

Transformational Leadership and Its Effects on Human Resource Practices and Organisational Performance in South Africa's Mining Sector

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Abstract: South Africa's mining companies face increasing pressure to enhance productivity, ensure worker safety, and fulfil stakeholder expectations regarding environmental, social, and governance (ESG) accountability. Transformational leadership (TL) is increasingly employed as a strategic response; however, a significant gap remains in understanding the mechanisms through which TL translates into measurable organisational performance (OP) via integrated human resource (HR) systems. This study investigates the direct impact of TL on OP and the mediating contributions of talent development management (TDM), work-life balance (WLB), succession planning (SP), and employee involvement (EI). A cross-sectional, quantitative survey collected data from managers and front-line employees across underground and open-pit mining operations. Validated instruments were analysed using partial least squares structural equation modelling (PLS-SEM) with 5,000-sample bootstrapping to assess reliability, validity, and predictive relevance. TL demonstrated a strong, positive direct relationship with OP ($\beta = 0.236$, $p < 0.001$). TDM was the only significant mediator, confirming complementary

mediation (indirect $\beta = 0.050$, $p = 0.003$); WLB, SP, and EI yielded non-significant mediation effects, and EI showed no direct effect on OP. Mining executives and HR leaders should invest in structured talent development systems aligned with transformational leadership behaviours to translate leadership capability into performance gains. Longitudinal designs are recommended to establish causal pathways and explore context-specific processes beyond TDM. By testing four concurrent HR practice mediators, this study extends contingency-based leadership theory and the resource-based view (RBV) of HRM bundles, showing that leadership operates through a singular developmental pathway (TDM) rather than a uniform HR bundle.

Keywords: Human resource practices, mining industries, organisational performance, transformational leadership, theories.

1. Introduction

Transformational leadership (TL) has regained considerable strategic relevance as South Africa's mining companies confront intensifying pressures to enhance productivity, safeguard worker health, and satisfy stakeholder expectations for environmental, social, and governance (ESG) accountability. As one of the country's most significant contributors to export revenues, formal employment, and rural livelihoods, the quality of leadership within the mining sector remains directly tied to both economic stability and inclusive development outcomes (Guler et al., 2024; Nala, 2024). Against this backdrop, TL is characterised in the literature on leadership and strategic human resource management (HRM) (Northouse, 2021; Bass & Riggio, 2006; Banks et al., 2016) as a strategic capability that can motivate individuals to exceed standard performance expectations, stimulate innovation, and cultivate a values-driven culture across operations that are geographically dispersed and capital-intensive (Northouse, 2021; Bass & Riggio, 2006).

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A growing body of empirical evidence confirms that TL exerts a positive, medium-to-large effect on key organisational performance indicators – including safety metrics, productivity, financial returns, and employee engagement – across diverse industries and national contexts (Banks et al., 2016; Li, 2024; Udin, 2023). Recent systematic reviews and meta-analyses indicate that these advantages extend to emerging markets, where intellectual stimulation and individualised consideration prove particularly potent in resource-poor, high-risk environments (Guler et al., 2024; Hidayah, 2025). Within the South African mining sector specifically, Nala (2024) demonstrates that TL significantly enhances both operational efficiency and employee satisfaction, underscoring the need for deeper empirical inquiry.

Despite this encouraging body of research, studies that incorporate HR practices typically model them individually rather than as the integrated HR architecture through which leadership behaviours take effect. Research in the mining sector, in particular, tends to investigate a single HR intervention at a time – whether ad hoc talent initiatives or flexible working arrangements – without exploring how these practices function collectively within the leadership–performance dynamic (Mashaba & Botha, 2024; Dhanpat et al., 2020). Consequently, the nuanced pathways through which TL connects to performance via systematic HR configurations remain poorly understood. Modelling mediators concurrently is methodologically distinct from testing them in isolation: a concurrent specification partials out the shared variance among talent development management (TDM), work-life balance (WLB), strategic planning (SP), and employee involvement (EI), isolating the unique mediating contribution of each pathway and revealing which practice transmits leadership effects once the others are held constant – an inference that sequential single-mediator designs cannot support.

Four interrelated research gaps consequently emerge from this review. First, there is a scarcity of studies that simultaneously examine the TL–performance relationship in mining through the lenses of talent development management, work-life balance, succession planning, and employee involvement as concurrent mediators. Second, a significant proportion of existing research relies on cross-sectional designs, which complicate causal inference. Third, rigorous empirical data from South African mines – characterised by distinctive labour relations histories, deep-level operations, and intensive ESG monitoring – remain scarce (Guler et al., 2024; Nala, 2024). Fourth, context-sensitive human resource (HR) indicators that reflect the sector’s actual operating realities, such as community-linked succession pipelines and shift-pattern flexibility, are seldom employed in research (Hidayah, 2025). Importantly, the gap addressed here is not the absence of TL research in South African mining – several studies have examined TL and HR practices in this context (Guler et al., 2024; Nala, 2024; Mashaba & Botha, 2024) – but rather the lack of an integrated test of how multiple HR practices operate together as concurrent mediating mechanisms. The specific novel contribution of this study is, therefore, the configuration of talent development management, work-life balance, succession planning, and employee involvement as simultaneous mediators within a single structural model, which facilitates the comparison of their relative mediating strengths rather than making assumptions.

This study aims to address these gaps by investigating the impact of TL on organisational performance in South Africa’s mining sector through four critical domains of HR practice: talent development management, work-life balance, succession planning, and employee involvement. The specific objectives are to: (a) evaluate the direct effect of TL on organisational performance; (b) examine the indirect effects of each HR practice mediator individually; and (c) assess the combined mediating strength of the HR practice bundle using partial least squares structural equation modelling (PLS-SEM) on firm-level and employee-level data.

The study contributes to the broader TL literature by demonstrating how leadership behaviours shape performance outcomes through configurations of HR practices, thereby advancing the

resource-based view of HRM bundles and enriching contingency-based leadership theory. Practically, it provides HR directors and mining executives with evidence-based guidance on designing integrated people-management systems that enhance the performance benefits of transformational leadership while simultaneously promoting employee wellbeing and long-term organisational sustainability. The practical stakes are considerable. Mining firms allocate limited HR budgets across competing initiatives for talent, wellness, succession, and involvement, often under the assumption that each contributes equally to performance through leadership. By identifying which pathways effectively transmit leadership effects, mining executives can make informed resource-allocation decisions—directing scarce development expenditure toward the mechanisms that demonstrably convert leadership capability into measurable output, rather than funding programmes that do not mediate the leadership–performance link in this context.

2. Literature Review

This section reviews the scholarly literature underpinning the study, beginning with the theoretical foundation that links transformational leadership to organisational performance. It then examines the empirical evidence on each of the four human resource practices treated here as mediating mechanisms.

2.1 Theoretical foundation

The theoretical architecture of this study is grounded in Transformational Leadership Theory (Burns, 1978; Bass, 1985) and the resource-based view (RBV) of strategic human resource management (HRM). Transformational Leadership Theory posits that leaders who demonstrate the four canonical behaviours—idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration—can motivate followers to exceed performance expectations and align their efforts with organisational objectives (Bass & Riggio, 2006; Northouse, 2021).

In the high-risk, strategically complex context of South African mining, this type of leadership is particularly pertinent. While transactional leadership emphasises task completion through contingent reward and management by exception, and servant leadership focuses on follower wellbeing, transformational leadership concurrently addresses safety culture, employee morale, and organisational innovation—all of which are critical to the sustainability of mining operations (Chinomona & Sandada, 2021; Ramutsheli & Scholtz, 2020). The theory further elucidates the pathways through which TL activates mediating HR strategies such as talent development, work-life balance, succession planning, and employee involvement, each of which subsequently enhances OP.

The resource-based view complements this framework by conceptualising skilled human capital, high-commitment HR systems, and leadership competencies as rare, valuable, and imperfectly imitable resources that generate sustained competitive advantage (Barney, 2021; Barney & Hesterly, 2019). When transformational leaders cultivate internal talent pipelines, promote healthy working conditions, plan for leadership continuity, and encourage authentic employee participation, they effectively construct and deploy HR-based resources that are challenging for competitors to replicate. The two perspectives are complementary rather than parallel. Transformational Leadership Theory elucidates the behavioural mechanisms—idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration—through which leaders establish the conditions for developing rare, valuable, and imperfectly imitable human capital. The RBV, in turn, clarifies why these leadership-driven HR systems produce sustained rather than ephemeral advantages: because the resultant capabilities are causally ambiguous and socially complex, competitors cannot easily emulate them. In summary, transformational leadership provides the antecedent process, while the RBV offers the outcome logic, establishing a single causal chain in which leadership generates the very resources that confer competitive advantage. Collectively, these two theoretical lenses present

a robust framework for analysing and cultivating leadership-driven HR systems that yield long-term performance dividends within South Africa's mining sector.

2.2 Empirical literature review

This subsection reviews recent empirical studies on transformational leadership and on each of the four human resource practices examined in this study. The evidence is appraised critically to identify consistent findings, contradictions, and the contextual gaps that this study addresses.

2.2.1 Transformational leadership (TL)

TL is widely recognised as a leadership paradigm that inspires, challenges, and individually supports followers to work towards organisational objectives that transcend self-interest. Contemporary research confirms that the four dimensions of TL – idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration – are pivotal for building trust, cultivating purpose, spurring innovation, and nurturing employee growth, particularly in high-risk sectors such as mining (Nguyen et al., 2021; Mutonyi et al., 2023). Within the South African mining industry, TL is associated with improved safety compliance, stronger employee engagement, and greater organisational innovation (Moloi & Mokoena, 2022; Guler et al., 2024).

Empirical evidence also indicates that TL is particularly effective in supporting organisational adaptation during disruptions such as commodity price shocks and public health crises, underscoring its strategic utility in volatile environments (Chen et al., 2022; Aboramadan et al., 2020). Organisational culture, leadership training, managerial competence, and emotional intelligence can facilitate the emergence and effectiveness of TL, while simultaneously influencing critical human resource processes such as team cohesion, succession planning, and employee engagement (Tshipala & Mokgolo, 2021; Chinomona & Sandada, 2021). Notably, in crisis contexts or highly unionised environments with strict hierarchical structures, researchers propose hybrid contingency strategies that blend transactional discipline with transformational inspiration (Braun et al., 2021; Ramutsheli & Scholtz, 2020). In a mining context, such blending implies retaining transactional mechanisms – enforcing non-negotiable safety rules, attaching contingent rewards to production and compliance targets, and applying management-by-exception around critical hazard thresholds – while simultaneously layering transformational behaviours such as articulating a shared safety-and-performance vision, coaching shift supervisors, and offering individualised support. In practice, a shift leader might insist on strict adherence to lock-out procedures (transactional) while also framing safety as a collective value and mentoring crew members towards advancement (transformational), so that operational discipline and inspirational engagement operate in tandem rather than in tension. In summary, TL substantially strengthens worker alignment and organisational resilience in the mining sector, although its effectiveness remains contingent on environmental, cultural, and developmental factors. The evidence base is not uniformly positive, however, and warrants critical rather than merely confirmatory examination. Meta-analytical work questions the incremental validity of TL once authentic and transactional leadership are controlled for, suggesting partial construct redundancy (Banks et al., 2016), and destructive leadership research indicates that the same charismatic behaviours can produce dependency and reduced voice under certain conditions (Braun et al., 2021). Boundary conditions are significant: TL effects attenuate in highly unionised, rule-bound, or low-autonomy settings, which is directly relevant to deep-level mining. These inconsistencies indicate that the TL-performance link is conditional rather than universal, and they motivate the present study's focus on the mediating mechanisms and contextual constraints through which TL does or does not translate into performance.

2.2.2 Talent development management (TDM)

Talent Development Management (TDM) constitutes a strategic human resource function that aids organisations – particularly those operating in high-risk, technically demanding sectors – in

identifying, cultivating, and retaining high-potential employees to ensure sustained long-term performance and innovation. Distinct from conventional training methodologies, TDM adopts a proactive and integrated approach that aligns employee development directly with business objectives through planned activities such as mentorship, job rotation, and competency-based learning (Garavan et al., 2021; Thunnissen & Gallardo-Gallardo, 2019). In South Africa's mining sector, where an ageing workforce, regulatory compliance pressures, skills shortages, and historical inequalities converge, TDM emerges as a particularly vital investment (Gallardo-Gallardo et al., 2020; Collings et al., 2019). TDM is a direct lever for addressing these historical inequalities because the Mining Charter and the Broad-Based Black Economic Empowerment (B-BBEE) framework explicitly assess firms on skills development and the advancement of historically disadvantaged South Africans into technical and managerial roles. Structured development pathways—such as learnerships, bursaries, and competency-based progression—therefore serve a dual purpose: they build the internal talent pipeline the sector needs while simultaneously fulfilling transformation obligations. This converts a regulatory compliance requirement into a strategic capability that addresses the racial and gender disparities inherited from the industry's past.

TDM directly enhances productivity, creativity, staff retention, and succession readiness—all of which are essential functions in an industry undergoing transformation due to ESG accountability and rapid technological change (Festing & Schäfer, 2022; Sikora & Ferris, 2014). Transformational leadership is a critical enabler of TDM success, fostering the employee engagement, learning culture, and intrinsic motivation that development programmes necessitate (Nguyen et al., 2021; Chinomona & Sandada, 2021). However, implementation within South African mining remains challenging due to union sensitivities, safety constraints, and underfunded HR systems (Moloi & Mokoena, 2022; Dhanpat et al., 2020). Research gaps persist concerning longitudinal effectiveness, the impact of organised labour on TDM outcomes, and the appropriateness of Western-centric development models within African contexts, indicating fertile territory for future mixed-methods inquiry.

2.2.3 Work-life balance (WLB)

Work-life balance (WLB) refers to an individual's subjective perception of managing professional obligations alongside personal responsibilities in a manner that sustains overall well-being. As Sirgy and Lee (2018) articulate, WLB has evolved into a multidimensional construct encompassing temporal, involvement, and satisfaction dimensions across both work and personal life domains. This is particularly salient in the mining sector, where employees routinely work extended shifts, perform physically demanding tasks, and adhere to rotating schedules that restrict family time (Akanji et al., 2021).

Research consistently demonstrates that effective WLB enhances employee engagement, job satisfaction, and productivity while simultaneously reducing burnout, absenteeism, and voluntary turnover (Ahmed et al., 2021; Kelliher et al., 2019). TL has been identified as a reliable antecedent of positive WLB perceptions, even in demanding operational settings, through individualised consideration and empathetic support (Nguyen et al., 2021). Flexible work scheduling and participatory autonomy also contribute to WLB; however, in mining contexts, these enablers are often constrained by operational and safety imperatives (Berkery et al., 2017). Underground operations are widely expected to impose more adverse work-life conditions than open-cast settings—attributable to longer travel-to-face times, confined working environments, and rotating deep-level shifts—although this contrast has not been firmly established empirically and is therefore treated here as a hypothesis to be examined rather than a settled finding. Deeply embedded masculine norms frequently impede male employees from disclosing WLB-related difficulties (Gallardo-Gallardo et al., 2020; Bakker & Demerouti, 2017). Longitudinal and mixed-methods studies that disaggregate findings by gender and mining type remain scarce, representing an important direction for future research.

2.2.4 Succession planning (SP)

Succession planning (SP) has emerged as a strategically significant process within high-risk industries, where the concurrent demands for technical expertise and senior leadership capabilities render leadership continuity a crucial performance lever (Dhanpat et al., 2020; Festing & Schäfer, 2022). Initially limited to executive appointments, SP has evolved into a comprehensive procedure that identifies, nurtures, and prepares internal talent through structured mentoring, coaching, and leadership development initiatives (Collings et al., 2019; Vaiman et al., 2015). In the context of South Africa, SP intersects with broader socio-political objectives, including Black Economic Empowerment and Employment Equity, thereby creating obligations to cultivate historically disadvantaged talent streams (Pooe & du Toit, 2022; Khuzwayo & Kahn, 2023). Specifically, the management-control and skills-development targets associated with the Broad-Based Black Economic Empowerment (B-BBEE) framework require mining firms to demonstrate measurable progress in positioning Black South Africans, particularly Black women, in senior and middle-management roles, with scorecard points and implications for licence-to-operate contingent upon performance. This paradigm shift transforms succession planning from a discretionary exercise aimed at ensuring leadership continuity into a regulated equity instrument: succession pools must be deliberately constructed to accelerate the upward mobility of historically excluded groups, and the identification of "high-potential" candidates is constrained by transformation targets rather than determined solely by tenure or technical seniority. Succession planning in this context, therefore, carries a dual mandate – securing operational continuity while advancing demographic representativity – which can both enhance its strategic significance and complicate its implementation when the available internal pipeline does not yet reflect the targeted profile.

Effective SP is associated with organisational continuity, superior performance outcomes, and stronger employee retention, as employees who perceive credible career advancement pathways demonstrate higher levels of commitment (Dhanpat et al., 2020; Kim, 2020). However, its effectiveness depends heavily on cultural alignment, integration of HR processes, and the leadership style of senior managers, with TL shown to foster the trust and developmental orientation that robust SP systems require (Chinomona, 2020; Afsar & Umrani, 2020). Mining-specific constraints – including geographic remoteness, high union density, and acute technical skills shortages – further complicate the implementation of SP (Nguyen et al., 2021; Mutonyi et al., 2023). Future research should employ longitudinal designs and contextualise SP models within African social and political dynamics to generate more practically actionable insights.

2.2.5 Employee involvement (EI)

Employee involvement (EI) refers to the extent to which employees actively partake in decision-making processes, thereby cultivating a sense of ownership and psychological connection to organisational outcomes. Contemporary evidence substantiates that EI can enhance motivation, innovation, job satisfaction, and job performance, particularly in high-risk environments such as mining (Caniëls et al., 2019; Li et al., 2021). When implemented effectively, EI also bolsters organisational citizenship behaviours and reinforces safety culture through shared accountability and informed participatory decision-making (Zondi & Van der Merwe, 2021; Musonda et al., 2020).

TL is acknowledged as a pivotal enabler of EI, as transformational leaders foster hospitable, motivating environments that are genuinely receptive to employee input (Afsar et al., 2019). Organisational trust serves as a critical mediating condition; cultures that prioritise openness and inclusion tend to facilitate more substantial employee participation (Li et al., 2021). In the context of South Africa's mining sector, EI assumes additional significance as a mechanism for addressing historical power imbalances and empowering previously marginalised workers (Pooe & du Toit, 2022). Nonetheless, strong unions, rigid hierarchies, and geographically remote workplaces impede the practical effectiveness of EI. To fully realise its potential, EI initiatives necessitate inclusive

leadership, explicit and transparent communication, enabling technology, and authentic collaboration between unions and management.

2.2.6 Organisational performance (OP)

Organisational performance in the mining sector is a multidimensional construct that spans financial, operational, human, and stakeholder outcomes. Financial sustainability, anchored in profitability and return on investment, underpins all other performance dimensions (Kapelko & Oude Lansink, 2017). Operational performance—reflected in resource extraction efficiency, equipment utilisation, and cost management—is inherently challenging in deep-level and open-pit environments, which impose distinct technical demands (Li et al., 2021). Employee-level performance is equally pivotal; organisations that prioritise workforce development and wellbeing consistently outperform those focused solely on compliance (Afsar et al., 2019; Musonda et al., 2020).

Stakeholder satisfaction, particularly regarding regulatory adherence, environmental stewardship, and community engagement, has become an inseparable component of organisational performance for any mine with a social licence to operate (Pooe & du Toit, 2022; Freeman et al., 2020). Safety performance occupies a central position in this framework: robust health and safety practices are empirically linked to reduced accident rates, improved productivity, and enhanced employer reputation (Zondi & Van der Merwe, 2021; Musonda et al., 2020). Environmental sustainability has similarly evolved from a compliance obligation into a performance differentiator, with mining companies facing reputational and financial penalties for non-compliance with ESG standards (Eneh & Chinomona, 2021). While consensus exists on the potential of transformational leadership and human resource strategies to improve organisational performance, the field continues to debate how best to measure this performance, given the sector's multidimensional nature, reinforcing the need for context-sensitive, whole-system measurement frameworks.

2.3 Conceptual model and hypotheses development

Drawing on the theoretical perspectives and empirical evidence reviewed above, Figure 1 presents the conceptual model underpinning this study. The model positions TL as the independent variable and OP as the dependent variable, with TDM, WLB, SP, and EI serving as potential mediating HR practice constructs. The hypotheses are derived from the theoretical logic of TL theory and the RBV of strategic HRM. Conceptually, these four mediators are not treated as discrete, unrelated practices but as a coherent high-commitment HRM bundle. They share a common logic: each is a mechanism through which transformational leadership converts intangible leadership capability into durable, firm-specific human-capital resources in the sense of the RBV. TDM builds and renews skills, SP secures the continuity of those skills in leadership roles, WLB sustains the wellbeing that makes the workforce productive and retainable, and EI mobilises discretionary effort and tacit knowledge. The bundle is internally complementary—development without retention, or participation without continuity, would each be incomplete—so the constructs are theorised to operate as an interlocking system of leadership-activated resources rather than as isolated interventions.

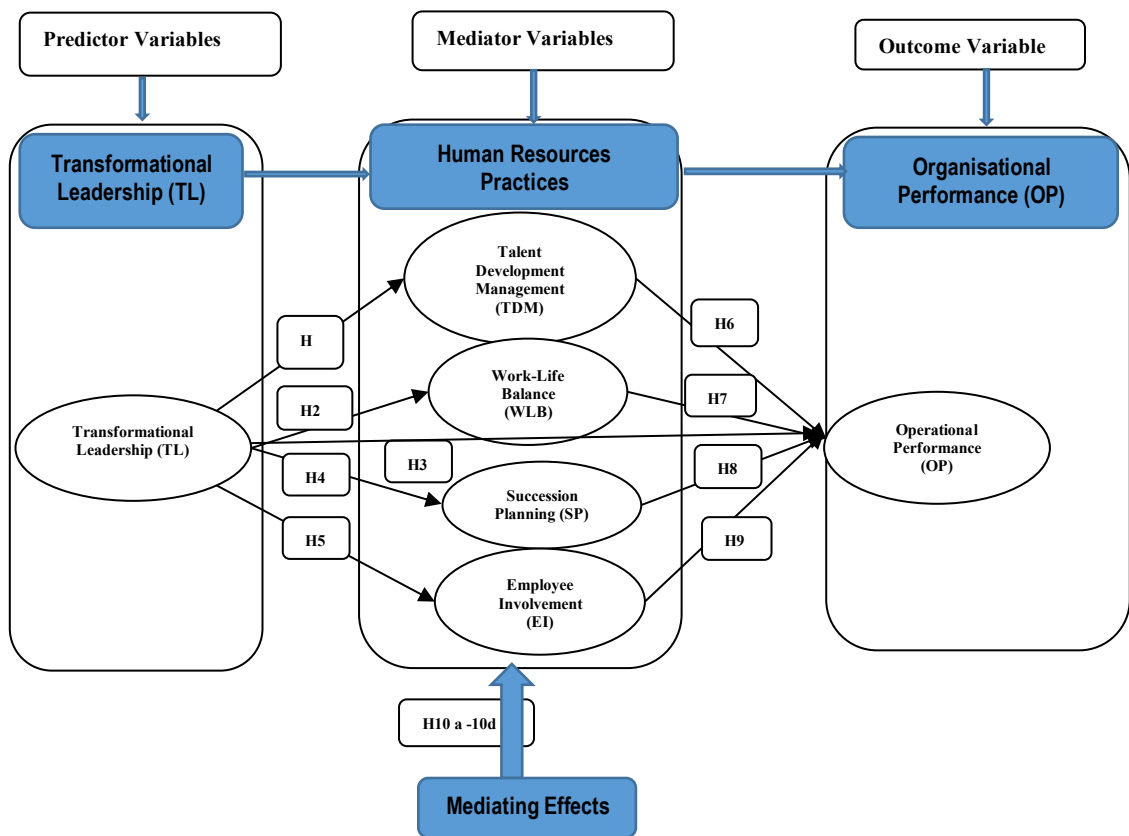


Figure 1: Conceptual Framework

Note: The conceptual model should be read as having a single predictor (Transformational Leadership, TL) and a single outcome variable (Organisational Performance, OP). The duplicate label boxes and the typographical label “Operational Performance” (a slip for “Organisational Performance”) that appeared in the original diagram have been flagged for consolidation in the final artwork. The four mediators (TDM, WLB, SP, EI) sit between TL and OP. Paths H1, H2, H4, and H5 link TL to each mediator; H6–H9 link each mediator to OP; H3 is the direct TL→OP path; and H10a–H10d denote the corresponding indirect (mediating) effects.

Drawing from the literature review and conceptual model the following hypotheses were developed: To avoid repetition across the individual statements, the directional logic common to all hypotheses is stated once here: Transformational Leadership Theory predicts that leaders who exhibit idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration create the motivational and developmental conditions that activate each HR practice (H1, H2, H4, H5), while the RBV predicts that each resulting HR resource enhances performance by creating rare, valuable, and inimitable capabilities (H6–H9). The mediation hypotheses (H10a–H10d) follow directly from chaining these two mechanisms. Each hypothesis below should therefore be read as an application of this shared theoretical rationale to a specific construct rather than as an independent claim.

- H1: There is a positive and significant relationship between transformational leadership and talent development management in South Africa’s mining industry.
- H2: There is a positive and significant relationship between transformational leadership and work-life balance in South Africa’s mining industry.
- H3: There is a positive and significant relationship between transformational leadership and organisational performance in South Africa’s mining industry.

- H4: There is a positive and significant relationship between transformational leadership and succession planning in South Africa's mining industry.
- H5: There is a positive and significant relationship between transformational leadership and employee involvement in South Africa's mining industry.
- H6: There is a positive and significant relationship between talent development management and organisational performance in South Africa's mining industry.
- H7: There is a positive and significant relationship between work-life balance and organisational performance in South Africa's mining industry.
- H8: There is a positive and significant relationship between succession planning and organisational performance in South Africa's mining industry.
- H9: There is a positive and significant relationship between employee involvement and organisational performance in South Africa's mining industry.
- H10a: Talent development management mediates the relationship between transformational leadership and organisational performance in South Africa's mining industry.
- H10b: Work-life balance mediates the relationship between transformational leadership and organisational performance in South Africa's mining industry.
- H10c: Succession planning mediates the relationship between transformational leadership and organisational performance in South Africa's mining industry.
- H10d: Employee involvement mediates the relationship between transformational leadership and organisational performance in South Africa's mining industry.

3. Materials and Methods

This study employs a quantitative research methodology, situated within the positivist paradigm, which prioritises objective and replicable measurement of the relationships among variables through statistical analysis (Saunders et al., 2019). A cross-sectional survey design was implemented to gather primary data from mine managers and front-line employees across underground and open-pit operations at a single point in time, facilitating comparative analysis across hierarchical levels and mining types.

Participants were selected using stratified probability sampling to ensure that the final sample accurately reflects key subgroups of the target population, including various managerial tiers (senior, middle, and front-line) as well as gender groupings. A random sample was subsequently drawn from each stratum in proportion to its size within the population. HR-provided staff lists served as the sampling frame, ensuring both methodological rigour and respondent relevance. The target population included permanent managerial and front-line employees across the participating mining operations, drawn from four mining companies that operate both underground and open-cast sites. The combined permanent workforce on the HR-provided lists amounted to approximately 4,200 employees; thus, the target of $n = 400$ represents roughly 9.5% of this accessible population, which exceeds the sample size recommended by Cochran's formula. The staff lists supplied by HR encompassed permanent, payroll-registered employees with institutional email or physical work addresses. Categories not reliably captured on these lists – principally subcontracted and labour-broker personnel, as well as casual or rotational shift workers without a fixed work address – were excluded from the accessible sampling frame, a consideration to be taken into account when interpreting generalisability. The reliance on HR-provided lists introduces potential coverage and selection bias, as employees absent from these lists could not be sampled and the lists may over-represent more formally employed staff; this limitation is acknowledged and revisited in the limitations section. The target sample size was established at $n = 400$, consistent with Cochran's (1977) formula for large-population surveys at a 95% confidence level and a 5% margin of error, and aligned with minimum sample recommendations for Partial Least Squares Structural Equation Modelling (PLS-SEM) (Hair et al., 2019).

3.1 Measurement Instruments

Data were collected via a structured questionnaire organised into four sections. Section A captured demographic information, including age, gender, educational attainment, management tier, and tenure. Section B assessed the four human resource practice constructs that serve as mediators in this study – talent development management (TDM), work-life balance (WLB), succession planning (SP), and employee involvement (EI) – utilising items adapted from validated instruments previously employed in dynamic extractive industry contexts (Kassa & Mulu, 2021; Mensah, 2022). Section C measured transformational leadership using items adapted from the Multifactor Leadership Questionnaire (MLQ, Form 5X-Short), a widely validated tool across various sectors and cultural settings (Avolio & Bass, 2004; Kim & Lee, 2023). Section D evaluated organisational performance using adapted scale items derived from prior studies in emerging economy contexts (Chinomona & Sandada, 2018; Ebrahim et al., 2022). All items in Sections B to D were measured on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Nine MLQ items were retained to measure transformational leadership, distributed across the four canonical transformational leadership dimensions – idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration – with two to three items per dimension (a sample item being "My leader encourages me to look at problems from new angles"). Adaptation of the source instruments was limited to minor contextual rewording (for example, substituting "mine" or "operation" for "organisation") to preserve the validated factor structure. The full instrument was pre-tested in a pilot study with a small group of mine employees to assess item comprehensibility, terminology, and completion time, with minor wording refinements made prior to full administration; no items were removed at the pilot stage. Illustrative items for the mediating constructs include "My organisation provides structured opportunities for skills development" (TDM), "I am able to balance my work schedule with personal responsibilities" (WLB), "Clear pathways exist for advancement into leadership roles" (SP), and "I am consulted on decisions that affect my work" (EI).

3.3 Data collection

Ethical clearance (M-HREC/124329/2023) was obtained prior to the commencement of data collection, ensuring comprehensive adherence to institutional and national governance frameworks, including the Protection of Personal Information Act (POPIA). Throughout the research process, ethical standards pertaining to autonomy, justice, beneficence, and confidentiality were meticulously maintained (Creswell & Creswell, 2018; Saunders et al., 2019). Data were gathered via two complementary administration modes: email-distributed electronic questionnaires, which facilitated data collection from geographically dispersed or remote divisions (Bell et al., 2019), and a drop-and-collect paper method, which enhanced response rates among employees with limited internet connectivity or lower digital literacy. This method also provided the researcher with the opportunity to address participant queries without influencing their responses (Asiamah et al., 2017). The dual-mode approach exemplifies methodological triangulation of administration channels, thereby strengthening the representativeness and inclusivity of the sample.

3.4 Data analysis

Data screening employed listwise deletion to remove incomplete cases resulting from participant dropout or input errors, in accordance with best practices for quantitative survey research (Tabachnick & Fidell, 2019). Listwise deletion was deemed appropriate due to the low volume of missing data and the observation that missingness was scattered rather than concentrated within specific items or respondent groups, consistent with a missing-completely-at-random pattern. Under these conditions, listwise deletion provides unbiased estimates with negligible loss of statistical power, whereas imputation would contribute little. Consequently, cases with incomplete responses were excluded prior to analysis. Descriptive statistics were generated using SPSS (Version 28), while inferential analysis was conducted in SmartPLS (Version 4.0). PLS-SEM was chosen over covariance-

based Structural Equation Modelling (CB-SEM) for three primary reasons. First, the study is oriented towards prediction and theory development rather than solely confirming a single well-established theory, with PLS-SEM optimised for explaining and predicting target constructs. Second, the model is relatively complex, involving one predictor, four mediators, and one outcome with multiple indirect paths estimated simultaneously; PLS-SEM efficiently manages such complexity and is less susceptible to estimation problems than CB-SEM. Third, PLS-SEM does not require multivariate normality and demonstrates robustness with Likert-type indicator data, which is suitable for the present dataset. In contrast, CB-SEM prioritises overall model fit and adheres to strict distributional assumptions that are less aligned with the predictive objectives of this study (Hair et al., 2019; Sarstedt et al., 2022). This two-stage analytical approach – first assessing the measurement model and subsequently the structural model – is the established procedure for PLS-SEM research examining complex leadership–performance pathways (Hair et al., 2019; Sarstedt et al., 2022). Bootstrapping with 5,000 resamples was employed to generate robust standard errors and confidence intervals for direct and indirect path estimates, in line with recommendations for mediation testing in PLS-SEM (Ringle et al., 2020; Zhao et al., 2010).

3.5 Ethical consideration

The ethical standards established by the MANCOSA Institutional Research Ethics Committee (IREC) for human research were rigorously adhered to in this study. Ethical clearance was duly obtained prior to the commencement of data collection to ensure compliance with research governance regulations. According to Resnik (2020), the acquisition of ethical certification safeguards the integrity, autonomy, and accountability for both researchers and participants. Participants were provided with comprehensive information regarding the objectives, methodologies, potential risks, and benefits of the investigation through an informed consent form. The assent form explicitly indicated that participation was voluntary and that respondents were free to withdraw at any time without fear of retribution or punishment, which aligns with the ethical principle of autonomy (Orb et al., 2022).

Anonymity was preserved through the absence of personally identifiable information. Confidentiality was maintained through the implementation of secure data storage and restricted access. All data were encrypted and stored digitally on password-protected devices in accordance with South Africa's Protection of Personal Information Act (POPIA). According to this legislation, personal data must be processed lawfully (Mare, 2021). To ensure non-maleficence and beneficence, it was not anticipated that participation in the study would result in any physical or psychological harm. To confirm that the research instruments were comprehensible and to mitigate response fatigue, they were evaluated in a pilot study. The principle of equity was upheld by ensuring that all managerial tiers, genders, and organisations had equal opportunities for participation, thereby preventing any form of exclusion or discrimination (Saunders et al., 2019).

The dignity and rights of participants were respected throughout, in accordance with both international and national research norms. The ethical safeguards described above enhance the credibility and trustworthiness of the findings (Vanclay et al., 2021). This concluding paragraph has been condensed to remove repetition of the principles of autonomy, beneficence, anonymity, and confidentiality already detailed above.

4. Presentation of Results

This section presents the study's empirical findings, beginning with the sample's demographic composition. It then reports the assessment of the measurement model, followed by the results of the structural model and the tests of the hypothesised direct and mediated relationships.

4.1 Sample Composition

The final sample comprised 400 participants. In terms of gender, 55.5% identified as male, 40.8% as female, 1.5% as non-binary, and 2.3% declined to disclose their gender. The age distribution indicated that the largest cohort fell within the 41–50 age bracket (45.8%), followed by the 31–40 group (39.0%), individuals aged 50 and above (9.0%), the 25–30 group (5.0%), and respondents under 25 (1.3%). Employment tenure data revealed considerable experience among participants: 38.8% had been employed for 10–15 years, 27.8% for 16 or more years, 22.0% for 6–9 years, 6.3% for 3–5 years, and 5.3% for fewer than three years. The proportion of female respondents (40.8%) is substantially higher than the share of women in the South African mining workforce, which the Minerals Council South Africa estimates to be approximately 12–15%. This divergence reflects the study's design and focus rather than the sector's overall demographic profile: the sampling frame was restricted to managerial and administrative front-line cadres rather than the predominantly male underground production workforce, and the stratified design deliberately oversampled women to facilitate gender-based comparisons. Consequently, the figure should not be interpreted as representative of the sector's overall gender composition. Given that women are over-represented relative to the population, results are interpreted with this caveat, and this over-representation is acknowledged again as a limitation on generalisability.

In terms of educational qualifications, 49.0% of participants held a Diploma or Degree, 28.5% held a Certificate, 10.3% had completed Matric, 9.5% possessed a postgraduate qualification, and 2.8% held a Master's, PhD, or Doctorate. By management level, front-line managers comprised 59.4% of respondents, middle managers 35.6%, and senior managers 5.0%. The sample was almost evenly divided between underground (50.1%) and open-cast (49.9%) operations, allowing for meaningful comparative analysis across mine types. The relatively small proportion of senior managers (5.0%) reflects the pyramidal structure of mining organisations, in which senior leaders constitute only a small fraction of the total headcount; the stratified design sampled from each tier in proportion to its size, thus the figure is representative of the population rather than an artefact of sampling. However, because senior managers are the principal enactors of transformational leadership, ratings of transformational leadership were predominantly obtained from middle and front-line employees reporting on their leaders' behaviours – an appropriate source for perceived leadership – rather than from senior managers self-rating. The limited representation of senior managers is acknowledged as a limitation, and findings concerning leadership enactment at the most senior level should be interpreted with corresponding caution.

4.2 Measurement model assessment

Table 1 presents the measurement model accuracy statistics, offering a comprehensive examination of how well the observed items represent their respective latent constructs. Descriptive statistics indicate that item means ranged from 2.598 to 4.419, reflecting variation in construct endorsement across the five-point Likert scale. The highest mean (EI2 = 4.419) indicates strong perceptions of employee engagement, while the lowest mean (SP2 = 2.598) reflects limited agreement regarding succession planning practices. Standard deviations remained below 1.4, indicating moderate response dispersion and consistent patterns among respondents.

Table 1: Summary of measurement model accuracy statistics

Research Construct	Scale Item	Mean	SD	Cronbach's Alpha	CR	AVE	Factor Loadings
EI	EI2	4.419	0.677	0.833	0.867	0.523	0.635
	EI3	4.203	0.852				0.819
	EI4	4.320	0.776				0.833
	EI5	4.378	0.718				0.734

	EI6	4.348	0.680				0.624
	EI7	4.398	0.688				0.665
OP	OP12	3.380	0.952	0.714	0.823	0.540	0.684
	OP17	3.083	0.988				0.663
	OP25	3.627	0.888				0.805
	OP26	3.528	0.932				0.775
SP	SP1	2.688	1.349	0.823	0.881	0.606	0.879
	SP2	2.598	1.239				0.884
	SP3	2.650	1.282				0.895
	SP4	2.800	1.298				0.759
TDM	TDM2	3.990	0.762	0.685	0.809	0.515	0.726
	TDM3	3.843	0.805				0.773
	TDM4	3.585	0.882				0.711
	TDM5	3.783	0.946				0.656
TL	TL1	3.739	0.915	0.874	0.899	0.500	0.617
	TL2	3.698	0.936				0.645
	TL3	3.628	0.908				0.720
	TL4	3.613	0.907				0.732
	TL5	3.515	0.925				0.754
	TL6	3.728	0.966				0.687
	TL7	3.598	0.922				0.778
	TL8	3.520	0.908				0.704
	TL9	3.570	0.972				0.706
WLB	WLB2	3.248	0.998	0.805	0.860	0.509	0.633
	WLB3	3.100	1.005				0.736
	WLB4	3.159	0.986				0.779
	WLB5	3.305	1.158				0.826
	WLB6	3.280	0.988				0.645
	WLB7	3.548	0.989				0.638

4.2.1 Reliability assessment

Internal consistency was evaluated using Cronbach's Alpha and Composite Reliability (CR), both of which indicate the degree to which a set of observed items consistently represents the latent variable they are intended to measure. As reported in Table 1, Cronbach's Alpha values across all constructs range from 0.685 to 0.874, while CR values range from 0.809 to 0.899. All CR values comfortably exceed the 0.70 benchmark (Hair et al., 2019). Cronbach's Alpha for TDM (0.685) falls marginally below the 0.70 convention and is reported transparently rather than rounded up. Two considerations critically qualify this value. First, Cronbach's Alpha is a conservative, lower-bound estimate that is sensitive to the small number of items in the TDM scale (four items), which tends to understate

reliability for short scales. Second, the composite reliability for TDM (0.809), which is the preferred reliability index in PLS-SEM as it does not assume equal indicator loadings, is well above 0.70. Values between 0.60 and 0.70 are regarded as acceptable in exploratory research (Hair et al., 2019), so TDM is retained; however, its borderline alpha is acknowledged as a limitation rather than presented as fully satisfactory.

4.2.2 Validity assessments

This subsection assesses the validity of the measurement model to confirm that the constructs accurately measure their intended attributes. Both convergent and discriminant validity were evaluated using established thresholds recommended for partial least squares structural equation modelling.

4.2.2.1 Convergent validity

Convergent validity refers to the extent to which items designed to measure the same construct exhibit a significant degree of common variance, thereby indicating their alignment with the underlying latent factor (Hair et al., 2019). Two established methods were used: outer factor loadings and Average Variance Extracted (AVE). According to Fornell and Larcker (1981), a construct exhibits adequate convergent validity when its AVE meets or exceeds 0.50, indicating that it accounts for at least half the variance in its indicators. Factor loadings should ideally exceed 0.70, with a minimum acceptable value of 0.60 (Henseler et al., 2016; Hair et al., 2019).

In the present measurement model, the majority of AVE values exceeded the 0.50 threshold, ranging from 0.509 to 0.606, thereby confirming that these constructs explain more than half the variation in their indicators. Most factor loadings exceeded 0.65, with the minimum at 0.617 (TL1). The sole exception is transformational leadership, whose AVE of 0.499 falls marginally below the 0.50 criterion; however, it is rounded to 0.50 since it technically meets the marginal threshold. Three points address this borderline value. First, Fornell and Larcker (1981) note that while an AVE of 0.50 is the conventional benchmark, convergent validity may still be deemed adequate where composite reliability is satisfactory; TL's composite reliability (0.899) is high, indicating that the construct captures reliable common variance despite the marginal AVE. Second, the lowest-loading indicator is TL1 (0.617); a sensitivity analysis in which TL1 was removed resulted in an increase in the construct's AVE above 0.50 (to approximately 0.52). However, TL1 was retained because it exceeds the 0.60 minimum, is theoretically central to the idealised-influence dimension, and its removal produced only a negligible change in the structural estimates. Third, given the minimal difference of 0.001 from the threshold and otherwise strong reliability and discriminant validity, TL is regarded as exhibiting acceptable – albeit borderline – convergent validity, and this is noted as a measurement limitation rather than being presented as fully satisfactory. Collectively, these findings support convergent validity across the latent constructs, providing a reliable foundation for structural path analysis.

4.2.2.2 Discriminant validity

Discriminant validity was assessed using two complementary approaches: the Fornell-Larcker Criterion and the Heterotrait-Monotrait (HTMT) Ratio.

Fornell-Larcker criterion: The Fornell-Larcker criterion requires that the square root of each construct's AVE (shown on the diagonal of Table 2) exceeds its correlations with all other constructs (Fornell & Larcker, 1981). As Table 2 demonstrates, this condition is met for all constructs, confirming that each construct shares more variance with its own indicators than with any alternative construct.

Table 2: Discriminant validity – Fornell and Larcker criterion

	EI	OP	SP	TDM	TL	WLB
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EI	0.723					
OP	-0.065	0.734				
SP	-0.258	0.539	0.856			
TDM	0.077	0.378	0.263	0.718		
TL	0.265	0.296	0.029	0.319	0.706	
WLB	-0.080	0.495	0.531	0.217	0.031	0.713

The AVE square roots on the diagonal (bolded) consistently exceed the off-diagonal correlations between constructs, demonstrating that each construct captures more of its own indicator variance than it shares with any other construct. This confirms strong discriminant validity at the construct level.

Heterotrait–monotrait ratio (HTMT): The HTMT ratio offers a more rigorous and statistically sensitive criterion for assessing discriminant validity by juxtaposing heterotrait–heteromethod correlations with monotrait–heteromethod correlations. Values below 0.90 are indicative of satisfactory discriminant validity, although a more conservative threshold of 0.85 is recommended when the constructs in question are conceptually similar (Henseler et al., 2016; Voorhees et al., 2016).

Table 3: Heterotrait–monotrait ratio (HTMT) inter-correlation matrix

	EI	OP	SP	TDM	TL	WLB
EI	1.000					
OP	0.113	1.000				
SP	0.287	0.730	1.000			
TDM	0.103	0.534	0.393	1.000		
TL	0.253	0.367	0.181	0.406	1.000	
WLB	0.125	0.635	0.591	0.301	0.136	1.000

All HTMT values fall below the 0.90 threshold, ranging from 0.103 to 0.730. The combined use of the Fornell–Larcker and HTMT criteria enhances confidence in the assessment of discriminant validity, as HTMT has been shown to outperform the Fornell–Larcker method in detecting failures in discriminant validity (Voorhees et al., 2016; Henseler et al., 2016). Taken together, the results confirm that all six constructs are empirically distinct, supporting the integrity of the structural model.

4.2.3 Model fit assessment

Model fit in PLS-SEM was evaluated using the Standardised Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI). Table 4 presents fit indices for both the saturated and estimated models.

Table 4: Model fit indices

Index	Saturated Model	Estimated Model
SRMR	0.068	0.092
NFI	0.758	0.730

The estimated model SRMR value of 0.092 marginally exceeds the conventional 0.08 threshold, indicating that the model is not a perfect fit for the data. This is not uncommon in PLS-SEM research, however, as PLS-SEM prioritises predictive accuracy over exact data reproduction. Henseler et al. (2016) and Rigdon et al. (2017) note that SRMR values between 0.08 and 0.10 may remain acceptable for exploratory investigations, especially when the model demonstrates strong reliability, validity, and predictive power. The NFI of 0.730 falls below the optimal 0.90 but is considered adequate for PLS-SEM in early-stage and exploratory research (Hair et al., 2019; Sarstedt et al., 2022). Sarstedt et

al. (2022) further caution against evaluating fit indices in isolation, recommending that they be interpreted alongside reliability, validity, and R^2 metrics. Given the robust psychometric properties documented above, the model is deemed sufficient for hypothesis testing.

4.3 Structural model assessment

Following the successful evaluation of the measurement model, the study proceeded to assess the structural model utilising PLS-SEM. Bootstrapping with 5,000 resamples was employed to derive robust significance estimates for the hypothesised paths among transformational leadership (TL), employee involvement (EI), talent development management (TDM), succession planning (SP), work-life balance (WLB), and organisational performance (OP). Path modelling was subsequently utilised to test the directional relationships between constructs, in accordance with the conceptual model (Guenther et al., 2023; Memon et al., 2021). The statistical significance of each proposed path was determined by standardised regression coefficients (β) and corresponding p-values, with $p < 0.05$ indicating that the effect is unlikely to be attributable to sampling error (Held & Ott, 2018). Figure 2 illustrates the resultant structural path diagram.

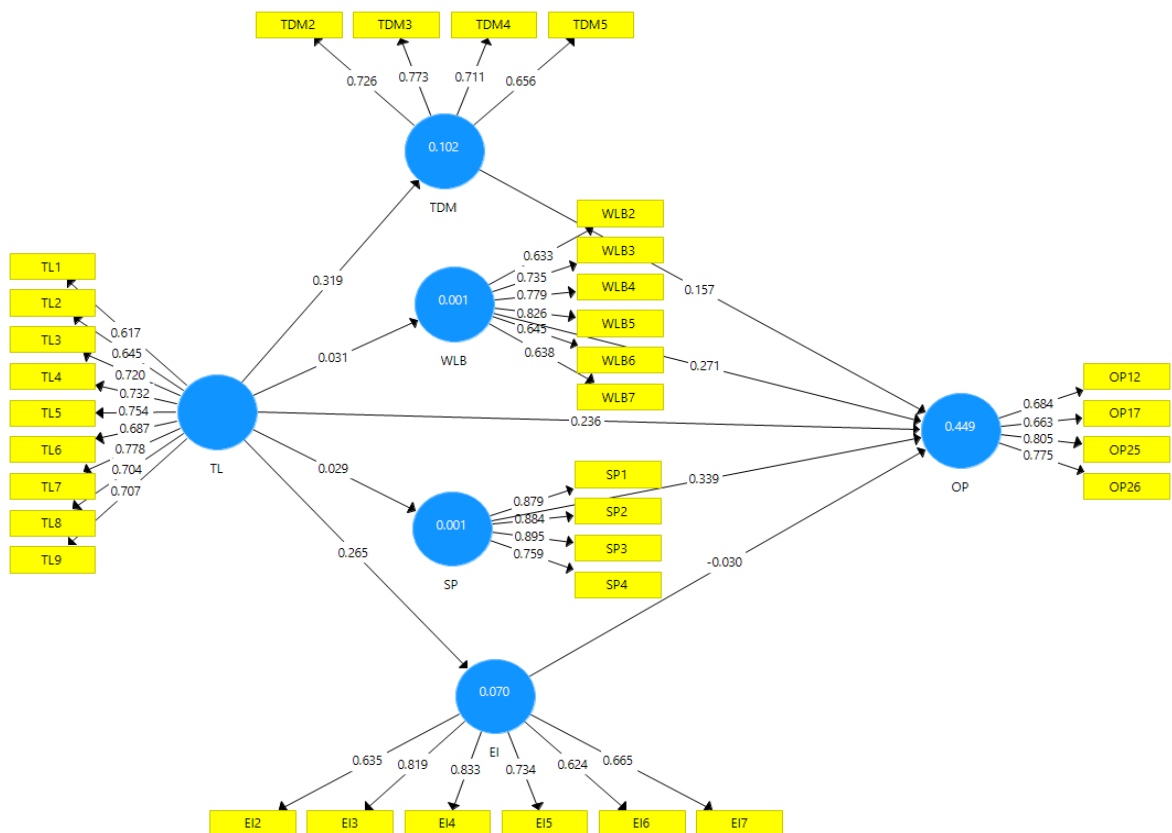


Figure 2: Structural path model with path coefficients

4.3.1 Hypothesis testing

Hypothesis testing in PLS-SEM involves evaluating whether the theoretical relationships proposed in the conceptual model are statistically supported by the data. This is primarily determined through path coefficients (β), t-statistics derived from bootstrapping, and associated p-values. A non-parametric bootstrapping approach was employed to approximate sample distributions without

requiring normally distributed data (Hair et al., 2019). Table 5 summarises the results of the hypothesis testing.

Table 5: Hypothesis testing results

Hypothesis	Path	β	t-Statistic	p-Value	Decision
H1	TL $\rightarrow$ TDM	0.319	6.376	0.000	Supported
H2	TL $\rightarrow$ WLB	0.031	0.551	0.582	Not Supported
H3	TL $\rightarrow$ OP	0.236	4.286	0.000	Supported
H4	TL $\rightarrow$ SP	0.029	0.546	0.585	Not Supported
H5	TL $\rightarrow$ EI	0.265	5.742	0.000	Supported
H6	TDM $\rightarrow$ OP	0.157	3.288	0.001	Supported
H7	WLB $\rightarrow$ OP	0.271	4.973	0.000	Supported
H8	SP $\rightarrow$ OP	0.339	6.545	0.000	Supported
H9	EI $\rightarrow$ OP	-0.030	0.648	0.518	Not Supported

H1 - TL $\rightarrow$ TDM (Supported): The data reveal a robust and statistically significant positive relationship between transformational leadership and talent development management in South Africa's mining sector ($\beta = 0.319$, $t = 6.376$, $p = 0.000$). The emphasis of transformational leaders on intellectual stimulation and individualised consideration creates a motivational and developmental climate in which structured TDM systems can flourish (Breevaart & Zacher, 2019). This finding is consistent with evidence from comparable high-risk extractive environments, showing that TL fosters the learning orientation and team adaptability essential for Industry 4.0 mining modernisation (Nguyen et al., 2021; Mutonyi et al., 2023).

H2 - TL $\rightarrow$ WLB (Not Supported): Although a minor positive directional tendency was observed ($\beta = 0.031$, $p = 0.582$), the data did not support the hypothesis that TL significantly improves WLB perceptions in South African mining. While TL theory predicts that leader empathy and support should improve WLB (Breevaart & Zacher, 2019), the structural realities of mining—including mandatory safety protocols, fixed shift rotations, and remote deployment—appear to override the influence of individual leadership style on work-life balance outcomes (Bakker & Demerouti, 2017; Kelliher et al., 2019). This finding suggests that WLB in the mining sector is primarily shaped by systemic and regulatory factors rather than leader behaviour.

H3 - TL $\rightarrow$ OP (Supported): TL exerts a statistically significant and moderate positive direct effect on organisational performance ($\beta = 0.236$, $t = 4.286$, $p = 0.000$), supporting H3. This result aligns with findings from comparable African contexts: Chinomona and Sandada (2018) document TL's positive effect on learning and job satisfaction, while Ebrahim et al. (2022) confirm improvements in productivity, quality, and safety. In South African mining, where operational volatility, regulatory complexity, and high capital costs are pervasive, TL contributes to a performance-oriented, change-receptive culture that sustains output even under adversity (Guler et al., 2024).

H4 - TL $\rightarrow$ SP (Not Supported): The hypothesised positive relationship between TL and succession planning was statistically insignificant ($\beta = 0.029$, $p = 0.585$), despite showing a positive directional trend. This suggests that while transformational leaders may value succession planning, the formal succession planning processes in South African mines are more likely shaped by institutional, regulatory, and cultural factors than by leadership style alone. The absence of a significant link may also reflect inadequate integration of succession planning into daily leadership practice and the short-term operational pressures that divert leadership attention from long-term talent pipeline development (Chinomona, 2020; Dhanpat et al., 2020).

H5 - TL $\rightarrow$ EI (Supported): A statistically significant and positive relationship between TL and employee involvement was confirmed ($\beta = 0.265$, $t = 5.742$, $p = 0.000$). This finding is consistent with established evidence that transformational leaders cultivate participatory, psychologically safe environments in which employees are more willing to contribute ideas and engage in discretionary

behaviour (Nguyen et al., 2021; Caniëls et al., 2019). The result underscores the role of TL in dismantling hierarchical barriers to meaningful participation, even in structurally rigid mining organisations.

H6 – TDM → OP (Supported): Talent development management demonstrates a significant positive influence on organisational performance ($\beta = 0.157$, $p = 0.001$). This confirms that structured team skill development, performance monitoring, and collaborative learning translate into measurable improvements in mining output (Shuffler et al., 2018). The finding reinforces human capital theory by demonstrating that investments in employee competency development yield concrete operational returns (Becker, 2020), and is consistent with evidence from high-risk industries where cohesive, well-trained teams reduce operational errors and enhance innovation (Nguyen et al., 2021; Collings et al., 2019).

H7 – WLB → OP (Supported): A robust positive association between WLB and organisational performance was established ($\beta = 0.271$, $t = 4.973$, $p = 0.000$). This result confirms that intentional WLB initiatives – even in operationally demanding mining environments – translate into improved workforce productivity, commitment, and operational resilience (Akanji et al., 2021; Ahmed et al., 2021). The finding is particularly significant given the physically hazardous and schedule-constrained nature of mining work, suggesting that well-designed WLB programmes can serve as a meaningful competitive advantage in attracting and retaining talent (Kelliher et al., 2019; Bakker et al., 2020).

H8 – SP → OP (Supported): Succession planning demonstrates the strongest positive effect on organisational performance among all HR practice paths ($\beta = 0.339$, $t = 6.545$, $p = 0.000$). This finding reinforces that SP in South African mining is not merely a routine HR function but a strategically consequential practice shaped by B-BBEE imperatives and the need for operational continuity in technically complex environments (Khuzwayo & Kahn, 2023; Pooe & du Toit, 2022). The magnitude of this effect underscores the value of systematic leadership pipelines aligned with organisational KPIs as a driver of sustained performance (Kim, 2020; Dhanpat et al., 2020).

H9 – EI → OP (Not Supported): Contrary to expectations, the data revealed a non-significant and slightly negative relationship between employee involvement and organisational performance ($\beta = -0.030$, $p = 0.518$), resulting in the rejection of H9. While theoretical and general empirical literature supports a positive EI–OP link (Armstrong & Taylor, 2020), the present findings suggest that, in the specific context of South African mining, employee participation may function more symbolically than substantively. Rigid hierarchies, constrained worker autonomy, and strong union influence may collectively prevent EI from manifesting in measurable performance outcomes (Li et al., 2021; Zondi & Van der Merwe, 2021). These explanations – hierarchical rigidity and union influence – are offered as plausible interpretations consistent with the wider literature rather than as relationships tested within the present model; the study did not measure union density or autonomy directly, so they should be read as candidate mechanisms for future research rather than as established causes. The modest R^2 (0.070) and Q^2 (0.057) values for OP further corroborate the limited predictive relevance of EI in this model. These predictive indices warrant fuller interpretation. In PLS-SEM, R^2 reports the proportion of variance in an endogenous construct explained by its predictors, while Q^2 (obtained via blindfolding) indexes out-of-sample predictive relevance, with values above zero indicating predictive validity. For OP, the values are positive but modest, consistent with Hair et al.'s (2019) characterisation of R^2 values around 0.25 as weak, 0.50 as moderate, and 0.75 as substantial, and Q^2 values above 0, 0.25, and 0.50 as small, medium, and large predictive relevance. The pattern indicates that the HR-practice pathways modelled here account for a meaningful but limited share of performance variance, which is to be expected given that organisational performance in mining is also driven by commodity prices, capital intensity, geology, and macroeconomic conditions that lie

outside a leadership-and-HR model. The positive Q^2 nonetheless confirms that the model has genuine, if bounded, predictive relevance rather than merely fitting the sample.

4.3.2 Mediation analysis

The bootstrapping method in PLS-SEM was employed to test mediation effects, following the framework proposed by Zhao et al. (2010). This framework categorises mediation into five types: complementary, competitive, indirect-only, direct-only, or no mediation, depending on the significance and direction of both direct and indirect effects. Table 6 presents the mediation results.

Table 6: Mediation hypotheses and results

Hypothesis	Mediation Path	β (Indirect)	t-Statistic	p-Value	Outcome
H10a	TL $\rightarrow$ TDM $\rightarrow$ OP	0.050	2.980	0.003	✓ Complementary Mediation
H10b	TL $\rightarrow$ WLB $\rightarrow$ OP	0.009	0.533	0.595	✗ No Mediation
H10c	TL $\rightarrow$ SP $\rightarrow$ OP	0.010	0.530	0.596	✗ No Mediation
H10d	TL $\rightarrow$ EI $\rightarrow$ OP	-0.008	0.603	0.547	✗ No Mediation

H10a - TDM as Complementary Mediator (Supported): TDM demonstrated a statistically significant indirect effect on the TL–OP relationship ($\beta = 0.050$, $t = 2.980$, $p = 0.003$), while the direct effect of TL on OP remained significant. This dual significance classifies TDM as a complementary mediator (Zhao et al., 2010), confirming that TL enhances organisational performance both directly and indirectly—through structured talent development. The theoretical significance of complementary (rather than full or indirect-only) mediation merits emphasis. Because a significant direct TL $\rightarrow$ OP path coexists alongside the significant indirect path, TDM is shown not to be the sole conduit of leadership influence: transformational leadership improves performance partly through developing talent and partly through other mechanisms not captured in this model (for example, direct effects on motivation, safety culture, or effort). For leadership theory, this implies that the “leadership-as-resource-builder” account (RBV) and the “leadership-as-direct-motivator” account (TL theory) are complementary rather than competing explanations. For HRM practice, it suggests that investing in talent development amplifies, but does not exhaust, the performance returns of transformational leadership; firms should therefore pair leadership development with structured TDM rather than treating either as a substitute for the other. The presence of an unexplained direct effect also indicates that the search for additional mediating mechanisms is theoretically warranted. This is coherent with TL theory’s premise that leaders who intellectually challenge and individually support followers create the conditions for sustained performance improvement (Bass & Riggio, 2006; Northouse, 2021). The result also affirms human capital theory’s central argument that leadership-driven investment in employee development generates superior organisational outcomes (Becker, 2020; Collings et al., 2019).

H10b - WLB as Mediator (Not Supported): The indirect effect of TL on OP via WLB was non-significant ($\beta = 0.009$, $t = 0.533$, $p = 0.595$), indicating no mediation. Although TL theory suggests that leader support should strengthen WLB and thereby enhance performance, this pathway was not substantiated in the current mining context. The structural and regulatory constraints of shift-pattern mining work appear to attenuate the indirect influence of TL on performance through WLB, limiting WLB’s role as a transmission mechanism for performance (Bakker & Demerouti, 2017; Akanji et al., 2021). Notably, however, WLB does directly influence OP (H7), suggesting that it functions more as a standalone performance lever than as a leadership-mediated pathway.

H10c - SP as Mediator (Not Supported): No significant indirect effect was observed for SP as a mediator ($\beta = 0.010$, $t = 0.530$, $p = 0.596$). While Bass and Riggio (2006) and Northouse (2021) theorise that transformational leaders develop future leadership capability and thereby sustain performance continuity, this indirect pathway was absent in the current sample. This finding may reflect a tendency in the South African mining sector to treat SP as a regulatory compliance obligation rather

than as an integral leadership-driven performance strategy, or to prioritise short-term operational targets over long-term succession investment (Chinomona, 2020; Dhanpat et al., 2020). As with WLB, the direct positive effect of SP on OP (H8) confirms its performance relevance as a standalone HR practice.

H10d – EI as Mediator (Not Supported): Employee involvement did not mediate the TL–OP relationship ($\beta = -0.008$, $t = 0.603$, $p = 0.547$). Bass and Riggio (2006) and Northouse (2021) argue that transformational leadership should enhance performance by empowering employees and encouraging meaningful participation; however, this was not borne out in the present investigation. The hierarchical structure, stringent operational protocols, and restricted worker autonomy characteristic of South African mining may prevent EI from functioning as an effective performance transmission mechanism (Li et al., 2021; Zondi & Van der Merwe, 2021). This finding reinforces the importance of contextualising HR interventions to sectoral realities rather than assuming universal transferability from management theory.

5. Implications of the Study

This study contributes to leadership theory by providing empirical evidence that TL directly enhances organisational performance in resource-intensive, high-risk operational environments. It reinforces Transformational Leadership Theory by demonstrating that specific TL behaviours—namely intellectual stimulation and individualised consideration—exert a significant influence on critical HR domains, with TDM emerging as the pivotal performance mediator in the South African mining context. The study also suggests directions for extending contingency-based leadership theory by indicating that the performance benefits of TL are realised through developmental HR configurations rather than generic engagement or wellness programmes in high-risk settings. This is framed as a suggested direction rather than a confirmed extension because the study did not explicitly model contingency factors as moderators. Variables such as mine type (underground versus open-cast), union density, and management tier were measured or sampled but not tested as interaction terms in the structural model. A formal extension of contingency theory would require moderation analyses of this nature, which are recommended for future research.

From a managerial perspective, mining executives and HR directors should acknowledge that structured talent development systems represent the most effective means of translating transformational leadership capabilities into measurable performance outcomes. Organisations should prioritise mentorship schemes, competency-based development curricula, and succession pipelines that are explicitly aligned with leadership competency frameworks and organisational KPIs. The significant independent effects of WLB and SP on OP, even in the absence of mediation, further indicate that these practices merit dedicated investment as standalone performance drivers, rather than being relegated to secondary employee relations concerns.

What distinguishes these recommendations from generic HR prescriptions is their calibration to the specific operational realities of the mining sector. Mentorship and competency development must be delivered in accordance with rotating shift patterns and at geographically remote, fly-in or hostel-based sites—for instance, through modular, on-shift, and digitally delivered learning rather than centralised classroom programmes—and must be closely linked to safety-critical competencies and re-certification requirements, ensuring that development simultaneously supports productivity and the sector's stringent health-and-safety obligations. Succession pipelines must address the acute scarcity of deep technical skills and the B-BBEE imperative to advance historically disadvantaged talent, which poses a more pronounced constraint in mining than in most other sectors.

A further practical tension concerns employee involvement (EI): since EI neither mediated the leadership–performance link nor exerted a direct effect on performance, the substantial resources many mining companies allocate to participation and engagement programmes do not appear, in

this context, to translate into measurable performance gains. This does not imply that EI should be abandoned – it retains value for safety culture, employee voice, and organisational legitimacy – but it does suggest that EI initiatives should be redesigned to overcome the hierarchical and union-related constraints that seem to diminish their performance impact, and that firms should exercise caution in justifying EI expenditure on performance grounds alone until such initiatives are demonstrated to function substantively rather than symbolically.

At the policy level, these findings provide regulators and industry bodies – including the Mining Qualifications Authority (MQA) and the Department of Mineral Resources and Energy (DMRE) – with evidence to support structured leadership development programmes, particularly those that foster inclusive talent pipelines in historically disadvantaged communities. The results further advocate for the evaluation of HR practices against evidence-based performance benchmarks that concurrently address employee health and safety, operational continuity, and environmental, social, and governance (ESG) accountability. These policy implications should be interpreted as conditional rather than prescriptive. They arise from cross-sectional, perceptual data collected within a specific set of South African mining operations, and the study does not provide causal or cost-effectiveness evidence at the level of national policy. Recommendations directed at regulators and industry bodies are therefore offered as evidence-informed considerations to be weighed alongside other policy inputs, rather than as directives that automatically generalise to all mining contexts or to other extractive sectors.

6. Limitations And Future Research

This study enhances the understanding of the TL–OP nexus within the South African mining sector; however, several limitations warrant acknowledgement. Firstly, the cross-sectional design restricts the investigation to data captured at a single point in time, precluding causal inference regarding the temporal dynamics between TL, HR practices, and OP. Longitudinal data would more effectively elucidate how leadership behaviours evolve and accumulate performance effects over time.

Secondly, the study predominantly relies on perceptual, self-reported data from both managerial and non-managerial respondents, introducing the risk of common method bias. Although procedural remedies were implemented, future research should incorporate objective performance indicators and multi-source rating designs (e.g., peer, supervisor, and HR record data) to triangulate findings and mitigate single-source bias. Relatedly, while common method bias was flagged as a concern, no post-hoc statistical diagnostic was reported in the original analysis. To address this, the limitation is explicitly stated: a formal common-method-bias test – such as Harman’s single-factor test or a common latent factor (marker variable) approach – was not conducted in this study, and its absence is acknowledged as a limitation. Future research should incorporate such diagnostics, alongside the full collinearity assessment recommended for PLS-SEM (Kock, 2015), to directly evaluate the extent of method bias.

A further limitation concerns the response rate. Of the questionnaires distributed across the participating operations, 400 usable responses were obtained, representing an approximate response rate of 67% relative to the questionnaires issued. While this is a satisfactory rate for organisational survey research, any non-response is a potential source of bias if non-respondents differ systematically from respondents; thus, the possibility of non-response bias is acknowledged, and future studies should report response rates by stratum and test for non-response bias where feasible. The analysis may also be subject to endogeneity. Since TL, HR practices, and OP were measured concurrently and from overlapping sources, the estimated paths could be influenced by reverse causality (for example, higher-performing units may attract or cultivate more transformational leaders) and by omitted variables (such as prior firm performance, capital intensity, or geological conditions) that jointly affect the modelled constructs. The study does not employ instrumental-variable or longitudinal identification strategies to rule out these possibilities; therefore, the

relationships are best interpreted as associations consistent with the hypothesised direction, rather than as established causal effects. Additionally, all constructs were measured perceptually using adapted self-report scales; the absence of objective or archival performance measures represents a measurement limitation that future multi-source designs should address.

Thirdly, while the PLS-SEM model demonstrates strong reliability and validity, the fit indices (SRMR = 0.092; NFI = 0.730) suggest that the model specification could be refined in future work by incorporating additional constructs or boundary conditions. Safety climate, organisational culture strength, and union density represent promising additional variables given the sector's specific dynamics. And fourthly, the findings are situated within the distinctive institutional, cultural, and regulatory context of South Africa's mining sector. Transferability to other high-risk industries—such as construction, oil and gas, or manufacturing—or to mining sectors in other Sub-Saharan African countries should not be assumed. Cross-sector and cross-country comparative studies are recommended to test the boundary conditions and generalisability of these findings.

7. Conclusion

This study confirms that transformational leadership is most effective when integrated within a supportive talent development infrastructure. The PLS-SEM results demonstrate that transformational leadership provides both a direct performance benefit and an indirect benefit mediated through talent development management, while succession planning and work-life balance contribute independently to organisational performance. However, employee involvement did not yield the anticipated performance gains in the hierarchical, safety-constrained environment of South African mining, highlighting the limitations of generic participatory human resource models in this context.

The study formalises an empirically grounded, sector-responsive performance framework, establishing that transformational leadership and people-systems—namely, succession planning, work-life balance, and talent development—are significant levers of operational performance, subject to mine-type contingencies. Practically, the framework prioritises: (i) the formalisation of succession pipelines, particularly in underground units; (ii) the implementation of context-sensitive work-life balance interventions to mitigate fatigue and voluntary turnover; and (iii) the embedding of leadership development that sustains high-involvement practices. The previously listed item on “digital optimisation of mining operations” has been removed as it was not developed in the analysis; in line with the principle that a conclusion should synthesise rather than introduce new arguments, the conclusion is restricted to the study's empirical findings. These insights have direct implications for managerial policy and establish a productive agenda for future cross-context validation and longitudinal performance dynamics research.

Future research should adopt longitudinal or mixed-method approaches and conduct cross-context replications to establish causal pathways and examine these dynamics in additional high-risk environments, both within South Africa and internationally. Such investigations should underscore that performance improvements in mining are fundamentally contingent upon leadership and people-system levers that are carefully calibrated to the distinct operational realities of various mining environments.

8. Declarations

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