing an altered viewpoint as one progresses to higher tiers of leadership. The literature surrounding engineers transitioning to managers indicated that engineers may not be willing to give up their identity as engineers (Rottman, Sacks, and Reeve, 2015), or change the focus from "things" to "people" (Aucoin, 2018). Additionally, it is proposed that engineers may have difficulty relinquishing technical tasks for the sake of taking on leadership skills and behaviors (Aucoin, 2018; Farr and Brazil, 2009).

In their respective studies on engineers transitioning to their first leadership role, Howard (2003) and Nittala (2020) both discovered evidence that the transition from technical to managerial skills and mindsets was difficult; some of their participants were hesitant to give up their technical roles, while others were astounded at the breadth of learning across multiple domains that was necessary for their new roles.

Research participant 5 revealed that "in the past few years I have been drifting further and further away from the technical work, but I'm starting to appreciate that it has its merits." Research participant 12 experienced difficulties when transiting from self-leadership to leading others, citing that they "had to modify their thought processes and relinquish a lot of responsibilities that were previously their own." The transition from self-leadership to leading others was a difficult process for research participants. This process necessitated relinquishing their technical tasks, but they did not display any reluctance in doing so. Additionally, finding rewards in their new role as a leader can allow them to establish different criteria for success than before (Maurer and London, 2018), indicating a significant degree of development of a leader identity.

It was observed that there is a feeling of unsureness with regard to what is required in the new role, and how to handle the new responsibilities. This feeling was linked to the concept of letting go of old duties. When there is uncertainty, people tend to cling on to something familiar to build up confidence and to steady themselves. It must be noted that in this context, no mention was made of entrusting others to carry out the former obligations, merely that it was perceived as difficult to assign such tasks.

Two distinct reactions were also noted. These elements demonstrate that people's readiness for the new role and their hesitance to trust others are the main factors causing difficulty in the transition.

Effective management requires not only technical knowledge but also the ability to lead and inspire a team. As participant five noted, "We must depend on our own leadership and it is usually something we have to learn on our own. People coming from a technical background do not usually have the opportunity to be taught this". It is evident that the management of human elements is often self-taught and not solely learned through technical training. This underscores the importance of developing one's leadership skills through continuous learning and practice. By actively seeking out opportunities to grow as a leader and investing in their own professional development, managers can equip themselves with the tools necessary to effectively guide their teams towards success.

6.2.3 Culture and inequality

The third and fourth highest rated difficulties reported by the research participants were organisational culture, and inequality. These organisational cultural challenges included elements such as working in a male-dominated sector, navigating a hierarchical context, and an atmosphere that did not give psychological security when it came to making decisions without fear of retaliation.

They also referred to the constant questioning of their skills as leaders, the shortage of acknowledgement from their colleagues, and the difficultly of overcoming invisible limitations that threatened their career progress. The research results revealed that inequality, such as gender inequality, racism, inadequate recognition and unequal treatment compared to male participants, was a challenge that certain participants had to face. The literature indicates that the behaviour, attitudes and practices within an organization shape its organizational culture (D'Netto, 2008). An organizational culture that facilitates learning and development among employees will prosper and realize its intended strategy. The literature also points to the existence of a range of obstacles to the advancement of engineers particularly women into leadership positions, including gender discrimination and inequality, and the glass ceiling effect (Chang and Milkman, 2019; Chengadu and Scheepers, 2017; Heilman, 2012; Jaga 2017; Koch 2015; Nekhili and Gatfaoui, 2013). The results of the research touch on these issues but the scope of the research did not extend to exploring the complex intersection of diversity challenges with career transitions. This would be a useful area for further research relating to engineers transitioning into leadership.

The main discerned themes were seen to be incorporated into the organizational culture and be courtly. The word courtly was used to portray traits such as modest, caring for others, proficient with customers, having great emotional intelligence and inciting others.
The second most prominent themes were being technically competent and having a willingness to learn. Having a strong technical understanding and a readiness to learn from an engineering background is essential, though this was mentioned less than culture and diplomacy. The theme of being an effective supervisor was also identified separately to emphasize its significance.

The next most mentioned theme is that of collaborating with others. The capability to collaborate with others is an essential aspect of managerial responsibilities since it requires creating and sustaining an effective atmosphere and culture. Ambition was identified as encompassing qualities such as self-motivation, being results-focused, independent thinking, initiative-taking, excitement around the work environment, and self-

confidence.

6.3 Discussion of results: Research question two

What do engineers consider as enablers or barriers in their transition into leadership roles?

This study was conducted to gain insight into what the participants thought contributed to their transition from self-leadership to leading others. Section 5.4.2 outlines the responses to this question. The research results provide an understanding of the different factors that had an influence on their transition to a leadership position. Furthermore, the researcher was able to gain a much clearer picture of the range of influential factors after performing a data analysis, thus allowing for a more comprehensive understanding of the participant's perspective.

6.3.1 Supportive environment and personal or individual drive

The frequency of the factors cited by the research participants was given in section 5.4.2. After coding and frequency analysis, nine themes emerged. The results suggest that the requirements for a successful transition are a combination of individual and organisational contributions. Table five reveals three stages of relevance, determined by the number of mentions by the research participants. The most important level, with 12 and 11 mentions respectively, included access to chances to utilize leadership capabilities also referred to as experiential learning and personal effort and competencies. These results indicate that leaders require a supportive environment to fully achieve their potential and be successful. Additionally, leadership skills need to be developed and honed through practice, feedback, and further learning experiences.

The literature revealed that aptitudes, practical experience, time application, and work values (Charan et al., 2010) are crucial when transitioning through the leadership hierarchy in manufacturing. Additionally, the results demonstrated that the research participants ranked their personal efforts highly, including dedication, initiative, enthusiasm, and the willingness to enhance one's knowledge as factors that supported the leadership transition. It is evident from the research that an individual's sense of autonomy is essential for professional advancement. Moreover, a change in attitude, the ability to delegate, the capability to communicate effectively, and the necessity to provide supervision are all factors that are essential for a successful transition into a leadership role (Strahan, 2016). According to the literature, adult learning is predominantly attained through practical experiences and opportunities (Strahan, 2016). Furthermore, the research demonstrated that having access to opportunities to advance oneself as a leader was an eminent factor in effectively transitioning into a leadership role. The

outcomes were consistent with the literature in that the emphasis on an individual's ability to both apply themselves and their learning from experience to the leadership role was critical for effective transitions.

6.3.2 Mentorship

Mentorship, a corporate culture that embraces diversity and equality, and training and development opportunities are the middle tier factors that are integral to leadership growth. It was evident from the research participants' answers that obtaining a mentor is a fundamental component of leadership advancement, the company culture should advocate for inclusivity and equality, and access to suitable leadership training and development opportunities should be available. The results of the research conducted by Maloney in 2012 and Mcilongo, Strydom and Kariena in 2021 justify the literature's assertions about the role of mentorship and guidance in aiding the career development of mentees. Mentorship is integral to the growth and development of aspiring leaders, and it can also help alleviate the potential feeling of alienation from peers once promoted above them. A mentor can provide guidance and support to navigate new leadership responsibilities and interpersonal relationships. Research by Muir, D. (2014) has shown that mentoring can have a positive impact on career advancement and help individuals develop critical skills necessary for leadership. By having a mentor, aspiring leaders can have access to a trusted ally who can provide practical advice, share experiences and offer support, ultimately helping them build confidence and navigate new challenges.

The results indicate that training and development is an element that facilitates the transition (Manuti 2015). The significance of the role of an organization is corroborated by the literature (D'Netto 2008; Kolb and Kolb, 2017; Perrault, 2014). The most important factor stemming from the findings was organisations having a culture that promotes enablement, diversity, and support. This culture of enablement, diversity and support encompasses aspects such as fostering an atmosphere of learning, providing tolerance for errors, and ensuring equality and diversity between genders, races, and management styles. In addition, it is imperative to craft a psychologically protected milieu, in which engineers can take decisions without fear or threat of severe repercussions, form a culture that is more mindful of cultivating employees into leaders, have a profound investment in employee self-development and create chances for personnel to advance into more leadership roles.

6.3.3 Training and development

The literature established that an organisation's function is central to an individual's career advancement. As such, it is important to synchronise professional development

to the objectives of the organisation. An environment that encourages skill growth and job growth will improve business success (Turgut and Neuhaus, 2020). The provision of formal training for employees is imperative for their development. This may comprise of training provided by external sources or job-based training (Wärnich et al., 2015). The findings of the study suggested that a notable portion of participants felt that organisations could have included more leadership development training to assist the participants' transition into a leadership role. Besides that, the participants pointed out that leadership training gives them a sense of confidence when it comes to decision-making. In addition, the research participants noted that, despite the fact that formal and informal training is critical for transitioning into a leadership role, the training was either not given at the right time, completely missing, no leadership-specific training was included, or the level of leadership training provided was not satisfactory. Building on the findings mentioned in the previous chapter, it is clear that leadership development training is crucial for organizational success. However, it is equally important to understand the specific strategies and approaches that organizations should implement when providing such training.

The study by Becker and Bish, 2017 suggest that effective leadership development programs should be tailored to meet the unique needs of each organization and its employees, and should incorporate a variety of experiential learning opportunities. Additionally, organizations should involve employees at all levels in the leadership development process to foster a culture of continuous learning and development. Furthermore, many organizations view investing in these training programs as a competitive advantage, particularly because it contributes significantly to employee retention and productivity (Wärnich, 2015). Therefore, there is a growing need for organizations to focus more specifically on leadership development training as a means of further improving their outcomes.

The research corroborates the literature; nevertheless, the magnitude and adequacy of the research participants' training were deficient. This illustrates that training is advantageous and accepted by the participants as aiding the leadership transition; yet the backing from the organization in this regard is inadequate and wanting. The present findings suggest that organisations may not be placing high enough value on learning and development. Nevertheless, the cultivation of a learning-orientated culture is an essential component of creating an enabling environment. As such, some organisations should invest their resources and time into creating a learning and development culture.

6.3.4 Coaching

Less commonly cited factors in the findings included coaching, line manager support,

internal support and guidance, as well as robust leadership structures and talent pipeline. The value of coaching in assisting study participants during their transition was emphasized, which is supported by the literature (Chengadu and Scheepers,2017; Maloney, 2012; Turesky and Gallagher, 2011). According to the literature (Tuesky and Gallagher, 2011; D'Netto et al., 2008; Maloney, 2012), research participants felt that line manager help was a significant element to their successful transition into a leadership post. They also mentioned how internal direction and support from peers and senior management facilitated their transition, which is supported by the research (Parl and Choi, 2016; Wärnich et al., 2015).

The research participants underlined the importance of having a structured leadership ladder to assist in the changeover to a leadership role. Companies should use institutionalized techniques to help the participants get good assistance from their bosses, peers, and even direct reports. Interaction with socialization agents is an essential factor that can assist in the transition (Kramer, 2010). Mentors and coaches are commonly recognized as beneficial resources to aid in this process (Freedman, 2011; Martin, 2015). Nittala's (2020) study revealed that the majority of participants had gained advantages from having mentors throughout the transition; Howard's (2003) study, however, showed that the lack of mentors made the transition more challenging. Out of all the participants in this study, only one had a formal mentor and one had hired a coach.

6.4 Discussion of results: Research question three

What are the personal transformation experiences of engineers in their transition into leadership roles?

This research was conducted to gain insight into what the participants thought contributed to their transition from self-leadership to leading others. Section 5.4.4 outlines the responses to this question. The research results provide an understanding of the different factors that had an influence on their transition to a leadership position. During the interviews, the participants discussed the changes that had occurred since they had entered their new leadership roles. They talked about how their view of themselves had been altered, and how people close to them had noticed a shift in their attitudes, behaviour and character. They also discussed how they had become more confident in their ability to lead, as well as the challenges they had encountered along the way. In addition, they spoke about the invaluable opportunities for learning and personal growth that had been made available to them through their transition into leading others.

To transition into a leadership role requires a change, a transformation of individual's mindset and behavior (Hill, 2004). The literature on forming a new leader identity supports the notion that personal transformation is a requirement for leadership development

(Arghode, Brieger and McLean, 2017). Adjustments to oneself are an expected outcome of transitions, as new competencies are learnt, new behaviors are tested, perspectives and worldviews are changed, and new relationships are forged. The responses pertaining to personal transformation were mainly, but not exclusively, triggered by inquiries regarding the alterations they observed in themselves, adjustments to their leadership style, and changes that individuals close to them may have noticed. The concept of personal transformation according to Hill (2004) resonates strongly in the realm of leadership development as it emphasizes the need for individuals to adapt and grow to achieve success. This transformation can manifest in a variety of ways, such as developing new competencies, refining communication skills, and building new relationships. Ultimately, embracing change and actively seeking personal growth can empower individuals to become effective leaders.

6.4.1 Self-perspective

The responses to the questions about the changes that had occurred in the participants' lives were varied and insightful and revealed that each individual had experienced a unique journey of personal transformation. Most cited that they had developed new skills and learned to think differently in order to become successful managers. One of the participants mentioned that their new role had allowed them to explore their leadership capabilities and think more strategically.

Others focused on the importance of learning to trust their team and delegate responsibility. Additionally, they felt a stronger connection to the organization, which allowed them to contribute more effectively to the long run. The research participants responses also indicated that the individuals had been successful in transitioning to their new roles, as many indicated that their self-perception had changed positively and that they had become more confident and assertive in their leadership capacities. Furthermore, the positive changes had extended to their relationships with others, as most of the participants reported that they had been able to foster better working relationships with their co-workers. All had found their new role to be both challenging and rewarding and were now feeling more confident in their ability to lead and motivate others.

The self- perspective from the individuals involved in the research noted various changes such as demeanour, conduct, connections with others, and personal health. Nonetheless, three of the individuals did not feel like they had changed at all. Those who noticed a difference in themselves as a result of their transition reported varying levels of apprehension and favourability. According to literature by Boaz and Fox (2014) that corroborated the research findings, changes in behaviour that come as a result of job

transitions are natural, often accompanied by feelings of excitement and nervousness.

Furthermore, the literature suggests that individuals' self-perception and experiences can improve or worsen depending on the nature of the transition process (Boaz and Fox, 2014). Lanaj, Foulk and Jennings, (2022) further suggested that individuals who experience more positive transitions tend to become more successful and confident in their roles. This is in line with the research participants, who reported feeling more confident and assertive in their new roles. Additionally, the participants reported improved relationships with their colleagues and supervisors, suggesting that the changes had been positive overall.

The research participants described the transition from their traditional roles to the new leadership positions and duties as a learning experience. They had to adjust to their new environment, exploring new ways of delegating, making decisions, problem-solving and providing feedback. Literature by Leonard, Lewis, Freedman and Passmore (2013) suggested that these changes allow for the development of essential leadership skills that are necessary for successful managers. Moreover, the research participants noted that due to the increased responsibility and power associated with their new roles, they felt more confident in their abilities. The majority noted that despite the changes, they were still able to hold on to their core values and beliefs. Finally, the participants felt that their professional competencies had increased, making them more effective in their current roles.

The replies to the questions concerning self-observed changes demonstrate how some of the participants realized that the pressure of the new role had a detrimental effect on their countenance, and consequently, their interactions with colleagues. Similar changes in countenance were also remarked by co-workers, as research participant four, articulated that their co-workers "didn't bother you today" since they could "see the stress on your face." The alteration in the behaviour of research participant six, such as not trusting as easily and not taking everyone at face value, could have an effect on the manner in which they interact with their peers. Despite the fact that the participants did not state that being less congenial, less trusting or unapproachable had damaged their relationships with co-workers, these changes to their own selves could surely affect the quality of those associations in the long run. The consequences of alterations in the leader due to stress, and how those modifications might influence interactions with colleagues, have been documented elsewhere (Humphrey, 2012). However, this has not been discussed much in the transition literature. It is universally accepted that the quality of relationships with colleagues is a critical factor in successful transitions (Levin, 2010; Terblanche 2018).

6.4.2 From the perspective of others

Finally, it is important to recognize the effects that role transition can have on the family and friends of the participant. While their own unique experiences may differ, their observations can be invaluable in helping to understand how role transition has impacted the individual (Palanski, Thomas, Hammond, Lester, and Clapp-Smith, 2021). In cases where the individual's role transition has had a negative impact, the family and friends may be able to alert the individual to potential issues or provide support. Conversely, when role transition has had a positive effect, those closest to them can also help to reinforce and encourage positive behavior and outcomes (Leonard et al., 2013). As they reflected upon their transition, the research participants were pleased to find that their family members, friends, and other close to them had connected with the participants' newfound awareness and capabilities. In some cases, the participant's ability to better manage their stress and balance their roles lead to improved communication and strengthened relationships with their family members, friends, and other close people.

Increased self-awareness also allowed for increased appreciation for the participant's new identity and roles, leading to increased assurance in their newly acquired skillset. Family members, friends, and other close people also noted enhanced problem-solving capabilities and improved interpersonal skills, which they attributed to the role transition process. Other research participants stated that members of their families and inner circle had mentioned the higher levels of strain and anxiety relating to the transition and had provided suggestions for lifestyle adjustments as a method of coping.

Based on previous research and consistent with the experiences shared by participants in this study, it is clear that transitioning to new roles and identities can bring about both positive and negative effects on one's mental health and relationships. While some participants reported improved communication and problem-solving skills, others faced increased levels of strain and anxiety. These findings underscore the importance of providing adequate support, both during and after the transition process. Strategies such as lifestyle adjustments and therapy can be effective in managing stress and promoting overall well-being

Role transitions can be a heavy burden for those undergoing the transition, resulting in longer hours of work and added stress, as well as an impact on family life and a disruption of the balance between work and leisure. Two studies, Howard (2003) and Nittala (2020), researched engineers transitioning to a first-time leadership position and can be seen to be the most germane to these research participants. The discussion concerning this finding clearly shows the similarities between the findings of this study and those of other research on engineers transitioning into leadership roles. Adjacent to

this initial finding, similarities can be seen as well as some differences. The interfacing discrepancies noted in Howard's (2003) and Nittala's (2020) studies related to the hardships the transitioning engineers confronted while transitioning from colleagues to directors, and the pressures the changes put on prior relationships among the role set.

Howard (2003) had observed that some of his participants were no longer part of social gatherings with their former friends, now seen as outsiders. None of the participants in this study reported any tension in their relations with their former peers. Research participant four was the sole interviewee to express changes in the relationships, but without illustrating that these were now hostile or uncooperative. They noted that changes in relationships can occur when one transitions into a position of authority. As noted by participant four, "I had been a peer for the prior two years and then I was suddenly in a position of leadership".

"I had been a peer for the prior two years and then I was suddenly in a position of leadership. I was now setting targets for development, issuing corrective action if needed and providing direct feedback that should be acted upon. I was held accountable for enforcing those expectations. "While changes may occur, it is important to maintain open lines of communication and engage in active listening to ensure that relationships remain positive and collaborative. Additionally, setting clear expectations and boundaries can help prevent any potential misunderstandings or conflicts from arising. Contrary to the experiences of Howard's 2003 participants, research participant four also reported that they now spend more time socially with their work colleagues as opposed to their friends outside of the work environment: "As I transitioned into a people leadership role, I found myself connecting with my colleagues more often, as I could better relate to them. With less free time, the friends I had previously seen multiple times a week, I now only see once a month."

In comparison to Howard (2003), who focused on all-male participants, Nittala (2020) was specifically investigating the impression of the switch to a leadership role on relationships within and beyond work, as well as any struggle to reconcile family obligations with the increased work hours. The study, involving both men and women participants, revealed that both genders had to adjust their work hours to meet family obligations, and that the increased workload had a negative effect on family life. Women continue to take on a greater percentage of domestic duties as compared to men (Eagly and Carli, 2020), further affirming the presence of this construct as a factor in the study. The additional working hours that came with the changes had a considerable impact on the participants' capacity to maintain a balance between their domestic tasks, especially childcare. Even without any children at home, the extra workload and stress was

apparent to the participants' families and friends.

6.5 Additional findings

The push to finish the transition effectively is concentrated on in this inquiry. The goal was to recognize what part inside the transition gave the members the will to be effective in this professional move. The topic distinguished by the dominant part of respondents was that they encountered the transition to an administrative job as a type of acknowledgment. The respondents had cherished recollections in light of the fact that they recognized the transition as an announcement of the confidence in them and their capacities. The respondents were aware of being acknowledged and this encouraged them to continue with their efforts and reach their objectives.

"I viewed it as a token of acknowledgment, and I was delighted with that," commented participant 4. The following concept was the empowerment granted to the respondents. They were trusted to administrate their own time. This theme was comparable to the initial one in that the authority provided was also representative of the recognition that they had the capability to administer their own time effectively and were dependable in administering others with no supervision.

Participant eight commented, "… I had my own time and was allowed to manage my own time and didn't need to report to anyone."

Two participants indicated that the power they had as perceived by others in their new function was a motivating factor for them to sustain the perception and not let anyone down. These ideas could be correlated to the recognition and empowerment themes, showcasing a persuasive motivator in the form of the perception of recognition and obeying the expectations set by themselves and others.

The final two themes identified were money, and making a difference, with two respondents each. These themes were presented alongside other themes but remain as primary drivers. Participant two commented, "Money. The main attraction to management is the money. The responsibility grows and you feel you make a difference, but money makes life easier."

6.6 Conclusion

The discussion of the research results corroborates what was outlined in Chapter 2 of the literature review. The results confirm that successful transition needs to be a collaborative effort between an individual and the organisation (Becker and Bish, 2017; Turgut and Neuhaus, 2020). The findings underscore the essential role that organisations play in the success of transitions, due to the large number of factors that influence the transition process. The results emphasise two significant aspects: fostering a corporate

culture of support, diversity and equity, and putting into practice solid leadership training plans.

The results bring to light two pivotal components for an engineer or technical professional's successful transition to leadership: furnishing them with the chance to exercise their leadership abilities and the personal effort necessary for them to traverse the leadership transition journey. Leadership experiences and the use of leadership skills contribute significantly to one's development as a successful leader. According to the studies, adult learning is mostly influenced by experiences. As a result, the findings are consistent with past studies (Becker and Bish, 2017; Kolb and Kolb, 2017).

The ability of an individual to drive a successful transition is the second most important and impactful component. Personal endeavor, which comprises components such as devotion, perseverance, personal passion, and a strong will to achieve, adds considerably to a successful transfer to a leadership job. This supports the research, which shows that without this personal effort, the transition would be negatively impacted.

In order to successfully manage people, the research participants discussed the importance of understanding individual personalities and motivations. They also highlighted the importance of effective communication, which includes both verbal and non-verbal cues. Furthermore, the research participants noted that developing a clear vision and goals, understanding group dynamics and knowing how to effectively delegate tasks were key elements in successfully managing people. This understanding must be applied with patience, empathy and the ability to adjust one's management style to different situations. Additionally, the research participants indicated that developing strong leadership skills was essential for effective people management. The research findings suggested that the development of a human-centred approach, which includes building emotional intelligence, inspiring trust, and fostering a culture of collaboration and cooperation, was key for successful people management. Furthermore, the research participants noted that technical and conceptual skills were less important than the development of leadership skills when it came to managing people. This highlights the importance of focusing on human-centred approaches in the development of people management skills.

The model illustrated in Figure five is an adaptation model developed by the findings of the research, which depicts the roadmap of an engineer's journey from self-leadership to leading others. This journey commences with self-leadership, in which the individual is mainly in charge of their own leadership, and then encounters six challenges as they traverse the transition. South African engineers face a number of challenges as they transition to leadership roles. These challenges require careful evaluation and

management. As individuals embark on this journey, input from both the individual and the organization can be useful. These factors play a key role in the successful shift from self-leadership to leading others. This model can be used to identify current or future issues.

In addition, the model can be utilized by individuals to uncover gaps in their input elements. Organisations can also apply the concept to better comprehend the important role they play in the leadership journeys of their workers. Ultimately, the model empowers organizations to understand how they can contribute positively to the success of the transition by implementing several input components.

Figure 5: The Leadership Transition Model
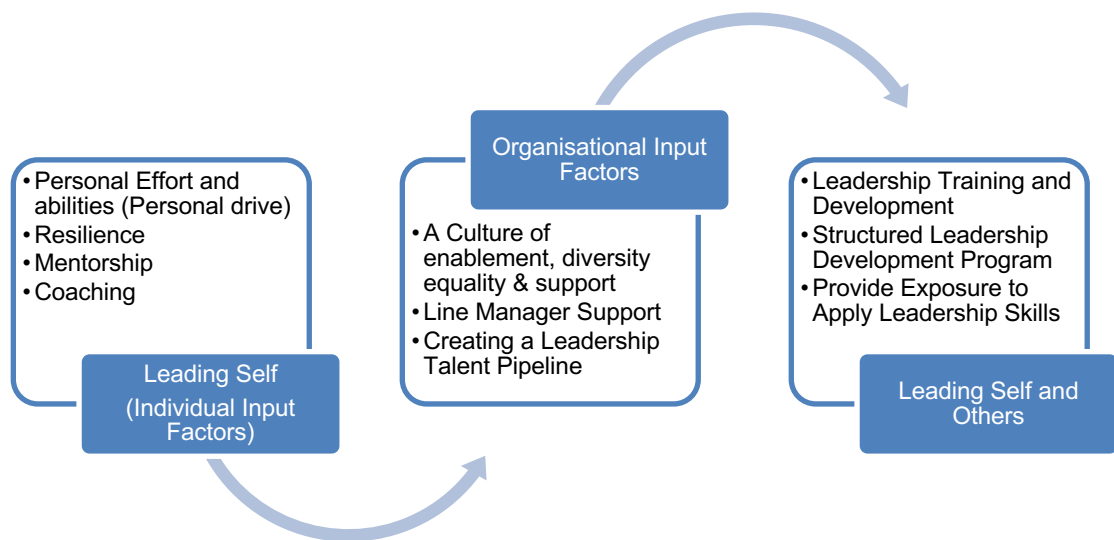
Source: Author's own

Chapter 7: Conclusion and Recommendations

7.1 Introduction

This chapter is intended to provide an overview of the primary discoveries of this research endeavour. It will likewise incorporate a model which contributes to the current research on transitioning into leadership roles from technical specialist roles and recommendations for organisations and individuals who wish to foster effective transitions. Finally, this chapter will spell out the restrictions of the research and suggest proposals for further research.

7.2. Findings on the challenges faced by engineers and technical professional during the transition to leader

According to the research findings, South African technical professionals and engineers experience several challenges when they move from self-leadership to leading others. These challenges include managing people, managing themselves, learning about organizational culture, addressing inequality, adapting to changing workplace dynamics, and gaining acceptance of the new role by colleagues.

7.2.1 Individual input into successful transition from leading self to leading others

The study's findings indicate that there are numerous factors that play a role in the transition from self-leadership to leading others, from both an individual and organizational perspective. Factors that contribute to an individual's success include hard work and aptitude, as well as external support such as mentorship, sponsorship, experiential learning, and coaching. At the organizational level, a corporate culture that esteems diversity and inclusion, training and development, and managerial support all contribute to the successful transition from self-leadership to leading others.

In sum, the research showed that both internal and external factors are critical to successful leadership transitions in South Africa. Furthermore, the study revealed that most engineers and technical professionals are not adequately prepared to make the transition from engineering duties to managerial duties. This suggests the need for structured programmes and support to enable a successful transition from individual self-leadership to leading others. Therefore, it is essential for organisations to create an atmosphere that encourages and enables the transition to leader roles by addressing the identified factors in a holistic manner. In addition, the research found that there are many positive gains that engineers and technical professionals can expect to experience once they have successfully transitioned to leading others. These gains include increased authority, career growth, improved personal effectiveness, and enhanced professional reputation.

7.2.2 Organisational input to successful transition of engineers and technical professionals

It has been determined through research that organisations have an essential role to play when it comes to aiding engineers and technical professionals in making the transition from self-leadership to leading others. These components include people management, self-management, organisational culture, and inequality. It is thus necessary for organisations to tackle these issues in order to create a supportive environment that allows for successful transition.

These factors must be addressed to create a successful transition of engineers and technical professionals from engineering duties to managerial duties. For example, organisations should foster an atmosphere of mutual respect and open communication to ensure that new leaders are accepted by colleagues. Additionally, organisations must recognise and address the potential for gender and racial inequality to ensure that all employees have equal opportunities for success in their leadership roles. Furthermore, organisations should provide training and support to new leaders, as well as mentors to help them navigate the changing workplace dynamics.

The findings presented in chapter 6 illustrate that engineers are capable of excelling in leadership roles when they have the chance to learn and practice leadership skills. It is not sufficient to motivate engineers' career growth by appointing them to meet employment equity targets. It is essential that organisations implement a comprehensive leadership plan that not only motivates engineers' professional growth but also addresses their individual needs. This should include creating a supportive environment that allows engineers to develop the skills they need to become effective leaders, while also addressing any existing gender or racial inequality.

As the studies point out, the combination of formal and informal training is the optimal approach to leadership development. The experiential learning component is of utmost importance, as this is the best way for adults to learn and develop.

In conclusion, unless all relevant input factors were taken into consideration, transitioning into a leadership role could be an arduous process. The research results suggested that the participants believed that, without all of the necessary input factors, they would not have been able to transition properly into the role of a leader, or it could have taken them longer. Thus, to minimise the risk of failure, it is best for both the engineers and the organisation to consider both success and risk factors. This will help them develop and implement individual and organisational plans that are tailored to their own need. Additionally, personal and group coaching can be helpful in providing guidance and support during this process. Finally, the use of on-the-job training can assist in making the transition smoother and more effective by allowing for the development of better interpersonal relationships.

7.3. Recommendations

7.3.1 Recommendations for engineers and technical professionals

The research findings provide guidance to engineers and technical professionals transitioning into leadership roles, along with those who are presently in the process of doing so. Figure four showed the essential individual input variables necessary for a successful transition into leadership. The first suggestion is for individuals to recognize that progressing through this transformation will take endurance, motivation, and mental stamina due to the multiple impediments and complexity that must be overcome.

The second recommendation is to foster a feeling of authority in respect to the personal capabilities needed to move to a chief role. Finally, it is imperative to seek mentorship both internally and externally. Coaching is a critical element to help the individual during transition. Moreover, selecting a well-qualified sponsor to foster and encourage progress within an organisation is the final recommendation.

To ensure the person is adequately prepared for the new role, it is recommended to perform a gap analysis to identify which personal skill components are lacking or in need of further development. This evaluation can be completed before or during the transition period. If the individual were to identify any discrepancies, corrective measures must be taken to fill the gaps. This might mean an introspective evaluation of one's own work to guarantee the adequate utilization of their personal agency. Seeking a qualified mentor, coach, or sponsor may form part of this gap analysis. Furthermore, it is imperative that the individual adopts a short-term and long-term approach to the leadership transition model. The model facilitates a proactive strategy for leadership development. Once the transition process commences, the individual should investigate the prompt or developmental inputs they could utilize. Furthermore, in line with preparing for the journey towards leadership, it is crucial for individuals to assess their skills and identify areas for enhancement. A self-assessment can reveal strengths that can be leveraged in a leadership role and weaknesses that should be worked on. The planning stage of the implementation plan can come in handy here, as it can be used to prioritize areas for improvement and create a roadmap for skill development. By taking these steps, an aspiring leader can better position themselves for success in a leadership role.

7.3.2 Recommendations for organisations

According to the results, organisations play a large part in assisting South African engineers and technical professionals in manufacturing to make the transition into a leadership role. There are six recommendations that organisations should consider.

Creating a culture of inclusivity and support is crucial for a smooth transition into a leadership role. This means implementing policies and initiatives that promote diversity, equity, and inclusion

at all levels of the organization. Leaders should also actively seek out and mentor individuals from underrepresented groups to ensure equal opportunity for all. Additionally, creating a supportive work environment that emphasizes teamwork and collaboration can help increase productivity and engagement among employees.

Moreover, it is advised to provide leadership training and development activities that are pertinent and timely to the individual. Furthermore, it is recommended to incorporate identified employees into an organised leadership programme. Lastly, it is suggested to establish a leadership talent pipeline. It is suggested that line managers should offer the appropriate on-the-job support and counsel. Organisations should also provide identified personnel with opportunities to exercise their leadership capabilities.

Prior to the selection of an engineer or technical professional for a leadership transition, it is recommended that the organization implement a gap analysis at the organisational level to determine which organizational inputs are absent or inadequately implemented. After identifying the input components, the organisation implements corrective measures. Then, the organisation scrutinizes these measures to ensure they are appropriately executed and feasible for the organisation to execute. The following stage is to modify and reuse the remedial actions to ensure their refinement and appropriate use. Once the remedial actions have been refined, the organisation should perform another gap analysis. This continuous process enables ongoing refinement, ensuring that the organisational implementation is relevant and appropriate in light of the ever-changing business environment.

7.4. Limitations

Before evaluating the results and findings of this research, it is essential to be mindful of the research limitations. Because of the relatively small sample size which resulted from the purposive and homogenous sampling techniques, the results cannot be seen as a representation of the population, and therefore, no forays into generalisations can be made. Additionally, the researcher's lack of expertise in interviewing could have caused bias in the interviews and errors in observation. The virtual environment of the interviews may have deterred the participants from providing adequate information, thus leading to the collection of little data and, as such, reducing the overall quality of the information gathered. The scope of the research did not allow deeper investigation into the impact of demographics such as race and gender of challenges experienced in transitioning to leadership roles. Further research would be required to understand these intersecting dimensions.

7.5. Recommendations for future research

In order to further understand the factors that may have an impact on the successful transition from self-leadership to leading of others, it is suggested that further research should be conducted.

- This research could also be quantitatively analysed to determine the variables of influential factors and to confirm the findings.

- Additionally, it is proposed that a study could be done to evaluate how engineers and technical professionals may be able to better recognise their strengths or weaknesses in order to advance their leadership journey.

- It is possible to study how organisations can improve their implementation of leadership training initiatives to assist South African engineers and technical professionals in their progression on the leadership path.

- Analysis of the impact of race and gender on South African engineers transitioning into leadership roles would be valuable to understand how these factors intersect with the leadership transition model proposed in this study.

References

Alase, A. (2017). The interpretative phenomenological analysis (IPA): A guide to a good qualitative research approach. *International Journal of Education and Literacy Studies*, *5(2)*, 9-19.

Algahtani, A. (2014). Are leadership and management different? A review. *Journal of Management Policies and Practices*, *2(3),* 71-82

Armitage, J. W., Brooks, N. A., Carlen, M. C., and Schulz, S. P. (2006). Remodeling leadership: Developing mature leaders and organizational leadership systems (an introduction to the leadership maturity model™). *Performance Improvement*, *45(2)*, 40-47.

Aslan, M., and Pamukcu, A. (2017). Managerial competencies and impact on management levels. *International Journal of Advanced Research in Management and Social Sciences*, *6(9),* 1-15.

Aucoin, B. M. (2018). *From Engineer to Manager: Mastering the transition*. Artech House.

Avolio, B. J., Walumbwa, F. O., and Weber, T. J. (2009). Leadership: Current theories, research, and future directions. *Annual Review of Psychology*, *60*, 421-449.

Barabas, C. C. M. (2015). Engineering the American dream: a study of bias and perceptions of merit in the high-tech labor market (Doctoral dissertation, Massachusetts Institute of Technology).

Bebb, S. S. (2009). The structure of role transition: A phenomenological study of successful executives from five countries. *International Journal of Leadership Studies*, *4(2),* 223-243.

Bhorat, H., and Rooney, C. (2017). State of manufacturing in South Africa. Development Policy Research Unit, University of Cape Town.

Boal, K. B., and Whitehead, C. J. (1992). A critique and extension of the stratified systems theory perspective. *Strategic Leadership: A multiorganizational-level perspective*, 237-253.

Boaz, N., and Fox, E. A. (2014). Change leader, change thyself. *McKinsey Quarterly*, *11*.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3(2),* 77-101.

Casalino, N., Cavallari, M., Marco, M. D., Ferrara, M., Gatti, M., and Rossignoli, C. (2015). Performance management and innovative human resource training through flexible production systems aimed at enhancing the competitiveness of SMEs. *The IUP Journal of Knowledge Management*, *13(4)*, 29-42.

Charan, R., Drotter, S. J., and Noel, J. L. (2001). *The Leadership Pipeline: How to build the leadership-powered company*. San Francisco: Jossey-Bass.

Cheville, A. (2014, June). Defining engineering education. In 2014 ASEE Annual Conference & Exposition (pp. 24-357).

Clandinin, D. J. (2006). Narrative inquiry: A methodology for studying lived experience. *Research Studies in Music Education*, *27(1),* 44-54.

Cohen, D. J. (2007). The very separate worlds of academic and practitioner publications in human resource management: Reasons for the divide and concrete solutions for bridging the gap. *Academy of Management Journal*, *50(5)*, 1013-1019.

Cook-Greuter, S. R. (2004). Industrial and Commercial Training. *Industrial and Commercial Training*, *36(7).*

Creswell, J. W., & Poth, C. N. (2018). Qualitative inquiry and research design (international student edition): Choosing among five approaches. *Language*, *25*(459p), 23cm.

Cumming, T. L., Shackleton, R. T., Förster, J., Dini, J., Khan, A., Gumula, M., and Kubiszewski, I. (2017). Achieving the national development agenda and the Sustainable Development Goals (SDGs) through investment in ecological infrastructure: A case study of South Africa. *Ecosystem Services*, *27*, 253-260.

Custovic, E., and Insaurralde, C. (2015). From engineer to manager, mastering the transition: Leadership qualities. *IEEE Engineering Management Review*, *43(4),* 20-22.

Dai, G., Yii Tang, K., and De Meuse, K. P. (2011). Leadership competencies across organizational levels: A test of the pipeline model. *Journal of Management Development*, *30*(4), 366-380.

De Meuse, K.P., Dai, G., and Wu, J. (2011). Leadership skills across organizational levels: A closer examination. *The Psychologist-Manager Journal*, *14(2),* 120–139. https://doi.org/10.1080/10887156.2011.570143

Desai, N., and Stefanek, G. (2017). A literature review of the different approaches that have been implemented to increase retention in engineering programs across the United States. In Proceedings of the 2017 ASEE Zone II Conference (pp. 2-5)

Drotter, S. (2010). Leadership pipeline. *Leadership Excellence, 27(8),* 11–12.

Dutta, S. (2008). The Strategic Shift from 3S's to 3P's Model. *HRM Review*, *35*.

Dweck, C. (2016). What having a "growth mindset" actually means. *Harvard Business Review*, *13(2)*, 2-5.

Elsbach, K. D., and Stigliani, I. (2018). Design thinking and organizational culture: A review and framework for future research. *Journal of Management*, *44(6)*, 2274-2306.

Ezeldin, A. S. (2013). International accreditation for engineering programs: Mission, learning objectives and outcomes. *Procedia-Social and Behavioral Sciences*, *102*, 267-275.

Floyd, R. E., and Spencer, R. H. (2014). Career paths: Technical or management? *IEEE Potentials*, *33(3),* 25-26.

Freedman, A. M. (1998). Pathways and crossroads to institutional leadership. *Consulting Psychology Journal: Practice and Research*, 50(3), 131–151. https://doi.org/10.1037/1061-4087.50.3.131

Freedman, A.M. (2005). Swimming upstream: The challenge of managerial promotions. In R.B. Kaiser (Ed.), *Filling the leadership pipeline* (pp. 25–44). Greensboro, NC: Centre for Creative Leadership.

Freedman, A. M. (2011). Some implications of validation of the leadership pipeline concept: Guidelines for assisting managers-in-transition. *The Psychologist-Manager Journal*, *14(2)*, 140-159.

Gabarro, J. J. (1987). The Dynamics of Taking Charge. Harvard Business School Press.

Goodwin, J. S. (2016). Exploring leadership challenges in transitioning from managing others to managing managers (Doctoral dissertation, Stellenbosch: Stellenbosch University).

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, *18(1)*, 59-82

Harris, A. (2009). Creative leadership: Developing future leaders. *Management in Education*, *23(1),* 9-11.

Hartmann, B., and Jahren, C. (2015). Leadership: Industry needs for entry-level engineering positions. *Journal of STEM Education*, *16(3)*.

Hamedi, O., Rahiminasab, M., and Pardis, S. T. (2011). Business, Strategy & Management.

Hunt, R. G. (1970). Technology and organization. *Academy of Management Journal*, *13(3),* 235-252.

Jamshidi, M. (Ed.). (2017). *Systems of Systems Engineering: principles and applications*. CRC Press.

Joyner, F.F., Mann, D. T. Y., & Harris, T. (2012). Engineering as a social activity: Preparing engineers to thrive in the challenging world of work. *American Journal of Engineering Education*, *3(1),* 67-81.

Kaiser, R. B., and Craig, S. B. (2011). Do the behaviors related to managerial effectiveness really change with organizational level? An empirical test. *The Psychologist-Manager Journal*, *14(2)*, 92-119.

Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., and Buckley, N. (2015). Strategy, not technology, drives digital transformation. *MIT Sloan Management Review*.

Kelley, J. (2014). Transitioning from Engineering to Leading. *The Way Ahead*, *10(01),* 8-9.

Knight, J. (2005). All leaders manage but not all managers lead: Leadership qualities. *IEEE Engineering Management Review*, *15(1),* 36 – 37

Lanaj, K., Foulk, T. A., and Jennings, R. E. (2022). Improving the Lives of Leaders: The Beneficial Effects of Positive Leader Self-Reflection. *Journal of Management*, 01492063221110205

Leonard, H. S., Lewis, R., Freedman, A. M., and Passmore, J. (2013). The role of psychology in leadership, change, and organization development. *The Wiley-Blackwell Handbook of the Psychology of Leadership, Change, and Organizational Development*, 1-11.

Lichtenstein, G., McCormick, A. C., Sheppard, S. D., and Puma, J. (2010). Comparing the undergraduate experience of engineers to all other majors: Significant differences are programmatic. *Journal of Engineering Education*, *99(4),* 305-317.

Maheshwari, V., Gunesh, P., Lodorfos, G., and Konstantopoulou, A. (2017). Exploring HR practitioners' perspective on employer branding and its role in organisational attractiveness and talent management. *International Journal of Organizational Analysis*, *25(5),* 742-761.

Mallaby, S. J. (2014). *The transition to general management* (Doctoral dissertation, University of Pretoria)

Mallaby, S.J., Price, G., and Hofmeyr, K. (2017). The transition to general management in South Africa. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*, *15(0)*, a846. https://doi.org/10.4102/sajhrm.v15i0.846

Manderscheid, S. V., and Ardichvili, A. (2008). A conceptual model for leadership transition. *Performance Improvement Quarterly*, *20(3-4),* 113-129.

Maula, M., & Stam, W. (2020). Enhancing rigor in quantitative entrepreneurship research. *Entrepreneurship Theory and Practice*, *44(6)*, 1059-1090.

Mcilongo, M., & Strydom, K. (2021). The significance of mentorship in supporting the career advancement of women in the public sector. *Heliyon*, *7(6),* e07321.

Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International Journal of Qualitative Methods*, *1(2)*, 13-22.

Mukhi, N., Rana, S., Mills-Knapp, S., and Gessesse, E. (2020). World Bank Outlook 2050 Strategic Directions Note. *World Bank Publications-Books*.

Müller, R., Geraldi, J., and Turner, J. R. (2011). Relationships between leadership and success in different types of project complexities. *IEEE Transactions on Engineering Management*, *59(1),* 77-90.

National Academy of Engineering. (2004). *The Engineer of 2020: Visions of engineering in the new century*. National Academies Press.

Newfarmer, R., Page, J., and Tarp, F. (2019*). Industries Without Smokestacks: Industrialization in Africa reconsidered* (p. 480). Oxford University Press.

Nittala, S. (2020). Lived experiences of recently transitioned engineering managers: An interpretive qualitative study. [Unpublished Doctoral dissertation], Purdue University.

Palanski, M. E., Thomas, J. S., Hammond, M. M., Lester, G. V., and Clapp-Smith, R. (2021). Being a leader and doing leadership: the cross-domain impact of family and friends on leader identity and leader behaviors at work. *Journal of Leadership & Organizational Studies*, *28(3)*, 273-286.

Polonsky, M. J., & Waller, D. S. (2018). *Designing and managing a research project: A business student's guide*. Sage Publications.

Rindfleisch, A., Malter, A. J., Ganesan, S., & Moorman, C. (2008). Cross-sectional versus longitudinal survey research: Concepts, findings, and guidelines. *Journal of Marketing Research*, 45(3), 261-279.

Rottmann, C., Sacks, R., and Reeve, D. (2015). Engineering leadership: Grounding leadership theory in engineers' professional identities. *Leadership*, *11(3)*, 351-373.

Rybakova, A., Vinogradova, M., and Sizikova, V. (2020, January). *Advancing leadership careers with leadership competences*. In 5th International Conference on Social, Economic, and Academic Leadership (ICSEALV 2019) (pp. 74-79). Atlantis Press.

Sandelowsky, H., Hylander, I., Krakau, I., Modin, S., Ställberg, B., & Nager, A. (2016). Time pressured deprioritization of COPD in primary care: a qualitative study. *Scandinavian Journal of Primary Health Care*, 34(1), 55-65.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students*. Pearson Education.

Schwartz, J., Hatfield, S., Jones, R., and Anderson, S. (2019). What is the future of work. Redefining work, workforces, and workplaces [published online April 1, 2019]. *Deloitte Insights*: ed.

Seron, C., Silbey, S., Cech, E., & Rubineau, B. (2015). Persistence is cultural: Professional socialization and the reproduction of sex segregation. *Work and Occupations, 43(2),* 178–214

Sultana, N., & Turkina, E. (2020). Foreign direct investment, technological advancement, and absorptive capacity: A network analysis. *International Business Review*, *29(2)*, 101668.

Terblanche, N., Albertyn, R., and Van Coller-Peter, S. (2018). Developing leaders by supporting their transitions into senior positions. *South African Journal of Business Management*, *49(1),* a12. https://doi.org/10.4102/sajbm.v49i1.12

Terre Blanche, M., Durrheim, K., and Painter, D. (1999). Practical research: applied methods for social research.

Thurasamy, R., Lo, M. C., Yang Amri, A., and Noor, N. (2011). An analysis of career advancement among engineers in manufacturing organizations. *International Journal of Commerce and Management*, *21(2),* 143-157.

Volini, E., Schwartz, J., Roy, I., Hauptmann, M., Van Durme, Y., Denny, B., and Bersin, J. (2019). Leadership for the 21st century: The intersection of the traditional and the new. *2019 global human capital trends*.

Volkwein, J. F., Lattuca, L. R., Harper, B. J., and Domingo, R. J. (2007). Measuring the impact of professional accreditation on student experiences and learning outcomes. *Research in Higher Education*, *48*, 251-282.

Wajdi, B. N. (2017). The differences between management and leadership. *Sinergi: Jurnal Ilmiah Ilmu Manajemen*, *7(1).*

Watkins, M. D. (2009). Picking the right transition strategy. *Harvard Business Review*, *87(1),* 47-53.

Wheeler, P. (2010). Making successful transitions: The leader's perspective. In M. Goldsmith, J. Baldoni, & S. Arthur (eds.), *The AMA Handbook of Leadership*, (pp. 187-202). AMACOM.

Whysall, Z., Owtram, M., & Brittain, S. (2019). The new talent management challenges of Industry 4.0. *The Journal of Management Development*, *38*(2), 118-129.

Zaleznik, A. (2004). Managers and leaders. *Harvard Business Review*, *1*.

Zhang, Y., & Wildemuth, B. M. (2009). Unstructured interviews. Applications of social research methods to questions in information and library science, 222-231.

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business Research Methods*. Cengage Learning.

Appendix One: Interview Discussion Guide

Date:

Time of interview:

I appreciate you taking the time to talk with me today. Your contributions to this research are very valuable. The objective of the research is to gain a greater insight into the factors that played a role in your transition from self-leadership to leading others, as observed by engineers in South African manufacturing. The transition from engineer to manager is a difficult one. It can be a challenge to manage both the technical and the people aspects of the job. I am interested in hearing your story about your personal experiences with this topic. In order to understand your meaning, I would appreciate it if you could provide examples of things that stood out to you during your experience.

I would like to thank you for sending the signed consent form and request your permission to make a digital recording of this interview. I want to assure you that everything said in this interview will be kept confidential and your name or that of your organisation will not be mentioned.

Overall Research Question

What Are The Leadership Challenges Experienced By Engineers Transitioning Into Management Role In Manufacturing In South African?

Biographical Details

1. Could you please provide your current employment details, including your job title and industry?

Research Question One

What is the experience of South African engineers and technical professionals in the manufacturing sector in transitioning into a leadership role?

2. Can you tell me about how you got the role of managing others, coming from a technical role? What made you decide to seek this particular role?

3. The transition from engineer to manager is a difficult one. It can be a challenge to manage both the technical and the people aspects of the job. What challenges have you faced in making the transition?

Question Two

What do engineers consider as enablers or barriers in their transition into leadership roles?

4. What made the transition into a leadership role easy?

5. What made your transition into a leadership role difficult?

6. What were some of your significant leadership lessons during the transition from your own experience?

7. How do you feel that formal learning prepared you for your leadership transition?

Question Three

What are the personal transformation experiences of engineers in their transition into leadership roles?

8. How have you had to change the way you see yourself as a result of this transition?

9. How have you changed your behaviour at work as result of the transition to leadership?

10. How have you changed the way you engage with others at work as a result of this transition into leadership?

11. How do you believe your leadership journey has shaped you?

Additional Question

12 Is there anything else you would like to say about your journey to becoming a leader of others?

Appendix Two: Informed consent letter

Dear Participant

I am a student of the Gordon Institute of Business Science (University of Pretoria) completing my research in partial fulfilment of a master's in business administration. I am conducting to gain a greater insight into the factors that played a role in your transition from self-leadership to leading others, as observed by engineers in South African manufacturing. The purpose of the interview is to obtain insights from your personal experience related to the topic.

The interview is expected to last between 30 minutes to an hour to allow me to gain invaluable insights on this subject.

Your participation is voluntary, and you can withdraw at any time without penalty. All data will be kept confidential with identifiers used in place of your name. If you have any concerns, please contact me or my supervisor. Our details are provided below:

Researcher: Mdumiseni Maphumulo

Email: 21818992@mygibs.co.za

Contact number: +27(0) 79 510 5948

Research Supervisor: Dr Lisa Kinnear

Email: lisa.kinnear@twimsafrica.com

Signature of participant: _____

Title of participant: _____

Date: _____

Signature of researcher: _____

Date:

Appendix Three: Consistency matrix

Research questions	Literature review	Data collection tools	Analysis
What is the experience of South African engineers and technical professionals in the manufacturing sector in transitioning into a leadership role?	Section 2.2, 2.4 and 2.6	Semi-structured interviews	Content analysis on open-ended questions
What do engineers consider as enablers or barriers in their transition into leadership roles?	Section 2.3.1 and 2.5.1	Semi-structured interviews	Content analysis on open-ended questions
What are the personal transformation experiences of engineers in their transition into leadership roles?	Section 2.3.1 and 2.5.1	Semi-structured interviews	Content analysis on open-ended questions

Appendix 4: Ethical clearance

Ethical Clearance Approved

Dear Mdumiseni Maphumulo,

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

Ethical Clearance Form

Kind Regards

This email has been sent from an unmonitored email account. If you have any comments or concerns, please contact the GIBS Research Admin team.