Leadership styles and performance of teams in underground South African coal mines.

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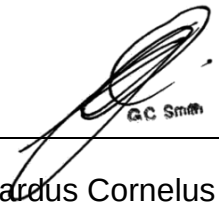
DECLARATION

I, Corne Smith, declare that this research article is my work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.



Gerhardus Cornelus Smith

Signed at ……Middelburg……

On the ……2nd…….. day of ……April…… 2024.

DEDICATION

I dedicate this paper to the mentors and co-workers that I looked up to throughout my career and who motivated me to continue my lifelong learning process as a professional certificated engineer.

To my parents, who have always encouraged me to have faith in myself and work hard to improve myself, and to my brothers, who showed me how to stand up for what I believe in.

Lastly, I dedicate this to the mining supervisors who operate in this area of the South African economy, urging them to use this study and constantly seek to improve as leaders and role models for other sectors.

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ABSTRACT

The purpose of this study was to investigate the relationship between leadership styles and team performance in underground South African coal mines. The mining industry, particularly in South Africa, is critical to the country's economic development, therefore excellent team performance is essential to guaranteeing safety, productivity, and long-term prosperity. To collect thorough data, the study adopted a rigorous literature review combined with a quantitative survey issued to underground mining supervisors. The study investigated the various leadership styles used in different mining situations and examined their impact on team performance measures using this method. The study investigated the effectiveness of various leadership styles in building team overall performance by identifying prevalent leadership styles such as situational and transformational leadership styles. The quantitative survey analysed team performance using key variables such as productivity rates. The obtained data was then statistically analysed to uncover relationships between leadership styles and team performance outcomes.

The findings of this study have important implications for both the mining industry and leadership theory. This study helps mining businesses adopt more targeted and meaningful leadership development programs by providing insights into the most effective leadership styles and productivity improvement for developing high-performing teams. Furthermore, the study added to a broader understanding of leadership practices in challenging and high-risk contexts, giving insight into the complex relationship between leadership styles and team success. Finally, this study shed light on the relationship between leadership styles and team performance in the particular environment of South African underground coal mines. It provided practical ideas for optimizing leadership methods to improve team performance, and overall productivity in this essential industry through its methodology and analysis.

Keywords: Effective leadership, Leadership styles, Team performance, Productivity, Mining industry.

INTRODUCTION

The motivation behind this research stemmed from a notable observation made by senior managers in their career: namely the need to comprehend the means by which the exceptional leadership skills exhibited by a certain supervisor, who consistently motivates their team to surpass the performance of their counterparts, may be replicated among other supervisors. What are the distinguishing leadership attributes exhibited by certain supervisors that contribute to their superior performance relative to their counterparts? This phenomenon holds special significance within the production sections of underground coal mines in South Africa, wherein supervisors are confronted with a range of challenges. These challenges encompass managing a workforce characterised by diversity in terms of linguistic backgrounds, cultural orientations, and value systems, as well as disparities in educational background. Additionally, supervisors must navigate emerging impediments, such as the inclusion of women in the mining industry.

The study conducted by Day and Lord (1988) indicates that the performance of leaders has a significant impact on the fundamental outcomes of an organisation. In order to ensure survival, it is imperative for any organisation to possess capable leaders across all hierarchical levels, particularly in light of the prevailing global economic conditions characterised by the 4th Industrial Revolution, heightened competitiveness, and the aftermath of the Covid-19 pandemic, which has resulted in a severe worldwide economic crisis. The manifestation of this phenomenon can be observed through fluctuations in commodity prices and a scarcity of investments in the coal sector (Eberhard, 2011), which can be attributed to the global transition towards renewable energy sources (Green & Vallee, 2022). The shift is driven by environmental considerations aimed at mitigating greenhouse gas emissions.

In order for companies to gain a competitive advantage and ensure their long-term viability, it is imperative for leaders at all organisational levels to effectively motivate their teams to achieve peak performance. This is particularly crucial in the context of underground coal mining, where the attainment of production success heavily

relies on the establishment of a well-coordinated production process rhythm and the cultivation of effective teamwork.

In the context of South African coal mining industry, it is customary for mining supervisors to possess a foundational understanding of management theories and practises as part of their initially training. Nevertheless, the development of their leadership abilities mostly relies on the provision of on-the-job guidance from experienced supervisors, as observed by Kravtsuk (2022). Consequently, these supervisors are compelled to employ their skills with various levels of efficacy. Therefore, this study is of significant value in assisting senior executives in evaluating the effectiveness of their mining supervisors and defining the specific coaching and training needs necessary for attaining outstanding performance.

There is a considerable body of academic literature available on leadership research that outlines the numerous leadership theories and leadership styles employed in modern organizational leadership. Therefore this study aimed at providing insights into the most effective leadership styles that would suit coal mining sector supervisors for developing high performance teams. Underground coal mining supervisors need to have integrity, determination, instil respect, great people-, team building- and motivational skills to communicate a common purpose to improve productivity.

RESEARCH PURPOSE

The study investigated the relationship between leadership styles and team performance in South African underground coal mines. It aimed to identify common leadership styles utilized by mine supervisors, examined the impact of leadership styles on team performance, and measured team success through productivity rates. The research intended to maximize leadership techniques for improving team performance, and overall productivity in this essential business imperative by providing practical advice, while also contributing to the understanding of leadership practices in high-risk contexts.

Explicitly stated the research purpose was to identify the most effective leadership style that coal mining supervisors should adopt to improve their teams' performance and overall productivity.

Problem Statement

The problem identified is the average mining supervisors' lack of understanding regarding the most effective leadership style to adopt in the coal mining sector in South Africa to improve their team's performance. In the absence of understanding regarding the most effective leadership style to employ, these mining supervisors fail to improve their team's performance and attain greater team effectiveness.

Research Objectives

The objective of this study was to investigate the influence of different leadership styles on the overall performance of teams operating in underground coal mining operations in South Africa. Competent leadership is a crucial factor in ensuring productivity and team performance within the mining industry, particularly in the challenging underground environment. The impact of various leadership styles on team performance indicators, such as productivity rates and team effectiveness, persists as unclear. Comprehending the significance of this connection is of utmost importance for mining businesses and supervisors in order to optimise their

leadership approaches and cultivate teams that demonstrate exceptional performance. This, in turn, will lead to enhanced safety, productivity, and sustained growth within the coal mining sector of South Africa.

This study aimed to resolve the research gap about the contradiction between literature attributing situational theory to have a positive effect on team performance and alternative literature attributing transformational theory to have a positive effect on team performance.

Furthermore, it sought to tackle the second research gap which pertains to the lack of contextual understanding of leadership styles and team performance in underground coal mines in South Africa.

Research Questions

- What effect does situational leadership have on productivity in underground coal mining?
- What effect does transformational leadership have on productivity in underground coal mining?

Assumptions

Perceived Impact of Leadership Styles: The study assumed that team members' perceptions of leadership styles match the actual impact on team performance. Individual perceptions can differ, and there may be disparities between leaders' objectives and how team members interpret their actions.

Existing Theories' Applicability: The theoretical framework posited that established leadership theories such as transformational and situational leadership were appropriate in the context of underground South African coal mines. These theories were thought to adequately explain the leadership-performance relationship in this context.

Data Validity and Reliability: The study assumed that data gathered through surveys were accurate and reliable representations of the leadership styles used and team performance measures examined. Although every effort was made to assure data accuracy, limitations in data-gathering methods may have had an impact on the robustness of the results.

Delimitations

The research focused on underground coal mines in South Africa. This regional and sectoral separation provided a focused and in-depth examination of the industry's particular challenges and dynamics.

This study largely concentrated on two seminal leadership theories, namely situational- and transformational leadership, as the human traits in leadership that motivate individuals to support organisational goals, based on the synthesis of the literature review and the styles that are more dominant based on current experience in the coal mining sector amongst the current population of shift bosses, foremen, safety officers, mine overseers, senior foremen, managers and engineers working on several mines within the South African coal mining sector.

As far as team-level analysis is concerned, the research focused on team performance rather than individual or organizational outcomes. While this approach is beneficial for understanding teamwork and collaboration, it may have limited insights into the impact of particular leadership styles on overall organizational success.

The study did not include team and employee performance variables such as work motivation, competence, salary, team size, experience levels, cultural diversity, work environment, organisational culture, and job operation due to the complexity and time limits.

LITERATURE REVIEW

The leadership styles used in the mining industry have a significant impact on the performance of teams working in South African underground coal mines. Scholars and researchers have conducted substantial research into this link in order to understand how leadership techniques affect team dynamics, safety records, productivity rates, and overall employee happiness. This review of the literature synthesizes major findings from pertinent research to shed light on the critical relationship between leadership styles and team performance in the context of the South African mining sector.

According to Khan, Bhat & Hussanie (2017) leadership may be defined as the practice of influencing others to achieve organisational goals , utilising qualities such as intellectual capacity, motivation, ethical principles, sincerity, industry knowledge, emotional maturity, cognitive aptitude and self-confidence.

Business studies describe leadership impact as their influence on organisational strategy, design, processes, personnel, culture and performance. In phycological theory, leadership is viewed as social influence that leaders use interpersonal behaviour to persuade followers to participate to collective goals. Kaiser, McGinnis and Overfield (2012) distinguish between interpersonal *how* and organisational *what* and see the viewpoints as complementary in terms of *how* leaders influence performance. They also show that leadership professionals tend to favour one and disregard the other. They discovered that both these aspects contribute equally to predicting leaders' perceived success and the distinct ways in which these facets of leadership impact team performance.

The *what* in the coal mining sector signifies the key performance metrics that drive section coal production output and ensure team success, while the how indicates to the supervisor's influence on the team's performance.

Two scholarly articles (Khan et al., 2017; Uys & Webber-Youngman, 2019), discuss the essential personal attributes associated with leadership theories that are rooted in personality traits, cognitive motivations, and behaviours. These theories have

developed over time and can be categorised based on shared principles as psychology has evolved.

The leadership theories discussed in this study can be classified into distinct eras, including the trait era, behavioural era, situational era, contingency era and more modern transactional and transformational era (Khan et al., 2017).

Trait Theory

This historical period placed emphasis on the inherent attributes of a leader and outlined the personality traits and qualities that contribute to the effectiveness of leaders. The initial premise was rooted in the great-man or personality premise, which posited that certain individuals possess inherent qualities that predispose them to become effective leaders or are inherently destined to assume leadership positions. Nevertheless, this practise was ethically problematic, as evidenced by the actions of many leaders, notably Joseph Stalin. Leadership theory then advanced to the contemplation of certain traits that indicate a capacity for leadership. (Khan, Nawaz, & Khan, 2016).

Charismatic Theory

In more modern techniques, leadership is analysed from the perspective of regular people, according to Khan et al. (2017) a successful leader, according to Attribution Theory, is one who makes consistent decisions. Corresponding to the Charismatic Theory, a leader's charisma is ascribed to him or her saving his or her followers from catastrophe by offering direction and inspiration and placing great emphasis on his or her vision, speech, risk-taking ability, and subordinates' emotions. Their followers have confidence in the leader's convictions and their agreement with their convictions, adoration for and acknowledgement of the leader, relate to and reverence for the leader, are willing to obey the leader, group member emotional investment in the purpose, challenging group member objectives and conviction in the mission's success.

Bass and Stogdill (1990), divide leaders according to Charismatic Theory into five types: socialised charismatics, who prioritise group members' necessities and afford intellectual stimulation; personalised charismatics, who only allow for, assist, and support other group members when doing so will help them reach their objectives; and charismatic leaders who provide group members contemplation, assistance, and backing only when it assists them reach their individual objectives, office bearer charismatics, in which leaders gain respect and recognition because of the office or status they hold rather than because of their characteristics, personal charismatics, in which leaders exert influence on others because of their traits and skills rather than because of their elevated status or station, and finally divine charismatics, in which leaders are considered to be endowed with a gift or great favour.

Behavioural Theory

This theoretical framework assesses leaders' conduct within the organisational context and proposes that individuals have the potential to develop into effective leaders by acquiring and using specific behavioural patterns. Among these were several behavioural theories, including autocratic theory, laissez faire theory, and democratic theory (Khan et al., 2016).

In the mining industry, a command and control culture has become entrenched (Uys & Webber-Youngman, 2019), which is especially relevant in the coal mining sector's production environment which is a form of autocratic leadership.

Contingency Theory

This model suggests that a correlation exists between leader behaviours of a specific nature and group performance and satisfaction. To accomplish this, various dependent factors interact with one another, including the leader's personality, the position held, group members, and the internal and external environment of the organisation (Khan et al., 2017).

Situational Theory

According to Sims Jr., Faraj and Yun (2009) research, defining goals for a particular case, specifying necessary leadership types, determining situational conditions, corresponding a certain leadership approach to the situation, and determining how the correlation between leadership style and the situation will be made up the core of the strategic situational approach. They reference Pearce, Sims, Cox, Ball, Schnell, Smith, & Trevino (2003)'s results, which identified five main leadership philosophies as an expansion of the transactional-transformational framework: aversive, directive, transactional, transformational/charismatic, and empowering.

Sims Jr. et al. (2009) emphasised the potential for managers to cultivate a personalised leadership style rooted in situational leadership theory, tailored to their own circumstances. The inferred questions pertaining to situational theory are of particular significance, such as they explore the extent to which situational leaders adapt their leadership style to influence and empower their teams, adopt the appropriate leadership style based on what the task demands and empower their subordinates when they want to develop their skills and experiences. Subsequently, these questions were employed as variables that make up the constructs for the hypotheses with regards to situational theory for the present study.

According to Manyuchi and Sukdeo (2021), the situational leadership style has acquired appeal in the mining sector as the current organisational leadership of choice, with the most crucial role of motivating subordinates. Leaders should be adaptable for the situational leadership model to succeed, as the leader's style must alter depending on the scenario. The model is not in favour of a single optimum leadership style but rather emphasises the ability to adapt to the maturity and competency level of subordinates. Kenneth Blanchard's Situational Leadership Model II, which expands on Hersey and Blanchard's original theory, proposes that good leadership is based on two fundamental behaviours: supporting and guiding. Providing precise rules and guidelines, as well as seeking to influence team members' behaviour, are examples of directing behaviours (Gilley, Dixon & Giley, 2008). Actions like supporting subordinates, paying attention to them, and providing acknowledgement and feedback are examples of supporting performances.

Employees are motivated to accomplish desired corporate goals through effective leadership, which promotes strong leadership and increases employee productivity. They concluded that personnel in the mining sector are influenced by their supervisors' situational leadership behaviours.

In their recent study, Munyuchi and Sukdeo (2021) suggested characteristics that can serve as pertinent questions to test the relevance of situational leadership in relation to the ability of leaders inspire their subordinates to increase productivity to achieve company targets and what effect situational leadership have on employee motivation and productivity. These were then employed additionally as variables that make up the constructs for the hypotheses pertaining to situational theory in the context of this research.

Hypothesis 1 (H1) formulated for this study then was whether situational leadership have a positive effect on productivity in underground coal mining with the variables of supervisors applying situational theory and style leadership with their teams and having a positive effect on productivity in underground coal mining. The measurement of the variables was conducted through the utilisation of specific questions pertaining to the components associated with situational leadership attributes, as indicated above and team performance measured as the monthly production accomplished by the team in relation to the budgeted target for each production unit that the supervisor is responsible for.

Transactional Theory

The transactional leadership style, on the other hand, is defined by a focus on paying staff for fulfilling particular performance targets, as addressed by Bass (1985) and Podsakoff, MacKenzie, Paine and Bachrach (2000). Transactional executives frequently utilize dependent rewards and performance-based incentives to motivate team members to meet goals. While this style may have short-term advantages, some research suggests that it may be less effective in promoting long-term team cohesion and intrinsic motivation (Dvir, Eden, Avolio, & Shamir, 2002).

Transactional leaders motivate followers by convincing them of their purpose and delivering benefits in return for work performed, which are conditional incentives and management by exclusion, according to Khan et al. (2017). According to Hunt (1991), the former needs the leader to tell subordinates what steps to take to obtain the desired motivation for their labour, whereas the latter permits the leader to intervene in subordinates' work only when requirements or guidelines are not followed.

Transformational Theory

Transformational Leaders urge followers to go beyond their interests and be concerned about their organisation, according to Bass and Avolio (1997). They assist followers realise and fulfil their greatest capability. These leaders determine the wants of their followers and then comprehend how to address those needs in order to grow. By organising their fans around a single goal, purpose, or vision, they establish a feeling of direction and future direction. They also function as examples for their subordinates, encouraging them to enquire about key assumptions from many angles. They inspire their subordinates to see obstacles as prospects and to cooperate with them to better their perspectives, desires, talents, and ethical nature.

Transformational leadership was connected to improved team performance (Schaubroeck, Lam & Cha, 2007). Team potency mediates this connection. In teams with a strong detachment and, separately, a high degree of collectivism, transformational leadership had a higher effect on group effectiveness and performance.

The impact of transformational leadership on team effectiveness can be moderated by group beliefs, suggesting the existence of potentially universal principles that govern teamwork. In order to achieve shared objectives, transformational leaders possess the ability to motivate individuals to transcend their personal interests and recognise the boundaries of their capabilities. Transformational leaders establish ambitious collective objectives and encourage their followers to recognise and embrace them. Furthermore, they provide support to their followers in achieving

their objectives by acting as positive role models, motivating them to engage in self-reflection, demonstrating empathy for them as individuals, and fostering a spirit of collaboration. The interdependence among team members in pursuing task intentions is influenced by various factors such as team conduct, values, and contextual conditions. These elements significantly impact the behaviour and performance of teams. There was a favourable correlation observed between the average levels of group potency and leader-supporting behaviours. It was found that leaders at the team level may express a desire to foster the development of collectivism. Leaders have the ability to foster the development of shared values by employing strategies like recruitment, socialisation, and incentivization. Individuals who exhibit a strong inclination towards collectivism and engage in socialisation practises are selected for recruitment, and team members are both formally and informally incentivized for their adherence to collectivistic norms and behaviours. Aspiring leaders may endeavour to cultivate a sense of deference towards their position, while simultaneously acknowledging and considering the desires and suggestions put forth by their followers. It is recommended that leaders keep a certain physical distance from their subordinates in order to cultivate obedience and respect (Schaubroeck et al., 2007).

Schaubroeck et al. (2007) identified specific characteristics that can serve as appropriate questions to test the relevance of transformational leadership in relation to the ability of leaders to support the members in the work teams when members are mutually dependent in pursuing task objectives to improve group potency and reward teams formally and informally for their teamwork. Also they assist subordinates in achieving their objectives by serving as a role model, stimulating them to conduct analysis, demonstrating compassion for them as individuals, and fostering teamwork. Their subordinates identify, admire and have deep respect for them as they instil respect for their authority while also paying attention to the demands and suggestions of their subordinates. They promote subordinate respect and compliance whilst they keep some distance from their subordinates and they set lofty collective goals for their subordinates and urge them to accept them. In turn, these questions were applied as variables to make up the constructs for the hypotheses with respect to transformational theory for this research.

Transformational Leaders, according to Khan et al. (2016), engage in relationships with subordinates based on shared principles, beliefs, and goals, and aim to persuade followers to rearrange their needs by transcending personal gain and pursuing higher-order ambitions. These leaders put their interests aside for the good of the team. Transformational leaders recognise the requirement for change, enlist others' support and commitment, develop a change-guiding vision, and implement the change. They give off the impression of a confident and upbeat future vision.

Khan et al. (2017) present the multielement leadership questionnaire developed by Bass and Avolio (1997) to distinguish the four different attributes of Transformational Leaders known as the "4I's". Because of their idealised influence or charm, these leaders are admired and equated with by their followers. These leaders are well-liked, have significate authority, and hold their followers to high standards and challenging goals. Inspirational motivation occurs when a leader employs symbols and figures to increase understanding of collective and preferred goals. Through academic encouragement, leaders are urged to review their principles, viewpoints, and prospects, along with that of their personal and the business. Finally, individualised understanding occurs when a leader assigns duties to followers to increase teaching circumstances and, if necessary, educate them.

In the study of Khan et al. (2017), they raised important traits regarding the significance of transformational leadership that can be used as evidence for leaders' transformational ability. Specifically, the authors highlighted the role of leaders in facilitating the recognition and cultivation of subordinates' potential, delegating tasks to provide learning opportunities, offering guidance and coaching when necessary, motivating individuals to transcend self-interest and perceived limitations in pursuit of shared objectives, and serving as role models to encourage critical examination of underlying assumptions from diverse perspectives. Subsequently, these traits were formulated as further variables that make up the constructs for the hypotheses related to transformational theory for the present study.

Bass and Avolio (1997) have identified a set of useful behaviours associated with transformational leadership, which can be employed to assess individuals' competence in this ability. These behaviours include the ability of leaders to mobilise subordinates around a common purpose, mission or vision and provide a sense of purpose and future direction and leaders want subordinates to regard challenges as opportunities and cooperate with them to elevate expectations, needs, abilities, and moral character. Then, these behaviours were also formulated as variables that make up the constructs for the hypotheses with regards to transformational theory for this research.

Employees who are one hundred per cent mentally dedicated, like the challenge of their everyday work, believe their talents are utilised and are continually looking for inventive ways to achieve their objectives (Bezuidenhout & Schultz, 2013). They discovered that leaders should be encouraged to clarify the link between an employee's job and the organization's mission and that leaders should allow employees to participate in learning opportunities and give them challenging assignments to enable them to explore their potential and put their high-level skills to the test. Their findings demonstrated the necessity of rewarding staff when deserving, instead of when out of the ordinary. Feedback should be timely, constructive, and balanced, and interactions with subordinates should shape the level and nature of assistance. To ensure that employees receive the awards they choose, leaders should provide contingent prizes to their staff through negotiation. This indicates that the transformational leader must be able to establish and set well-defined goals that the workforce can understand and support. Leaders should hone their skills by giving each of their subordinate’s particular attention, keeping them intellectually stimulated and fostering inventiveness. To give employees the impression that prospects exist for advancement, the leader should try to create a milieu that encourages progress and improvement.

Bezuidenhout and Schultz (2013) suggested questions pertaining to transformational theory that are of particular significance in the mining industry to ensure employee engagement when supervisors establish and set well-defined goals that the workforce can understand and support, their interactions with

subordinates shape the level and nature of support and they reward staff when they are deserving, rather than just "managing by exception". They need to provide feedback timely, constructive, and balanced and hone their skills by giving each of their subordinate's particular attention, keeping them intellectually stimulated and fostering inventiveness. The supervisors should encourage the establishment of shared values through socialisation and rewards and clarify the link between an employee's job and the company's mission. These supervisors should give employees the impression that there are prospects for advancement and allow employees to participate in learning opportunities and give them challenging assignments so that they can explore their potential and put their skills to the test. Further they should set high standards and challenging goals for their subordinates and try to create an environment that encourages growth and development. Subsequently, these questions were used to formulate the last portion of the variables for the constructs for the hypotheses pertaining to transformational theory in the context of the present study.

Hypothesis 2 (H2) formulated for this study then was whether transformational leadership positively affect productivity as a measure of team overall performance in the coal mining sector with the variables of supervisors applying transformational theory and style leadership with their teams and having a positive influence on productivity as a measure of overall performance within underground coal mining. The measurement of the variables were conducted using particular questions pertaining to the constructs associated with transformational leadership attributes, as described above and team performance measured as the monthly production accomplished by the team in relation to the budgeted target for each production unit that the supervisor is responsible for.

The transformative leadership method is a popular leadership style widely observed in underground coal mines. Transformational leaders have also been shown in studies by Bass and Avolio (1994), and Yukl (1999) to improve team motivation and cohesion. Such leaders motivate their teams by establishing a compelling vision, stimulating creativity, and instilling a sense of purpose in their people, which results in higher performance outcomes.

Team Performance

The elements that affect or influence member performance were identified by Nguyen, Yandi, and Mahaputra (2020). Work motivation, competence, and remuneration have an effect on member performance, whereas leadership, work environment, organizational culture, and job operation have an influence on employee performance. This is backed by Diamantidis and Chatzoglou's (2018) study on the factors that affect employee performance, which found that a deficiency of supervisory support for employees' actions harms the organization's climate and job environment, consequently harms employees' training, reducing employee flexibility and intrinsic motivation. Everything has a negative influence on employee productivity.

In the context of South African coal mines, the laissez-faire leadership style, typified by a hands-off and non-interventionist approach, has also been investigated. According to Skogstad, Einarsen, Torsheim, Aasland and Hetland (2007), laissez-faire leadership can result in decreased productivity and safety hazards in mining teams due to a lack of clear direction and guidance, which can result in decreased employee engagement and commitment.

In the mining industry, a command and control culture has become entrenched according to Uys and Webber-Youngman (2019) which is a form of autocratic leadership. Studies on autocratic leadership styles in mining environments, such as those conducted by Stogdill (1948) and Judge and Bono (2001), have yielded mixed results. While autocratic leaders can make swift judgments and maintain compliance with safety rules, their leadership style can have a severe impact on employee morale and teamwork, perhaps leading to performance concerns.

Furthermore, recent research has focused on the impact of moderating factors on the relationship between leadership styles and team performance. Huang and Liden (2011) discovered that team size, experience levels, and cultural diversity can all have an impact on the effectiveness of different leadership styles in underground mining contexts. Transformational leadership, for example, maybe more effective

in bigger, varied teams, whereas transactional leadership may be more appropriate in smaller, task-focused groups.

In the context of underground coal mining in South Africa, the metric used to assess team performance is the monthly production accomplished in relation to the budgeted target for each production unit that the team achieved which the supervisor is responsible for. The inquiry was transformed into an interrogative statement, followed by a hypothesis that pertains to the performance of teams within the specific scope of this research.

Study Focus

Manyuchi and Sukdeo (2021) argue that the situational leadership style has gained popularity in the mining sector as the preferred organisational leadership approach, primarily due to its significant role in inspiring subordinates. The approach does not advocate for a singular optimal leadership style, but rather underscores the importance of adapting to the maturity and competency levels of subordinates. The researchers reached the conclusion that individuals working in the mining industry are subject to the influence of their supervisors' situational leadership practises.

Because the study conducted by Schaubroeck et al. (2007) established a positive correlation between transformational leadership and enhanced team performance and identified the relationship between the variables that is mediated by team potency. Transformational leadership had a greater impact on group effectiveness and performance in teams characterised by a robust sense of separation and, independently, a high level of collectivism. The potential influence of transformational leadership on the success of teams may be subject to moderation by group beliefs, indicating the presence of potentially universal rules that control the dynamics of teamwork.

The study conducted by Bezuidenhout and Schultz (2013) also established a positive correlation between transformational leadership and employee engagement within the context of the South African mining industry.

This study therefore focused on two prominent leadership theories that the literature review strongly indicated are most effective in improving team performance and has been confirmed in the context of mining organizations such as the studies of Manyuchi and Sukdeo (2021) in terms of Situational Theory and Bezuidenhout and Schultz (2013) in terms of Transformational Theory.

Finally, the study of literature emphasizes the vital relevance of leadership styles in impacting team performance in South African coal mines. Situational and Transformational leadership are promising strategies for improving team cohesion, motivation, and overall performance. The appropriateness of leadership styles, on the other hand, may change based on certain contextual conditions. Mining businesses and supervisors must take these findings into account in order to maximize their leadership strategies, assuring the safety, productivity, and long-term growth in the demanding and high-risk environment of South African underground coal mines.

This study aimed to address the existing gap in the literature about inconsistent findings on the impact of situational leadership style versus transformational style on team performance. By doing so, it aimed to contribute to the existing body of literature on this topic. Furthermore, this study attempted to address the second literature gap, which is the insufficient contextual understanding of leadership styles and team performance in underground coal mines in South Africa.

Theoretical Framework

The theoretical framework for the study is based on various recognized theories and concepts from the disciplines of leadership, organizational behaviour, and team dynamics. These ideas lay the groundwork for understanding the relationship between leadership styles and team performance in the context of South African underground coal mining. The theoretical perspectives listed below are relevant for building the framework and as explained in the previous section of study focus.

Situational leadership theory, according to Hersey and Blanchard (1969) is the most effective leadership style is determined by the readiness and maturity of team

members. Leaders may need to modify their leadership style based on their team's competency and dedication. This theory applies to the mining industry according to Manyuchi and Sukdeo (2021), where team members may have diverse degrees of experience and expertise and different leadership styles may be required to optimize team performance.

Transformational leadership theory proposed by Bass (1985) and subsequently refined by Avolio and Bass (1991), transformational leadership theory emphasizes the leader's ability to inspire and motivate subordinates to accomplish extraordinary results. Transformational leaders are distinguished by their visionary approach, charisma, and ability to empower team members. This idea is important because it explains how particular leadership styles can improve team performance by encouraging team cohesion, employee enthusiasm, and dedication to common goals, as confirmed again by Schaubroeck et al. (2007). Bezuidenhout and Schultz (2013), confirmed that transformational leadership and employee engagement in the South African mining industry are related to one another.

The employee performance framework that Diamantidis and Chatzoglou (2018) developed which is a theoretical framework or employee evaluation model that identifies environmental factors, employee factors and job related factors. Nguyen et al. (2020) concluded a conceptual theoretical framework with dominant factors of motivation, leadership, work environment, organisational culture, work achievement, competence and compensation for employee performance. These frameworks were employed to better understand how these leadership styles affect employee performance.

A team effectiveness model which Hackman and Wageman (2005) established identifies crucial aspects that drive team performance. Clear goals, task interdependence, team composition, and team processes are examples of these elements. This model shed light on how these different leadership styles influence team dynamics, coordination, and collaboration, and hence team effectiveness in underground coal mining.

The framework attempted to provide a thorough understanding of how these two different leadership styles affect employee and team performance in the demanding setting of underground South African coal mines by integrating several theoretical views. The framework was used to guide the analysis of empirical data and the drawing of conclusions about the relationship between these leadership styles and team outcomes in this specific situation.

HYPOTHESES

In order to establish accurate correlations, the literature review made reference to earlier works that had already established some of these associations. The study by Manyuchi and Sukdeo, (2021) concluded that employees working in the mining sector are positively influenced by situational leadership behaviours of their managers. Therefore:

Hypothesis 1: Situational leadership intentions are positively associated with team productivity in underground coal mining.

Independent variables: the various situational leadership constructs' variables (cause).
Dependent variable: positively associated with team productivity in underground coal mining (effect).

A study by Schaubroeck et al., 2007 found that transformational leadership was connected to improved team performance and transformational leaders have also been shown in studies by Bass and Avolio (1994), and Yukl (1999) to improve team performance. Therefore:

Hypothesis 2: Transformational leadership intentions are positively associated with team productivity in underground coal mining.

Independent variables: the various transformational leadership constructs' variables (cause).
Dependent variable: are positively associated with team productivity in underground coal mining (effect).

RESEARCH METHODOLOGY

The goal of the study was to test hypotheses about the correlational or causal links between the variables in the database. The research was descriptive or ex post facto in character, to discover the connections of the current circumstances. The research paradigm employed in this research was the positivist paradigm employing a quantitative approach (Rehman & Alharthi, 2016). It was applied research, to discover solutions to the practical research problems posed. The research was classified as quantitative empirical research, which rely on the experience of the population sample to acquire data to either prove or reject the hypotheses. (Kothari, 2004).

The study employed a quantitative approach based on the rigorous literature review of the theoretical framework of various recognised theories and concepts of the disciplines of leadership, organisational behaviour, and team dynamics to investigate the relationship between leadership styles and team performance in the context of underground coal mining in South Africa.

The adopted methodology involved testing the hypotheses that examine the relationships between variables associated with situational theory, transformational theory, and team productivity. The objective was to identify the presence of positive or negative connections between these variables. This was done by means of correlation analysis and regression analysis between the variables of situational theory, transformational theory and team productivity variables.

Research Approach

The approach adopted by this research was a quantitative approach. This quantitative approach focused on analysing the data collected from a structured survey questionnaire from mining supervisors operating in underground South African coal mines.

Research Instrument

The quantitative approach involved the administration of a structured survey questionnaire based on the literature review to mining supervisors working in underground South African coal mines. Items relevant to team performance measures, such as productivity rates were included in the questionnaire. The survey was delivered to a sample of mining teams, ensuring that different divisions and locations are represented.

The interpretation of the literature reviewed guided the development of further variables in the research survey to test the various constructs of the leadership theories at hand. The leadership theory constructs of situational theory consisted of directing, coaching, supporting and delegating functions (Munyuchi & Sukdeo, 2021).

The survey questions to test for the directing construct of situational theory were that they influence their subordinates with situational leadership behaviours (Munyuchi & Sukdeo, 2021) and adapt their leadership style to different organizational situations (Sims Jr. et al., 2009).

The survey question to test for the coaching construct of situational theory was that they empower others when they want to develop their subordinate's skills and experiences (Sims Jr. et al., 2009) and the survey question to test for the delegating construct of situational theory was that they adopt the appropriate leadership style based on what the task demands (Sims Jr. et al., 2009).

Lastly the survey questions to test for the supporting construct for situational leadership were that they inspire their subordinates to achieve company targets through effective leadership, which increases employee productivity (Munyuchi & Sukdeo, 2021) and they are less prone to empower others when subordinates are less experienced and the task is very important (Sims Jr. et al., 2009).

These questions were then the variables of the constructs for the hypothesis that situational leadership have a positive effect on employee motivation and productivity in underground coal mining. These survey questions are included in the

table in Annexure 1 and related to the a priori relative constructs for which theory in the table in Annexure 2.

The constructs for transformational theory consisted of individualised consideration, inspirational motivation, idealised influence and intellectual stimulation (Bass & Avolio, 1997).

The survey questions to test for the individualised consideration construct of transformational theory were that they help subordinates to realize and develop their potential (Khan et al., 2017), delegate assignments to subordinates to provide learning opportunities and coach them if they need it (Khan et al., 2017), establish and set well-defined goals that the workforce can understand and support (Bezuidenhout & Schultz, 2013), support the members in the work teams when members are mutually dependent in pursuing task objectives to improve group potency (Schaubroeck et al, 2007), interactions with subordinates shape the level and nature of support (Bezuidenhout & Schultz, 2013), reward staff when they are deserving, rather than just "managing by exception" (Bezuidenhout & Schultz, 2013), provide feedback timely, constructive, and balanced (Bezuidenhout & Schultz, 2013) and hone their skills by giving each of their subordinate's particular attention, keeping them intellectually stimulated and fostering inventiveness (Bezuidenhout & Schultz, 2013).

The survey questions to test for the inspirational motivation construct of transformational theory were that they motivate their subordinates to look beyond their own self-interest and perceptions of their own limits to achieve common goals (Khan et al., 2017), mobilise their subordinates around a common purpose, mission or vision and provide a sense of purpose and future direction (Bass & Avolio, 1997), encourage the establishment of shared values through socialisation and rewards (Bezuidenhout & Schultz, 2013), reward teams formally and informally for their teamwork (Schaubroeck et al, 2007), clarify the link between an employee's job and the company's mission (Bezuidenhout & Schultz, 2013) and give employees the impression that there are prospects for advancement (Bezuidenhout & Schultz, 2013).

The survey questions to test for the idealised influence construct of transformational theory were that they want their subordinates to regard challenges as opportunities and cooperate with them to elevate expectations, needs, abilities, and moral character (Bass & Avolio, 1997), act as role model for their subordinates and encourage them to question problems that underlie basic assumptions from different perspectives (Khan et al., 2017), assist subordinates in achieving their objectives by serving as a role model, stimulating them to conduct analysis, demonstrating compassion for them as individuals, and fostering teamwork (Schaubroeck et al, 2007), their subordinates identify, admire and have deep respect for them (Schaubroeck et al, 2007), instil respect for their authority while also paying attention to the demands and suggestions of their subordinates (Schaubroeck et al, 2007), promote subordinate respect and compliance (Schaubroeck et al, 2007) and keep some distance from their subordinates (Schaubroeck et al, 2007).

The survey questions to test for the intellectual stimulation construct of transformational theory were that they allow employees to participate in learning opportunities and give them challenging assignments so that they can explore their potential and put their skills to the test (Bezuidenhout & Schultz, 2013), set high standards and challenging goals for their subordinates (Bezuidenhout & Schultz, 2013), set lofty collective goals for their subordinates and urge them to accept them (Schaubroeck et al, 2007) and try to create an environment that encourages growth and development (Bezuidenhout & Schultz, 2013).

These questions were then used as the variables of the constructs for the hypothesis that transformational leadership positively affect team overall performance in the coal mining sector. These survey questions are included in the table in Annexure 1 and related to the a priori relative constructs for which theory in the table in Annexure 2.

The variable entailed the construct that are compared to for team performance consisted of production achievement relative to production target for each production section in an underground coal mine for which the supervisors' individual teams are responsible for.

Population

The research focused on persons who hold key positions in the coal mining industry in South Africa, which included the middle management team and first line supervisors. More precisely, this study concentrated on teams functioning in underground coal mines at Blue mining Services operations. The teams consisted of miners, supervisors, department heads, managers, and safety personnel who are responsible for the daily activities of coal mining, safety procedures, and team coordination.

The study sought to examine the effects of various leadership styles on team performance and overall output in the demanding and perilous setting of underground coal mining. The study aimed to get significant insights for developing leadership practices and improving team effectiveness in this critical area by analysing this specific demographic.

Sampling

The selection of participants for the study was a crucial element of the research design. To address the unique circumstances of underground coal mines in South Africa, a purposive sampling strategy was utilised. Purposive sampling facilitated the intentional selection of participants who possess pertinent information and experience pertaining to the study's focal point. The individuals targeted in this case were mine managers, heads of departments, supervisors, and safety personnel who possess significant expertise in the underground coal mining business at Blue mining Services operations.

The sample size chosen were all the employees for all these key positions within Blue Mining operations aiming for saturation, that data collection reach a state of redundancy where additional participants do not substantially contribute to novel insights. The study intended to capture the varied views and leadership styles found in South African underground coal mines by employing purposive sampling.

Data Collection

The data collection was done employing a specifically designed structured survey questionnaire for the sample of the cross-sectional population of shift bosses, foremen, safety officers, mine overseers and senior foremen currently employed in South African Coal Mines in a field experiment.

The questions were structured such that it could be answered by means of a Likert scale response where 1 meant to strongly disagree; 2 meant to disagree; 3 meant to be neutral; 4 meant to agree and 5 to strongly agree.

The study utilised Qualtrics, an advanced web-based survey platform equipped with online survey capabilities, to oversee the anonymous online survey and gather the relevant data. Users could utilise their mobile devices or personal computers to respond to the survey questions on the Qualtrics website. Subsequently, the data was transferred from Qualtrics to Excel format for subsequent analysis.

The data was then analysed in terms of various descriptive and inferential statistical criteria.

Data Analysis

Quantitative data was analysed statistically utilizing techniques such as reliability analysis, factor analysis, correlation analysis, and regression analysis. The analysis investigated the correlations between the various leadership style constructs and team performance metrics, evaluating the extent to which leadership styles influence the team performance outcomes.

The production metric was constructed as the typical production budget versus the production achievement for each production unit that the supervisor oversaw. This was operationalized as tonnes per month per production section and used as the team performance metric.

Initially, the data was organised based on the predetermined components based on theoretical deduction what literature described, and subsequently, additional

variables were derived by calculating the average of the replies according to the aforementioned a priori factors. Subsequently, a multivariate technique such as a correlation study was conducted to evaluate the associations between production success and the aforementioned four newly introduced factors for both situational and transformational theories.

Subsequently, an exploratory factor analysis was performed in order to ascertain the latent structure of the variables from the observations. Subsequently, the data was organised based on these characteristics, and novel variables were derived by calculating the mean of the responses pertaining to the exploratory elements. Subsequently, a correlation analysis was conducted to evaluate the associations between production success and the aforementioned additional factor analysis factors for both situational and transformational theories.Another multivariate technique, multiple univariate linear regression analysis, was conducted to examine the associations between production success and the four calculated a priori factors from both situational and transformational theories. This analysis aimed to provide a comprehensive understanding of these associations by considering multiple factors.

Finally, a multiple univariate linear regression analysis was conducted to examine the relationship between production success and the estimated factor analysis variables. This analysis aimed to provide a comprehensive understanding of both situational and transformational theories.

Reliability

To maintain the consistency and stability of research findings over time and under various settings, it was important to ensure the reliability of the study (Marczyk, DeMatteo, & Festinger, 2010). This involved taking into account numerous important factors during the measurement, sampling, data collection, and statistical analysis processes.

To ensure research reliability, data on leadership styles and team performance was collected using the web-based survey platform Qualtrics, which is a valid

measurement instrument that consistently produces consistent results when applied repeatedly.

To enhance the literature review, it covered existing theories, empirical studies, and insights relevant to leadership styles and team success in the context of underground coal mining. This provided the research with a firm theoretical base.

To ensure sampling reliability, the study utilised a representative sample of teams operating in underground South African coal mines at Blue Mining operations. The precise sampling approach guaranteed that the results can be extrapolated to the wider target population.

For quantitative rigor, the study made use of rigorous sampling approaches to verify that the sample was representative, such as random sampling from a naturally formed representative potential pool of mining supervisors from various employers and locations in the coal mining sector by employing voluntary participation in an online survey. Self-selection bias and nonresponse bias was addressed by follow up on non-responders and the online survey kept as short as possible and accessible to everyone with a smartphone.

The dependability of data gathering methods was improved with the implementation of stringent data collection protocols using the standardised survey platform Qualtrics. The standardised survey was designed to minimise bias and maintain consistency with a standardised Likert scale response.

For the design of the survey, great care was taken in designing the survey questionnaire. The survey questions were made clear to mining supervisors, and the objectivity, and clarity related to the study objectives were maintained by basing the questions on relative literature. The survey questions were formulated from the literature of Sims Jr. et al. (2009) and Munyuchi and Sukdeo (2021) with respect to situational theory and from Bass and Avolio (1997), Schaubroeck et al (2007), Bezuidenhout and Schultz (2013) and Khan et al. (2017) with respect to transformational theory.

The dependability of the data was assessed using robust statistical approaches, such as Cronbach's alpha for internal consistency, KMO and Bartlett’s test, analysis of variance or ANOVA, Durban-Watson statistic for auto correlation, collinearity test and regression coefficients. These techniques were used to measure the level of consistency in the data.

This resulted in a strong and meaningful study that explored the association between leadership styles and team performance in South African underground coal mines by adhering to ethical issues by focusing entirely on the quantitative phase and applying these tactics.

Validity

In order to guarantee the validity of the research, it was crucial to carefully assess the data collection methods and analyse the research design for internal, external, construct, and content validity (Marczyk et al., 2010).

The study employed simple randomisation to mitigate potential confounding factors and establish a genuine association between observed effects of leadership styles and team performance, thereby enhancing the internal validity of the study. This internal validity specifically pertained to which the study accurately reflected the relationships between variables within the specific context of underground coal mines.

As far as limited generalizability, the research findings and conclusions may be limited to the context of underground South African coal mines and may not be fully generalizable to other mining industries or sectors with diverse organizational cultures and work conditions.

Related to industry specificity, because the study was done within the coal mining industry, the findings may not be immediately relevant to other industries or sectors that operate under different operating conditions and have distinct organizational structures.

The sample of mining supervisors that participated in the study was employed at four different operations of one corporate employer and were not a representative sample throughout the whole sector with participants from all the mining houses represented although the different cultures of the different mining houses and mines might influence the result.

The small sample size of the study may restrict the findings' generalizability. The findings may not be representative of the total population of mining supervisors, and the small sample size may have a restrictive effect in that the associations between the leadership factors and productivity measures which appear weak and affect the analysis's statistical power.

The majority of research in this field was based on cross-sectional data, which captured a snapshot of the relationship between leadership styles and team performance at a single point in time. Longitudinal research would provide a more complete picture of how leadership practices change and their long-term impact on team success.

The selected methods to precisely capture the intended concepts entailed ensuring that the scales for the leadership style concepts and performance indicators were appropriately represented.

The data collected through surveys on leadership styles and team performance may be prone to self-reporting bias. The data was based on self-reported measures, which might lead to response bias. Participants may have provided socially desired responses or may not have precisely recalled their events and activities, resulting in data measurement mistakes.

As far as limited perspective is concerned, the study focused on mining supervisors' assessments of their leadership styles and their impact on production success. It did not, however, take into account the viewpoints of team members, subordinates, or other stakeholders who could provide useful insights into leadership effectiveness.

The existing literature on the construct being evaluated provided guidance on the necessary components of the research instrument to comprehensively address the many features of leadership styles and team performance. This ensured that the measuring tools accurately captured the concepts being studied.

Overall, the study's meticulous focus on research validity guaranteed that its findings make a significant contribution to our comprehension of leadership dynamics and team success in the demanding environment of underground South African coal mines.

The singular quantitative research method employed rather than a combination of quantitative surveys and qualitative interviews, confined the output to a less thorough perspective. Integrating both methods would have enhanced data triangulation and resulted in a more comprehensive view. However, the size of the sample and the breadth of data collection would have been limited due to resource and time limitations.

Limitations

Establishing causation between leadership styles and team performance can be challenging due to the intricate relationship between the two. Unaccounted variables that were not taken into consideration throughout the study may have influenced team performance, therefore causing the results to be distorted.

The limited sample size of just 51 respondents in the study may hinder the capacity to apply the findings to a larger population. The findings may lack representativeness for the entire population of mining supervisors, and the small sample size may limit the ability to establish strong connections between leadership traits and productivity metrics, therefore affecting the statistical power of the analysis.

The supervisors who participated in the survey were not a representative sample of the demographic composition of the greater South African population, indicating a slightly biassed sample. This could impact the survey results as these supervisors

may respond to the questions based on their perspective on their position within various societal sectors and their understanding of their role as leaders in society, as well as how leadership is practiced in these diverse sectors.

The research findings and conclusions may have limited generalizability, namely to other mining industries or sectors with various organisational cultures and work circumstances. However, they are applicable to the context of underground South African coal mines.

The research in the subject matter is conducted using a cross-sectional design, which allows for the examination of the relationship between leadership styles and team performance at a specific moment in time. Conducting longitudinal study would offer a more comprehensive understanding of the changes in leadership techniques and their long-term effects on team success.

The data obtained from questionnaires on leadership styles and team performance may be susceptible to self-reporting bias. The data relied on self-reported measurements, which could potentially introduce response bias by participants leading to inaccuracies in data measurement.

Research Procedure and Ethical Considerations

The research was based on voluntary participation where research subjects were free to choose whether to engage in the study or to leave at any time without penalty. It was also done through informed consent where all potential participants were given all of the information they need to make an informed decision about whether or not they wished to participate (Kasstan, Pearson & Brooks, 2023). This included details regarding the study's advantages, disadvantages, funding, and institutional approval.

Participants' anonymity were ensured by removing identifying information from the report, to protect their privacy (Kasstan et al., 2023). The use of data was limited to this study and took into account the protection of sensitive personal data following

the Personal Information Protection Act. All potential sources of harm to participants were considered and, to the extent practicable, mitigated.

Plagiarism was avoided as far as possible, and research misconduct was avoided by appropriately presenting the results. Permission was sought from the participants and their employers.

Statistical Analysis

The analysis of the results was done utilizing Excel as well as IBM Statistical Product and Service Solutions (SPSS) statistical analytic tool. The method of analysis employed inferential statistics. Statistical analysis consisted of descriptive statistics and inferential statistics such as bivariate and multivariate analysis of the variables and concepts in the collected data.

No responses to questions were treated as missing data. The questionnaire was designed to minimise missing data using muti-item scales employing reverse answers and programmed not to allow missing data where possible. Cronbach Alpha ratings was used to validate the data. Factor analysis was used to examine the items from multiple-item scales into various variables while dealing with multi-item scales. The data was subjected to statistical significance tests such as confidence intervals, standard error, probability value, and bootstrapping.

The methodical details of the analysis used variable names and the resolution employed the interpretation of the results of an analysis to resolve the problem by confirming which of the constructs confirmed between leaders and followers had a positive correlation.

RESULTS

The evaluation of data was conducted in five stages to examine the correlation between situational and transformational leadership theories and production success in coal mines located in South Africa. The methodology encompassed the examination of the demographic characteristics, assessment of the validity of leadership constructs, implementation of correlation analysis, execution of factor analysis on leadership theories and production performance with associated correlation analysis and linear regression analysis with production performance as the dependent variable.

Profile of Demographics

The survey included 77 respondents, 64 of whom submitted relevant data for further study. The majority of responders (92% were men) ranged in age from 40 to 49 years (37%). The majority of respondents (65%) were white, followed by black (31%), and coloured (2%). The educational background ranged from 57% who had completed grade 12 to 18% who had a bachelor's degree. The majority of respondents (63%), spoke Afrikaans as their first language, followed by Zulu (14%). The majority of respondents (29%) have one to five years of experience at their current level of employment.

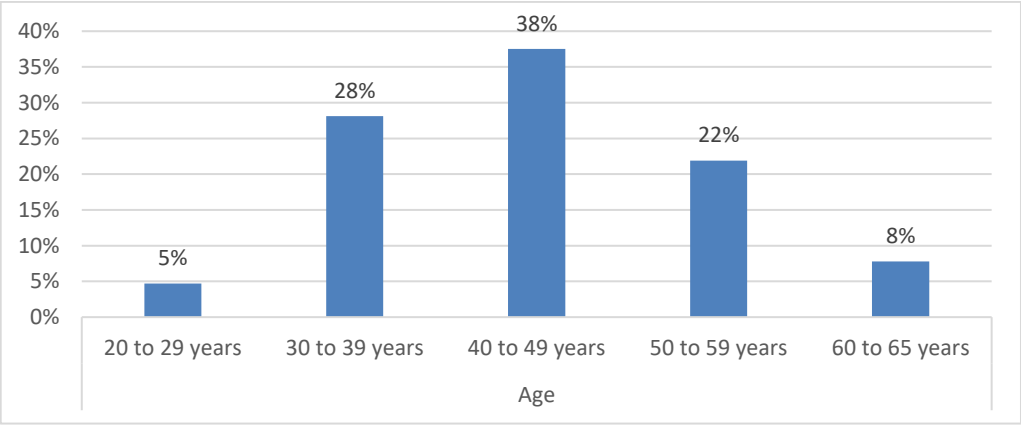

Figure 1: Respondents' Age Distribution

The age distribution of the respondents that can be seen in Figure 1 holds relevance in that the majority were above the age of thirty. This aligns with expectations for personnel at the supervisor level, who are typically responsible for leading teams.

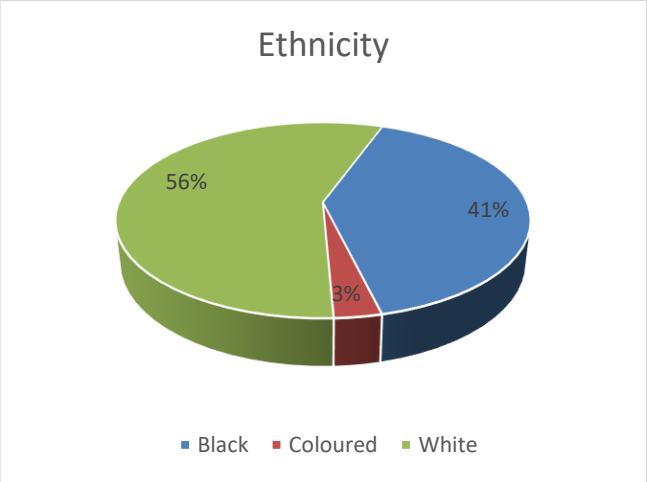

Figure 2: Respondents' Ethnicity Distribution

The respondents' ethnic background distribution that can be seen in Figure 2 was characterised by a majority of individuals identifying as black, followed by a somewhat smaller proportion identifying as white, and a tiny number of supervisors who identified as coloured. The current situation falls below the anticipated standards for transformation in mining environments as outlined by the Mineral and Petroleum Resources Development Act (MPRDA) and its corresponding Mining Charter. The provincial Employment Equity Plan (EAP) objectives for Mpumalanga pertain to the representation of skilled technical and academically prepared personnel, as well as individuals in junior management, supervisory, foreman, and superintendent positions (referred to as C Level in Paterson job grading). These objectives aim for a demographic composition of 50.6% African males, 31.5% white males, 1.2% coloured males, and 8.6% African females (Blue Mining Services, 2022).

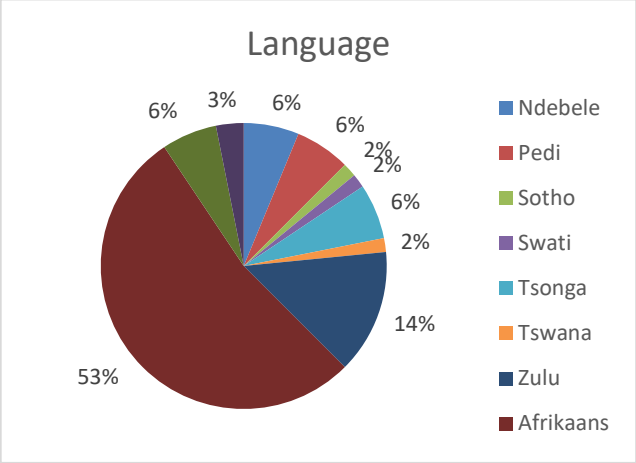

Figure 3: Respondents' Mother Tongue Distribution

Figure 3 displays the distribution of the respondents' primary spoken language, revealing that the majority of individuals surveyed reported Afrikaans as their mother tongue. This is followed by Zulu, Ndebele, Pedi, Tsonga, and English. Shona is reported as the next most prevalent language, while Sotho, Swati, and Tswana are reported as the least often spoken languages among the respondents. The prevalence of African languages in the coal mining sector can be attributed to the geographical location of operations. SiSwati (30,5%), IsiZulu (27,8%), Xitsonga (10,6%), Sepedi (10,3%) and IsiNdebele (9,9%) are the most spoken languages in the Mpumalanga province according to the 2022 census (Statistics South Africa, n.d.). However, the predominance of Afrikaans can be seen as a result of historical factors, including the legacy of white supervisors who were previously granted unfair advantage.

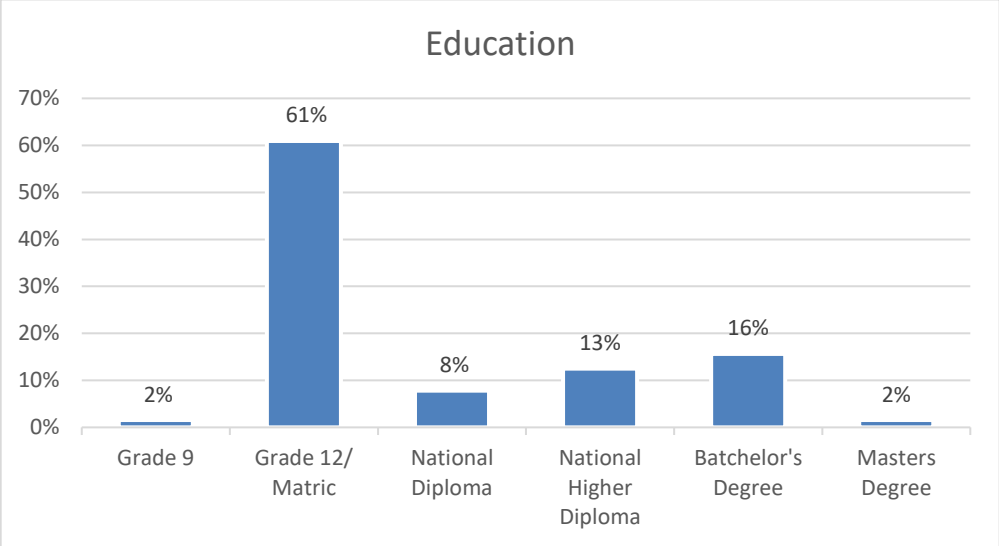

Figure 4: Respondents' Educational Background Distribution

The educational backgrounds of the majority of the respondents, as depicted in Figure 4, were mostly at the grade 12 level, followed by a bachelor's degree, national higher diploma, national diploma, and lastly, a master's degree and grade 9. This phenomenon is anticipated since it aligns with the prescribed qualifications for employment at different tiers of supervision, namely the minimum requirement of a grade 12 education for foreman and shiftboss positions, with higher educational qualifications expected for higher levels of supervision within the organisational hierarchy.

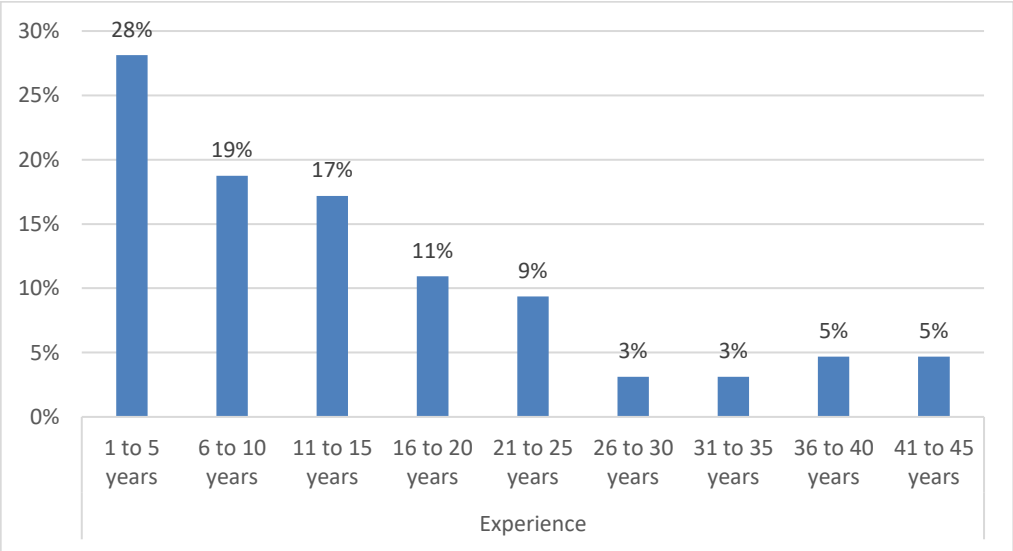

Figure 5: Respondents' Experience Distribution

Figure 5 displays the distribution of respondents' experience levels at their current level of work. The findings indicate that a significant proportion of participants indicated possessing fewer than 15 years of professional experience, whilst a smaller proportion claimed having more than 26 years of experience at their present level of employment.

Productivity Analysis

The production variance was calculated from the Likert scale responses for the production budget and actual production for each respondent. The average production variance from each respondent's data was then used to generate a new variable of production variance to determine whether the specific respondent's production units outcomes achieved their production targets or not. This then served as a variable in most of the hypothesis testing for this study. 34% of the respondents fell marginally short of their production targets, 33% met their objectives and 20% exceeded their average monthly production targets as can be seen in Figure 6 below. The average exceeded their targets by 2,255 tons per section per month.

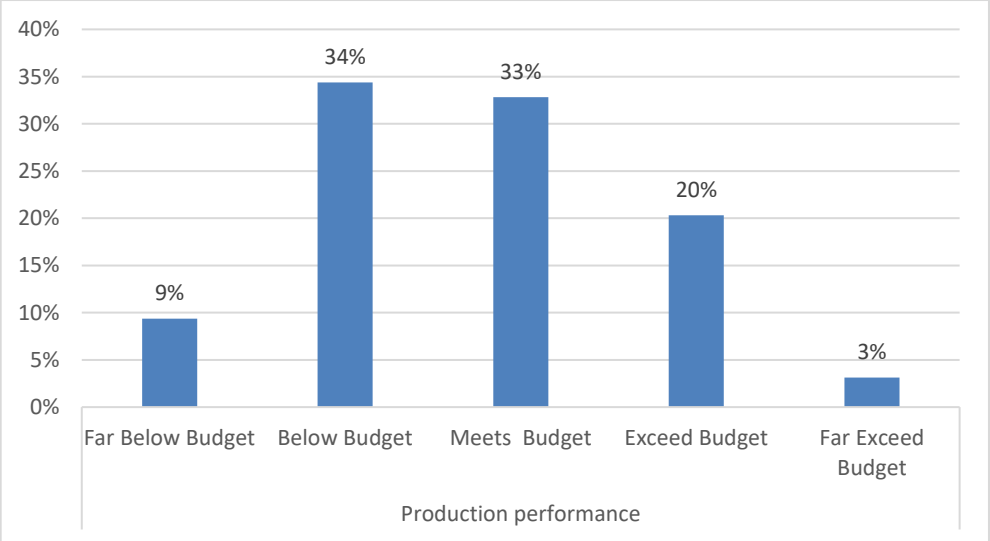

Figure 6: Production Performance Distribution

Situational Theory Analysis

The evaluation of data was conducted in five stages to examine the correlation between situational and transformational leadership theories and production success in coal mines located in South Africa. The methodology encompassed the examination of the demographic characteristics, assessment of the validity of leadership constructs, implementation of correlation analysis, execution of factor analysis on leadership theories and production performance with associated correlation analysis, and a linear regression analysis of production performance as a dependent variable and situational leadership theory components as independent variables.

An investigation was conducted to assess the reliability of situational leadership theory constructs. The reliability of the 'directing' construct multi-variable scale was found to be good, with a Cronbach Alpha of 0.828, as shown in Table 1. However, the 'supporting' construct multi-variable scale showed a negative Cronbach Alpha, indicating poor reliability. The respondents' comprehension of question 23 was reversed due to the dual usage of the term "less" in the question which was influenced that only 6% of the respondents speak English as their first language. With the modification of the variable of question 23 to an inverted format, the updated Cronbach Alpha value of 0.302, as shown in table 2, demonstrated an unsatisfactory outcome.

Table 1: Situational Theory 'Directing' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.828	0.845	2

Table 2: Situational Theory 'Supporting' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.302	0.319	2

The unsatisfactory reliability of the 'supporting' construct can be attributed to the low number of questions related to the construct and the poor correlation between its variables within the construct.

The four primary leadership styles of situational theory leaders were directing, coaching, supporting and delegating functions according to Hersey & Blanchard (1969). The response to the questions pertaining to these leadership styles from the survey were utilised to generate consolidated variables, which were subsequently employed for the analysis of situational theory.

The statistical significance of the correlation coefficient for these a priori situational theory construct variables suggests that there is not enough statistical evidence to support the idea that the correlations are meaningful, except for the coaching construct, which did generate a significant result, considering the sample size of the respondents. The correlations on the other hand indicated very weak correlation with productivity from any of the situational variables as can be seen in Table 3 below, which suggests that there are other important determinants not measured.

Table 3: Situational Theory Constructs Correlation to Productivity

Correlations

		Production	Directing	Coaching	Supporting_Rev	Delegating
Spearman's rho	Production	1.000	0.070	0.173	-0.044	0.092
	Directing	0.070	1.000	.354*	.285*	.402**
	Coaching	0.173	.354*	1.000	0.214	0.239
	Supporting_Rev	-0.044	.285*	0.214	1.000	.394**
	Delegating	0.092	.402**	0.239	.394**	1.000

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

**. Correlation is significant at the 0.01 level (2-tailed).

The data obtained was then subjected to an exploratory factor analysis to examine the situational leadership further. The analysis revealed a two-factor structure for situational leadership, as shown in Table 4. These factor structures accurately reflected the underlying patterns in the data since the significance of the data were less than 1% in the KMO and Bartlett's test.

Table 4: Situational Theory Factor Analysis Pattern Matrix

Pattern Matrix[a]		
	Component	
	1	2
Q11	0.917	-0.174
Q16	0.933	-0.173
Q18	0.856	0.190
Q20	0.783	0.125
Q23	-0.203	0.868
Q31	0.356	0.580

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 5 iterations.

The leadership constructs of situational leadership were subsequently reduced to encompass these two underlying main elements, namely formulated as participative influence and empowerment functions as indicated by the data.

Again, an investigation was conducted to assess the reliability of these revised situational leadership theory constructs. The reliability of the 'participative influence' construct multi-variable scale was found to be excellent, with a Cronbach Alpha of 0.891, as shown in Table 5. The reliability of the ‘empowerment’ construct multi-variable scale was found to be unacceptable, with a Cronbach Alpha value of 0.221, as shown in table 6.

Table 5: Situational Theory ‘Participative Influence’ Construct Reliability Analysis

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.891	0.901	4

Table 6: Situational Theory ‘Empowerment’ Construct Reliability Analysis

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.221	0.233	2

The unsatisfactory reliability of the 'supporting' construct can be ascribed to the limited quantity of questions pertaining to the construct and the weak connection among its variables inside the construct.

To assess the links between production success and situational leadership further, another correlation analysis was performed using the revised latent factor structures of situational leadership.

This correlation analysis also indicated statistical insignificant association, all the novel variables derived from latent structure of the situational leadership construct variables resulted in weak correlations with production performance, as can be seen in Tables 7.

Table 7: Revised Situational Leadership Constructs Correlation to Productivity

Correlations

		Production	Participative Influence	Empowerment
Spearman's rho	Production	1.000	0.040	0.020
	Participative Influence	0.040	1.000	0.242
	Empowerment	0.020	0.242	1.000

Transformational Theory Analysis

An investigation was conducted to assess the reliability of transformational leadership theory constructs. For transformational theory constructs, the reliability of the 'individualised consideration' construct multi variable scale was found to have an acceptable Cronbach Alpha of 0.626 as can be seen in Table 8. The reliability of the 'inspirational motivation' construct multi variable scale was found to have a poor Cronbach Alpha of 0.527 as can be seen in Table 9. The reliability of the 'Idealised Influence' construct multi variable scale was found to have a poor Cronbach Alpha of 0.593 as can be seen in Table 10. The reliability of the 'Intellectual Stimulation' construct multi variable scale was found to have a poor Cronbach Alpha of 0.523 as can be seen in Table 11.

Table 8: Transformational Theory 'Idealised Consideration' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.626	0.717	8

Table 9: Transformational Theory 'Inspirational Motivation' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.527	0.616	6

Table 10: Transformational Theory 'Idealised Influence' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.593	0.732	7

Table 11: Transformational Theory 'Intellectual Stimulation' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.523	0.651	4

The unsatisfactory reliability of the 'inspirational motivation'-, 'idealised influence'- and 'intellectual stimulation' constructs can be attributed to the poor interrelatedness between the variables of the constructs.

The four distinct characteristics of transformational theory leaders were idealized influence, inspirational motivation, intellectual stimulation and Individualised consideration according to Khan et al. (2017). The response to the questions pertaining to these distinct characteristics from the survey were utilised to generate consolidated variables, which were subsequently employed for the analysis of transformational theory.

The statistical significance of the correlation coefficient for these a priori transformational theory construct variables also suggests that there is not enough statistical evidence to support the idea that the correlations are meaningful, considering the sample size of the respondents. Further to this the correlations of productivity and these a priori transformational theory construct variables indicated weak correlation from any of the transformational variables as can be seen in Table 12 below, which suggests that there are other important determinants not measured.

Table 12: Transformational Theory Constructs Correlation to Productivity

Correlations

		Production	Individualized Consideration	Inspirational Motivation _Rev	Idealized Influence _Rev	Intellectual Stimulation
Spearman's rho	Production	1.000	0.024	0.189	-0.062	0.064
	Individualized Consideration	0.024	1.000	.444**	.296*	.568**
	Inspirational Motivation _Rev	0.189	.444**	1.000	.390**	0.108
	Idealized Influence _Rev	-0.062	.296*	.390**	1.000	0.107
	Intellectual Stimulation	0.064	.568**	0.108	0.107	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

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

The data obtained was then subjected to an exploratory factor analysis to examine the transformational leadership further. The analysis revealed a seven-factor structure for transformational leadership, as shown in Table 13. These factor structures accurately reflected the underlying patterns in the data since the significance of the data were less than 1% in the KMO and Bartlett's test.

Table 13: Transformational Theory Factor Analysis Pattern Matrix

Pattern Matrix[a]							
	Component						
	1	2	3	4	5	6	7
Q12	0.173	-0.173	0.112	-0.052	0.825	0.046	0.026
Q13_Rev	0.027	-0.013	0.186	0.612	-0.028	-0.243	0.481
Q14	-0.184	0.098	-0.065	-0.038	0.923	-0.037	-0.002
Q15	-0.265	0.255	-0.001	0.086	0.851	-0.091	-0.063
Q17	0.283	-0.081	-0.042	0.021	0.769	0.117	0.075
Q19	0.228	-0.062	0.101	-0.031	0.756	0.032	0.101
Q21	0.696	0.156	0.131	-0.055	0.199	0.040	-0.129
Q22	0.584	0.167	0.255	-0.053	0.224	0.037	-0.211
Q24_Rev	-0.050	-0.247	0.222	0.800	0.016	-0.030	-0.033
Q25	0.308	0.654	0.181	-0.105	0.138	-0.079	-0.043
Q26	0.003	0.841	0.062	-0.034	0.157	-0.101	-0.088
Q27_Rev	0.103	0.226	-0.187	0.830	-0.050	0.014	-0.055
Q28	0.157	-0.106	0.841	0.098	0.075	-0.051	0.072
Q29	0.045	0.038	0.861	-0.047	0.000	-0.107	-0.132
Q30	0.070	0.060	0.826	0.017	0.030	0.077	0.076
Q32	0.676	0.485	-0.033	-0.083	-0.001	0.068	0.259
Q33	0.798	-0.059	0.113	0.036	-0.036	0.063	0.035
Q34	0.631	0.040	0.256	0.006	0.267	0.043	-0.235
Q35	-0.063	0.002	-0.040	-0.126	0.092	0.099	0.890
Q36_Rev	-0.114	0.075	-0.091	0.655	0.033	0.304	-0.204
Q37	0.180	-0.218	-0.070	0.036	0.028	0.817	0.007
Q38	0.327	0.613	0.057	0.153	0.033	0.073	-0.026
Q39	-0.040	0.437	0.052	0.085	0.020	0.671	0.096
Q40	-0.331	0.292	0.580	-0.058	-0.108	0.562	0.061
Q41	-0.071	0.871	-0.018	0.054	-0.008	0.069	0.049

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 14 iterations.

The transformational leadership constructs were subsequently changed to encompass seven latent factors, formulated namely as idealized influence, encouraging challenge, directed teamwork, guided potential, motivational learning, individualised consideration and professional distancing as interpreted by the data. The survey questions related to these factor structures of the relative constructs of situational- and transformational leadership are grouped accordingly in the table in Annexure 3.

Again, an investigation was conducted to assess the reliability of these revised transformational leadership theory constructs. The reliability of all the constructs' multi-variable scale was found to range from acceptable to perfect, with Cronbach Alpha values ranging from the acceptable 0.688 to the perfect 0.902, as shown in Table 14 to 19.

Table 14: Transformational Theory 'Idealised Influence' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.896	0.904	5

Table 15: Transformational Theory 'Encouraging Challenge' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.851	0.857	4

Table 16: Transformational Theory 'Directed Teamwork' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.868	0.872	3

Table 17: Transformational Theory 'Guided Potential' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.710	0.716	4

Table 18: Transformational Theory 'Motivational Learning' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.902	0.904	5

Table 19: Transformational Theory 'Individualised Consideration' Construct Reliability Analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.688	0.693	3

To assess the links between production success and transformational leadership further, another correlation analysis was performed using the revised latent factor structures of transformational leadership.

This correlation analysis indicated statistical significant associations from the transformational leadership constructs of idealised influence, encouraging challenge, directed teamwork, motivational learning and individualised consideration, nonetheless all the novel variables derived from latent structure of the transformational leadership construct variables resulted in weak correlations with production performance, as can be seen in Table 20.

Table 20: Revised Transformational Leadership Constructs Correlation to Productivity

Correlations

		Production	Idealized Influence	Encouraging Challenge	Directed Teamwork	Guided Potential	Motivational Learning	Individualized Consideration	Professional Distancing
Spearman's rho	Production	1.000	0.147	0.222	0.144	-0.014	0.116	0.062	-0.243
	Idealized Influence	0.147	1.000	.771**	.577**	0.171	.631**	.596**	-0.027
	Encouraging Challenge	0.222	.771**	1.000	.624**	0.197	.703**	.555**	-0.132
	Directed Teamwork	0.144	.577**	.624**	1.000	.286*	.655**	.590**	-0.172
	Guided Potential	-0.014	0.171	0.197	.286*	1.000	.285*	.323*	-0.083
	Motivational Learning	0.116	.631**	.703**	.655**	.285*	1.000	.454**	-0.130
	Individualized Consideration	0.062	.596**	.555**	.590**	.323*	.454**	1.000	-0.026
	Professional Distancing	-0.243	-0.027	-0.132	-0.172	-0.083	-0.130	-0.026	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

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

Linear Regression Analysis

An initial linear regression analysis was conducted on the consolidated variables of the a priori situational theory construct and the consolidated variables of the a priori transformational theory construct. The independent factors were used to predict the dependent variable of production success. In order to improve the model, the regression analysis was conducted multiple times in an effort to address the primary issue highlighted of significance. Unfortunately, after all attempts the model could not yield a significance level less than 5% as can be seen in Table 21: Linear Regression 1 (a priori) ANOVA output.

Table 21: Linear Regression 1 (a priori) ANOVA output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	775289194.384	6	129214865.731	1.288	.283[b]
	Residual	4415397080.126	44	100349933.639		
	Total	5190686274.510	50			

a. Dependent Variable: Production

b. Predictors: (Constant), Trans_Intelect_Stimulate, Situational_Supporting,

The statistical evidence of the linear regression between the a priori consolidated variables of the a priori situational theory construct and the consolidated variables of the a priori transformational theory construct and production performance did not reach significance and therefore none of these variables predict production success.

Then a second linear regression analysis was employed on the factor analysis situational theory construct consolidated variables and on the factor analysis transformational theory construct consolidated variables as independent variables and production success as the dependent variable. The regression analysis had to be repeated several times to enhance the model with each step to remedy issues identified during the process of parsimony and multi-collinearity.

In the model, four other demographic variables—age, education level, experience, and job description—might have an impact on the dependent variable of production success but only age and experience were included since they comprise ordinal data. The regression was then repeated including these changes.

A significance level of 0.006 or 99.4% or 0.6% error in the model was obtained using the aggregate components of factor analysis situational theory construct consolidated variables and on the factor analysis transformational theory construct consolidated variables as independent variables and production success as the dependent variable, as indicated in Table 22: Linear Regression 2 (factor analysis) ANOVA output.

Table 22: Linear Regression 2 (factor analysis) ANOVA output

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1962948888.158	8	245368611.020	3.193	.006[b]
	Residual	3227737386.352	42	76850890.151		
	Total	5190686274.510	50			

a. Dependent Variable: Production

b. Predictors: (Constant), Q8, Transformational_5, Transformational_3,

As can be seen in Table 23: Linear Regression 2 (factor analysis) model summary output, the R squared and adjusted R square show a significant drop-off, indicating that there is some parsimony in the model and that the model does not have such good cumulative predictability of all the independent variables. The model only predicted 26% of the variability of the production success as can be seen in the adjusted R square.

Table 23: Linear Regression 2 (factor analysis) model summary output

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.615[a]	0.378	0.260	8766.4639	1.459
a. Predictors: (Constant), Q8, Transformational_5,					
b. Dependent Variable: Production					

This is because production success as a measurement of team performance is not as simple, the production performance of the sections is influenced by factors other than just leadership factors, such as geological mining conditions and other external factors, such as the availability of infrastructure. The studies of Nguyen et al. (2020) found that leadership was but one among work environment, organisational culture and job performance that influence employee performance. Huang and Liden (2011) found that team size, experience levels, and cultural diversity have an impact on effectiveness of different leadership styles.

The Durbin-Watson statistic in Table 23: Linear Regression 2 (factor analysis) model summary output indicates the model is slightly time-dependent, which makes sense since the production wouldn't improve instantly if the leadership efforts improved but would lag slightly, and the output is rather low at 1.459, indicating that at least one of the variables in the model predicts the success of the production.

Since situational theory evolved from transformational theory and shares some of the same concepts in theory, the regression correlation matrix in Table 24: Linear Regression 2 (factor analysis) correlations shows a slight multi-collinearity between situational theory and transformational theory component one at 0.884, indicating that the specific transformational theory component measures similar things as what situational theory measures. The correlations also show a slight multi-collinearity between question one of age and question eight of experience at 0.735, indicating that the specific demographic component measures similar things, which makes sense since experience comes with age.

The correlations between situational- and transformational theory components and the impact on production performance though were all found to be weak correlations, all lower than 0.4 as evident in Table 24: Linear Regression 2 (factor analysis) correlations.

This result was unexpected, as neither the a priori nor factor analyses of situational and transformational theory constructs and their associated consolidated variables yielded sufficient evidence to support a relationship between any of them and production performance, as determined by the linear regression analyses.

Table 24: Linear Regression 2 (factor analysis) correlations

Correlations										
		Production	Situational_1	Transformational_1	Transformational_2	Transformational_3	Transformational_4	Transformational_5	Q1	Q8
Pearson Correlation	Production	1.000	0.222	0.114	0.319	0.246	0.284	-0.346	-0.023	0.012
	Situational_1	0.222	1.000	0.884	0.576	0.379	0.614	0.129	0.126	0.142
	Transformational_1	0.114	0.884	1.000	0.420	0.334	0.470	0.108	0.071	0.180
	Transformational_2	0.319	0.576	0.420	1.000	0.354	0.553	0.312	0.197	0.152
	Transformational_3	0.246	0.379	0.334	0.354	1.000	0.457	0.117	-0.156	-0.066
	Transformational_4	0.284	0.614	0.470	0.553	0.457	1.000	0.254	0.187	0.256
	Transformational_5	-0.346	0.129	0.108	0.312	0.117	0.254	1.000	0.106	0.021
	Q1	-0.023	0.126	0.071	0.197	-0.156	0.187	0.106	1.000	0.735
	Q8	0.012	0.142	0.180	0.152	-0.066	0.256	0.021	0.735	1.000
Sig. (1-tailed)	Production		0.058	0.214	0.011	0.041	0.022	0.006	0.437	0.468
	Situational_1	0.058		0.000	0.000	0.003	0.000	0.183	0.189	0.160
	Transformational_1	0.214	0.000		0.001	0.008	0.000	0.224	0.309	0.103
	Transformational_2	0.011	0.000	0.001		0.005	0.000	0.013	0.083	0.143
	Transformational_3	0.041	0.003	0.008	0.005		0.000	0.206	0.138	0.322
	Transformational_4	0.022	0.000	0.000	0.000	0.000		0.036	0.094	0.035
	Transformational_5	0.006	0.183	0.224	0.013	0.206	0.036		0.230	0.443
	Q1	0.437	0.189	0.309	0.083	0.138	0.094	0.230		0.000
	Q8	0.468	0.160	0.103	0.143	0.322	0.035	0.443	0.000	
N	Production	51	51	51	51	51	51	51	51	51
	Situational_1	51	51	51	51	51	51	51	51	51
	Transformational_1	51	51	51	51	51	51	51	51	51
	Transformational_2	51	51	51	51	51	51	51	51	51
	Transformational_3	51	51	51	51	51	51	51	51	51
	Transformational_4	51	51	51	51	51	51	51	51	51
	Transformational_5	51	51	51	51	51	51	51	51	51
	Q1	51	51	51	51	51	51	51	51	51
	Q8	51	51	51	51	51	51	51	51	51

Analysis of Research Questions

The research questions and associated hypotheses of the effect situational- or transformational leadership have on productivity as a measure of overall team performance in underground coal mining's analysis by means of correlation analysis based on a priori of the literature, aggregated into situational- and transformational theory components as variables and production success was found to be insignificant, even after multiple attempts to improve the model and the degree of fit. Factor analysis as the exploratory technique demanded subjective judgements, which can be problematic because conflicts over interpretations may occur due to variable subjectivity.

The correlation studies and regression analysis surprisingly found no evidence that any of the key components of situational- or transformational leadership theory, whether in a priori fashion or the exploratory factors, were related with higher production success, refuting the premise that situational- or transformational leadership theory and style would lead to more successful teams. Instead, the nil hypothesis was supported, which suggested that neither situational- or transformational leadership theory and style would lead to improved team performance.

This study investigated the relationship between situational and transformational leadership theories and their impact on mining production success. While there was no clear significant correlated association between leadership theories and production success, there was a considerable correlation between situational and transformational leadership constructs, showing some similarities in their emphasis on leadership characteristics.

Hypotheses Testing

The claim that supervisors who adopt situational leadership theory and style enhance the productivity of their teams in underground coal mining in South Africa

was not supported by enough statistical evidence, thereby failing to reject the null hypothesis.

The study also found insufficient evidence to reject the null hypothesis that supervisors who utilise the transformational leadership theory and style do not enhance the performance of their teams.

DISCUSSION

Outline of the Results

The sample size of the respondents could have had a restrictive effect that the associations between the leadership factors and productivity measured that appear weak and restrict the finding' generalizability.

The respondents' level of experience in their current positions, with 47% of the population having less than 10 years' experience, could have influenced their responses because their leadership abilities may not be fully developed, although the average age of the respondents were in the range of 40 to 49 years of age. This is exacerbated by the very small sample size that may limit the findings' generalizability.

As far as having a biased sample, the supervisors who responded to the survey was not representative of the demographic makeup of the South African population. This may affect the survey results in the sense that these supervisors would answer the questions from the viewpoint of where they fit into the different parts of society and perceive their leadership role in society as well as how leadership is applied in these different parts of society.

One should acknowledge that other elements, apart from leadership, have an impact on the performance of production. The elements that influence employee performance was identified in a study by Nguyen et al., (2020) which found that leadership was but one among work environment, organisational culture, and job performance. This was supported by a study by Diamantidis and Chatzoglou, (2018) which found deficiency of supervisory support and in turn harms employee motivation. Huang and Liden (2011) discovered that team size, experience levels, and cultural diversity have an impact on effectiveness of different leadership styles.

The aspects include geological mining conditions as the work environment within which each section is operating, equipment reliability of different types of equipment employed in each section, team dynamics such as team motivation of each

individual team and the effectiveness of the existing bonus systems in place to motivate these teams, team cohesion and teamwork which is affected by the fact that the team is divided over two shifts for each production section, support services for the production sections such as power, water and ventilation supply. These aspects were not assessed as part of this research.

The findings of this study provide important insights into the relationship between leadership philosophies and mining production success in that it was surprising to find no direct meaningful association between situational and transformational leadership and production success. The significant association between the two leadership theories, on the other hand, suggest that they may share certain fundamental characteristics that drive team effectiveness. This aligns with the findings of the literature study, which indicate that certain interconnected issues are associated with several constructs (Sims Jr. et al., 2009).

Spearman’s correlation’s low associations underline the complexities of mining production success. It is influenced by a variety of external elements, including geological conditions, equipment reliability, power, water and ventilation supply which are beyond supervisors' direct control. This implies that, while leadership is important, other contextual factors also have a substantial impact on output outcomes. These findings align with the research conducted by Nguyen et al. (2020), which suggests that leadership is just one of several elements that impact employee performance. Other aspects include motivation, work environment, organisational culture, job achievement, competence, and compensation, among others.

The outcome of this study therefore could not gain sufficient evidence to support the appeal of situational theory as a means of motivating subordinates and increase productivity in the mining industry as indicated by the research of Manyuchi and Sukdeo (2021). Furthermore, this study was incapable of acquiring adequate proof to support the study of Schaubroeck et al. (2007) that transformational leadership is connected to improved team performance suggesting the moderation of the supervisors’ group beliefs on the teams’ effectiveness.

The implications for mining firms are not as clear as one would have hoped but augmenting leadership development programs as well as productivity improvement training for first line supervisors should not be neglected to increase team performance as highlighted by these leadership theories in itself as well as the other factors classified in company and environmental factors, employee factors and job related factors as identified by Diamantidis and Chatzoglou (2018).

To fully understand the impact of leadership on production success and maximize leadership strategies for success in the coal mining sector, a comprehensive awareness of contextual elements and a more rigorous research strategy are required for future research with more consideration of the research conducted by Diamantidis and Chatzoglou (2018) on employee evaluation, Nguyen et al. (2020) on employee performance, and Hackman and Wageman (20025) on team effectiveness.

While this study did not fully address the highlighted research gaps, it does contribute to the existing body of research on situational, transformational, and team productivity in that it confirmed that the identified constructs in existing literature for situational and transformational approaches are not the only factors to consider when analysing its effect on team performance. One need to take the other factors into account as was identified in several other studies by Nguyen et al. (2020), Diamantidis and Chatzoglou (2018), Skogstad et al. (2007) and Huang and Linden (2011).

Practical Implications

The contribution of this study therefore enhances the results of research in the field of situational and transformational leadership theory application and its effect on team performance in the South African coal mining sector by contributing to the body of research confirming that team performance is more complex than just being affected by leadership factors.

The broad impact on the South African coal mining industry as well as the knowledge that human resources managers can use to improve their training

programmes for supervisory level production personnel are some of the implications of this applied research to advance knowledge around a practical issue or solving a real-life problem. Future research should include other factors that impact on the production success of underground coal mining section teams. These should include measures such as geological mining conditions, equipment reliability, team motivation and reward, team cohesion and power-, water- and ventilation supply availability. These can be classed into company or environment factors, job related factors and employee related factors as proposed by Diamantidis and Chatzoglou's (2018) in their employee evaluation model.

Training and coaching of supervisors can be aligned with the objectives of the company to enhance impacts of the leadership traits employed by the first-line supervisors within Blue Mining Services.

The study was not able to determine the relationship of situational and transformational theory components on production success for Blue Mining Services. But mining supervisors should still be coached and developed to improve those skills while monitoring the success of production in future, to positively impact business success.

The current company short term and medium term bonus system for supervisors is the exactly the same as that for operator level employees which is only based upon whether or not the target is achieved. This should be reviewed to include more of the key performance indicators classed into environmental factors, job related factors and employee related factors as proposed by Diamantidis and Chatzoglou's (2018) employee evaluation model.

Recommendations

Due to the small sample size (only seventeen beltsmen, miners, and craftsmen responded), a correlation analysis to examine the impact of leadership theory and style on team members' perceptions of positive influences on team performance was not possible. To draw significant conclusions from this question, a bigger sample size would be required.

The results were also not representative according to South African demographics for the supervisors who participated in the study. Therefore, future research should expand the population size to a more representative sample of the whole sector with all the mining houses and mines represented. To support claims against the results in a quantitative research strategy, the population data set's confidence interval needs to be enhanced. For a more thorough study, future studies should focus on supervisors as well as a larger population of non-supervisory level participants to get a perspective on how team members experience certain leadership theories.

By the scientific method, when the results do not support the hypothesis, the experimental data now serves as a guideline for subsequent studies. As a result, future research should be improved to consider a better comprehension of how to evaluate the influence of leadership on the outcomes of the organisation and the other factors influencing production outputs apart from just people factors. To isolate the leadership strategy more effectively, all the factors that affect production performance should be measured, such as the geological mining conditions under which these sections operate, equipment reliability issues like supplier proficiency, infrastructure reliability, and the type and size of equipment used.

Mining companies should prioritize implementing leadership development programs for their supervisors. These programs can assist supervisors in developing the skills required to motivate their employees and foster a healthy work environment.

To assist supervisors in strengthening their leadership skills, regular performance feedback and coaching sessions should be implemented. Constructive input and coaching on how to effectively utilize leadership components in daily interactions with team members can benefit supervisors.

Beyond leadership, organizations should do detailed evaluations of contextual aspects that influence production success. When evaluating team performance, geological mining conditions, equipment reliability, team shift system employed, team motivation by means of monetary reward in the existing bonus systems, team

cohesion and teamwork, and infrastructural availability should all be considered. Understanding these contextual variables will assist firms in setting realistic production targets and avoiding blaming success or failure only on leadership.

Studies that track production success over time can provide important insight into the long-term impact of leadership actions. This technique will aid in determining the long-term viability of leadership development activities as well as the long-term effects on team performance.

Organizations should perform employee perception surveys in addition to quantitative data to assess team members' experiences with their supervisors' leadership styles. Understanding how members of a team perceive leadership influences on team performance can provide a more complete picture of leadership effectiveness.

Ethical leadership should be addressed in leadership development programs. Supervisors should be taught in ethical decision-making and developing an integrity culture among their teams. Ethical leadership can have a good impact on team dynamics and help a business achieve long-term success.

Blue Mining Services should revise the supervisor level short term and medium term bonus system to include specific environmental, job related and employee related key performance indicators to drive the right behaviours amongst their first line supervisors.

Finally, good leadership is critical to generating production success in the mining business. Mining firms may maximize leadership tactics and build a culture of success and collaboration among their employees by adopting situational- and transformational leadership development programs, taking contextual considerations into account, and engaging in continuous improvement activities.

CONCLUSION

As leadership theory evolves the understanding of how these impacts the organisation to drive the correct behaviour was once again affected in this study.

None of the leadership theories' elements could be ascribed to the company's production outputs. To enhance supervisors' talents and have an impact on the bottom-line outcomes of the company, junior management members should be able to learn all of these leadership factors and cement these through coaching and remuneration of the right behaviours.

Since the variables about situational- and transformational leadership were factored in completely unrelated ways, the research could not support what the basis of leadership literature suggested but does agree with what the team performance and productivity literature suggested.

The relationship of situational- and transformation theory components on production success for Blue Mining Services could not be determined but can be used to positively impact business success when mining supervisors are coached and developed to improve those skills while monitoring production success in the future. The focus however should be moved to coaching and development of productivity improvement and team dynamics and performance.

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ANNEXURE 1 - Research Survey Questionnaire

Leadership Theory	**Leaders/ Supervisors**
Demographical and team performance information	1. What is your current age? 2. What gender do you identify most as? 3. What is your ethnicity? 4. What is you highest level of education? 5. What is your home language? 6. Which operation are you situated at? 7. In what position are you currently employed? 8. What is your experience at your current level of employment? 9. What is your production target per section per month? 10. What is the actual production achieved per month?
Situational Theory Transformational Theory Reversed questions	1. I inspire my subordinates to achieve company targets through effective leadership, which increases employee productivity. 2. I motivate my subordinates to look beyond their own self-interest and perceptions of their own limits to achieve common goals. 3. I help subordinates to realize and develop their potential.

	4. I want my subordinates to regard challenges as opportunities and cooperate with them to elevate expectations, needs, abilities, and moral character. 5. I allow employees to participate in learning opportunities and give them challenging assignments so that they can explore their potential and put their skills to the test. 6. I influence my subordinates with situational leadership behaviours. 7. I delegate assignments to subordinates to provide learning opportunities and coach them if they need it. 8. I adapt my leadership style to different organizational situations. 9. I mobilise my subordinates around a common purpose, mission or vision and provide a sense of purpose and future direction. 10. I adopt the appropriate leadership style based on what the task demands. 11. I act as role model for my subordinates and encourage them to question problems that underlie basic assumptions from different perspectives. 12. I assist subordinates in achieving their objectives by serving as a role model, stimulating them to conduct analysis, demonstrating compassion for them as individuals, and fostering teamwork. 13. I am less prone to empower others when subordinates are less experienced and the task is very important. 14. My subordinates identify, admire and have deep respect for me. 15. I instil respect for my authority while also paying attention to the demands and suggestions of my subordinates.

	16. I set high standards and challenging goals for my subordinates. 17. I set lofty collective goals for my subordinates and urge them to accept them. 18. I establish and set well-defined goals that the workforce can understand and support. 19. I encourage the establishment of shared values through socialisation and rewards. 20. I support the members in the work teams when members are mutually dependent in pursuing task objectives to improve group potency. 21. I empower others when I want to develop my subordinate's skills and experiences. 22. My interactions with subordinates shape the level and nature of support. 23. I reward teams formally and informally for their teamwork. 24. I promote subordinate respect and compliance. 25. I keep some distance from my subordinates. 26. I clarify the link between an employee's job and the company's mission. 27. I reward staff when they are deserving, rather than just "managing by exception." 28. I provide feedback timely, constructive, and balanced. 29. I hone my skills by giving each of my subordinate's particular attention, keeping them intellectually stimulated and fostering inventiveness. 30. I give employees the impression that there are prospects for advancement. 31. I try to create an environment that encourages growth and development.

ANNEXURE 2 - Research Survey Questions A Priori Constructs

Situational Leadership Theory Constructs (Munyuchi & Sukdeo, 2021)

Directing	16. I influence my subordinates with situational leadership behaviours (Munyuchi & Sukdeo, 2021). 18. I adapt my leadership style to different organizational situations (Sims Jr. et al., 2009).
Coaching	31. I empower others when I want to develop my subordinate's skills and experiences (Sims Jr. et al., 2009).
Supporting	11. I inspire my subordinates to achieve company targets through effective leadership, which increases employee productivity (Munyuchi & Sukdeo, 2021). 23. I am less prone to empower others when subordinates are less experienced and the task is very important (Sims Jr. et al., 2009).
Delegating	20. I adopt the appropriate leadership style based on what the task demands (Sims Jr. et al., 2009).

Transformational Theory Constructs (Khan et al., 2017) and (Bass & Avolio, 1997)

Individualised Consideration	13. I help subordinates to realize and develop their potential (Khan et al., 2017). 17. I delegate assignments to subordinates to provide learning opportunities and coach them if they need it (Khan et al., 2017). 28. I establish and set well-defined goals that the workforce can understand and support (Bezuidenhout & Schultz, 2013). 30. I support the members in the work teams when members are mutually dependent in pursuing task objectives to improve group potency (Schaubroeck et al, 2007). 32. My interactions with subordinates shape the level and nature of support (Bezuidenhout & Schultz, 2013). 37. I reward staff when they are deserving, rather than just "managing by exception" (Bezuidenhout & Schultz, 2013). 38. I provide feedback timely, constructive, and balanced (Bezuidenhout & Schultz, 2013). 39. I hone my skills by giving each of my subordinate's particular attention, keeping them intellectually stimulated and fostering inventiveness (Bezuidenhout & Schultz, 2013).
Inspirational Motivation	12. I motivate my subordinates to look beyond their own self-interest and perceptions of their own limits to achieve common goals (Khan et al., 2017). 19. I mobilise my subordinates around a common purpose, mission or vision and provide a sense of purpose and future direction (Bass & Avolio, 1997).

	29. I encourage the establishment of shared values through socialisation and rewards (Bezuidenhout & Schultz, 2013). 33. I reward teams formally and informally for their teamwork (Schaubroeck et al, 2007). 36. I clarify the link between an employee's job and the company's mission (Bezuidenhout & Schultz, 2013). 40. I give employees the impression that there are prospects for advancement (Bezuidenhout & Schultz, 2013).
Idealised Influence	14. I want my subordinates to regard challenges as opportunities and cooperate with them to elevate expectations, needs, abilities, and moral character (Bass & Avolio, 1997). 21. I act as role model for my subordinates and encourage them to question problems that underlie basic assumptions from different perspectives (Khan et al., 2017). 22. I assist subordinates in achieving their objectives by serving as a role model, stimulating them to conduct analysis, demonstrating compassion for them as individuals, and fostering teamwork (Schaubroeck et al, 2007). 24. My subordinates identify, admire and have deep respect for me (Schaubroeck et al, 2007). 25. I instil respect for my authority while also paying attention to the demands and suggestions of my subordinates (Schaubroeck et al, 2007). 34. I promote subordinate respect and compliance (Schaubroeck et al, 2007). 35. I keep some distance from my subordinates (Schaubroeck et al, 2007).

Intellectual Stimulation	15. I allow employees to participate in learning opportunities and give them challenging assignments so that they can explore their potential and put their skills to the test (Bezuidenhout & Schultz, 2013). 26. I set high standards and challenging goals for my subordinates (Bezuidenhout & Schultz, 2013). 27. I set lofty collective goals for my subordinates and urge them to accept them (Schaubroeck et al, 2007). 41. I try to create an environment that encourages growth and development (Bezuidenhout & Schultz, 2013).

ANNEXURE 3 - Research Survey Questions Factor Analysis Constructs

Situational Leadership Theory Constructs (Exploratory Factor analysis)

Participative influence	11. I inspire my subordinates to achieve company targets through effective leadership, which increases employee productivity. 16. I influence my subordinates with situational leadership behaviours. 18. I adapt my leadership style to different organizational situations. 20. I adopt the appropriate leadership style based on what the task demands.
Empowerment	23. I am less prone to empower others when subordinates are less experienced and the task is very important. 31. I empower others when I want to develop my subordinate's skills and experiences.

Transformational Theory Constructs (Exploratory Factor Analysis)

Idealised Influence	21. I act as role model for my subordinates and encourage them to question problems that underlie basic assumptions from different perspectives. 22. I assist subordinates in achieving their objectives by serving as a role model, stimulating them to conduct analysis, demonstrating compassion for them as individuals, and fostering teamwork. 32. My interactions with subordinates shape the level and nature of support. 33. I reward teams formally and informally for their teamwork. 34. I promote subordinate respect and compliance.
Encouraging challenge	25. I instil respect for my authority while also paying attention to the demands and suggestions of my subordinates. 26. I set high standards and challenging goals for my subordinates. 38. I provide feedback timely, constructive, and balanced. 41. I try to create an environment that encourages growth and development.
Directed teamwork	28. I establish and set well-defined goals that the workforce can understand and support. 29. I encourage the establishment of shared values through socialisation and rewards. 30. I support the members in the work teams when members are mutually dependent in pursuing task objectives to improve group potency.

Guided potential	13. I help subordinates to realize and develop their potential. 24. My subordinates identify, admire and have deep respect for me. 27. I set lofty collective goals for my subordinates and urge them to accept them. 36. I clarify the link between an employee's job and the company's mission.
Motivational learning	12. I motivate my subordinates to look beyond their own self-interest and perceptions of their own limits to achieve common goals. 14. I want my subordinates to regard challenges as opportunities and cooperate with them to elevate expectations, needs, abilities, and moral character. 15. I allow employees to participate in learning opportunities and give them challenging assignments so that they can explore their potential and put their skills to the test. 17. I delegate assignments to subordinates to provide learning opportunities and coach them if they need it. 19. I mobilise my subordinates around a common purpose, mission or vision and provide a sense of purpose and future direction.
Individualised consideration	37. I reward staff when they are deserving, rather than just "managing by exception." 39. I hone my skills by giving each of my subordinate's particular attention, keeping them intellectually stimulated and fostering inventiveness. 40. I give employees the impression that there are prospects for advancement.

Professional distancing	35. I keep some distance from my subordinates.