



Critical Realism Approach to ERP Implementation in Zimbabwe's Mining Sector: A Literature Review

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Abstract: This study employed a critical realism perspective to examine the implementation of Enterprise Resource Planning (ERP) systems within the Zimbabwe's mining sector. By delving beyond empirical observations to uncover underlying generative mechanisms, the study provides a nuanced understanding of success and challenges in this context. Key critical realism concepts, such as the distinction between real, actual and empirical domains, stratification, emergence and structuration, were pivotal in the analysis. The study revealed a complex interplay of ERP implementation dynamics, where significant challenges, such as resource constraints, foreign currency shortages, skill gaps, organizational resistance to change and data quality issues often overshadow successes in data integration and operational visibility. Crucial generative mechanisms identified include financial viability, human agency, such as leadership and skilled personnel, organizational culture and the state of national infrastructure. Notably, Zimbabwe's unique socioeconomic and political landscapes emerged as a powerful contextual mechanism, profoundly shaping all aspects of ERP projects. The study underscores that successful ERP system implementation in such challenging environments is not merely a technical endeavour but a deeply embedded and context-dependent process, necessitating a comprehensive understanding of the intricate interplay between deep-seated structures and human agency. While drawing valuable insights from existing literature, this review acknowledges limitations concerning data availability and depth, advocating for future empirical and longitudinal studies to further validate and refine the understanding of ERP implementation in similar developing contexts.

Keywords: Critical Realism; enterprise resource planning system; mining sector; ERP.

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Introduction

The mining of minerals and mineral products has become the backbone of most industries across the world. These metals and minerals have much potential to boost economic growth and development (Mahonye & Mandishara, 2015). The mining industry is a vital component

of the nation's economy, making a substantial contribution to both GDP and employment (Ericsson & Löf, 2019). The Mining Sector Organizations (MSOs) play a pivotal role in Zimbabwe's sustainable economic development. Mining Sector Organizations are a crucial, diverse range of corporate entities,

state-owned enterprises and institutional bodies engaged in the exploration, extraction, processing and marketing of mineral resources within Zimbabwe.

In the country, mining provides employment, dividends and taxes that support the operation of hospitals, schools and other public facilities (National Research Council, 2002). Mining emerged as Zimbabwe's most lucrative industry, accounting for approximately 13% of the country's GDP and 60% of its export revenue in 2022 (Gordon, 2023).

MSOs promote economic recovery, create jobs and vital wealth, and boost economic activities (Casey, 2020). Despite the upheavals in the local economy, which are typified by economic uncertainty, liquidity challenges, growing inflation, inconsistent policies and a dearth of investment, Zimbabwe's mining sector is remarkably resilient (Bhoroma, 2018). The mining sector is a complex and dynamic system that involves multiple stakeholders, processes and challenges. Due to the nature of these organizations, they must embrace Information and Communication Technologies (ICTs) to manage the enormous volume of operations, data and information (Simovic & Becejski-Vujaklija, 2015). When the government of Zimbabwe formally acknowledged ICTs as essential elements of the country's sustainable development and economic turnaround in 2012, various stakeholders, including private sector companies like Liquid Telecoms and mining organisations, made tangible investments in areas, such as fibre optic networks, ERP systems and necessary skills training (Makiwa & Steyn, 2016).

MSOs face various operational and strategic challenges, such as resource depletion, low productivity, skills shortage, regulatory compliance and technological innovation (Ediriweera & Wiewiora, 2021). These issues require effective management and coordination of the sector's activities and resources, which can be facilitated by adopting the Enterprise Resource Planning (ERP) systems. ERP systems are defined (Jagoda & Samaranayake, 2017) as business software packages that help organisations automate crucial business processes, generate and access information in real-time using a single database, share common data, information and knowledge throughout the entire enterprise and integrate

business functions (sales, production, human resources, finances, purchasing, inventory etc) (Jagoda & Samaranayake, 2017). For their operations to have appropriate and sufficient ICT infrastructure systems, mining industry organizations need to collaborate with technology businesses and other stakeholders (Moyo, 2021).

The Zimbabwe sector faces challenges in improving efficiency, productivity and transparency. ERP systems are powerful tools to address these challenges by integrating and streamlining core business processes across departments. Despite potential benefits, successful ERP implementation and adoption in the Zimbabwean mining sector remains low. However, implementing ERP systems in the mining sector is not straightforward, as it involves transforming the organizational structure, culture and practices. Past studies often showed that a project could be deemed a success even if it failed to meet traditional financial, scope and schedule metrics. These evaluations were flawed because they neglected technical and organizational factors, along with the crucial linkages between activities across the different phases of ERP system implementation and adoption. Past ERP studies used a flawed definition of success that allowed projects to be considered successful despite failing on traditional cost, scope, and schedule metrics, primarily by neglecting crucial technical and organizational factors and the essential sequencing of activities across the implementation and adoption phases (Misita et al., 2016).

The existing literature on ERP systems in the mining sector is limited, fragmented and does not adequately address the contextual and relational aspects of the mining sector. The critical realism framework for ERP system implementation and adoption in the Zimbabwean mining sector lacks comprehensive research and analysis. A notable gap exists in applying a critical realism approach to this context, even though there is a considerable body of literature on ERP implementation and adoption and critical success factors (CSFs) (Grabski et al., 2011). Previous research has primarily focused on identifying CSFs (Finney & Corbett, 2007), developing integrative knowledge competence frameworks (Jayawickrama et al., 2016), and exploring the relationship between ERP System

implementation and performance enhancement factors (Shafi et al., 2019). Critical realism is a philosophical framework asserting the existence of a reality independent of human perceptions, while acknowledging the complex processes through which we understand the reality (Bhaskar, 2013). However, there is a lack of in-depth analysis using the critical realism philosophy, which is essential for understanding the underlying factors and generative mechanisms that influence the ERP implementation in the Zimbabwean mining sector.

In addition, while some studies have proposed the integrated frameworks for ERP system implementation (Jagoda & Samaranayake, 2017), they do not specifically address the unique challenges and contextual factors present in the Zimbabwean mining sector. Therefore, there is a clear research gap in applying the critical realism framework to the ERP implementation in the mining sector, which requires a more nuanced and context-specific approach to understanding the underlying causal mechanisms and generative mechanisms that shape ERP implementation outcomes in this industry. A critical realism framework for ERP systems in the mining sector can help identify and explain the complex interactions and interdependencies among the various elements of the sector as well as the opportunities and challenges associated with the ERP implementation and adoption.

This study examined the ERP implementation challenges, specifically within Zimbabwe's mining sector. It adopted the critical realism approach to understand the challenges. Critical realism helps uncover the deeper, often hidden, causes behind the successes or failures of an implementation. The study analyses existing literature through the critical realism lens.

Literature Review

A Critical Realist Approach to developing a conceptual framework for ERP system implementation in the Zimbabwean mining sector necessitates a thorough understanding of the CSFs and the contextual complexities involved in the ERP systems. This approach emphasizes the interplay between structure and agency, recognizing that while certain factors may influence the ERP implementation

success, the context of Zimbabwe's mining sector will shape these dynamics.

Critical success factors for ERP systems implementation in mining

The pursuit of CSFs became a dominant paradigm. Pinto and Slevin (1987) examined the success of ERP systems implementation from a critical success factors point of view. Many researchers then subsequently investigated extensively the CSFs, which are significant to the successful implementation of ERP systems (Bingi et al., 1999; Guy et al., 2003; Kiran & Reddy, 2019; Reitsma & Hilletoth, 2018; Somers & Nelson, 2001, 2004; Wu, 2007). Based on the provided references, the CSFs for ERP systems implementation and adoption in the mining sector can be identified.

Top management support, project team competence, interdepartmental cooperation, clear goals and objectives, project management, interdepartmental communication, business process re-engineering, establishing a total quality management culture, ERP implementation strategy and consultant support are among the critical success factors for ERP systems implementation (Akhzan et al., 2021; AlQashami & Mohammad, 2015; Ghayas et al., 2022; Jagoda & Samaranayake, 2017; Nagpal et al., 2015; Soja, 2006).

In addition, factors, such as users' acceptance, communication effectiveness, conflict resolution, training, leadership style, financial constraints, information technology knowledge, system usage, and IT governance framework play significant roles in determining the success of ERP implementation (Agha et al., 2019; Alimohamadian & Abdi, 2014; Bueno & Salmeron, 2008; Dezdar & Sulaiman, 2009; Ghayas et al., 2022; Ifinedo, 2007; Jagoda & Samaranayake, 2017; Maditinos et al., 2011; Scholtz & Kapeso, 2014; Shafi et al., 2019; Shatat & Dana, 2016; Soliman & Karia, 2017; Subanidja & Mercurius, 2019; Tsai et al., 2007; Wijaya et al., 2023; Ziemba & Oblak, 2013). Moreover, the role of human critical success factors, such as competence, behaviour, team composition and communication, has been recognised as essential for ERP system implementation, further underlining the significance of these factors in ensuring successful ERP implementation (Akhzan et al., 2021). The critical success factors have also been studied across different stages of ERP

system implementation, including pre-implementation, implementation and post-implementation stages, highlighting their relevance throughout the entire implementation process (Shatat, 2014; Shatat & Dana, 2016).

Additionally, the critical success factors for ERP systems implementation in public administration and the impact of ERP consultant selections on service quality satisfaction and performance improvement are important considerations (Tsai et al., 2007; Ziemba & Oblak, 2013). Various dimensions, including usability, vendor support, system quality and consultant support, can influence the success of ERP systems (Bueno & Salmeron, 2008; Dezdar & Sulaiman, 2009; Ghayas et al., 2022). Moreover, the role of leadership style, particularly transformational leadership, has been identified as a critical success factor for the successful implementation of ERP systems (Agha et al., 2019). Furthermore, the impact of financial constraints on ERP system success and the effects of information technology on supply chain integration, mediated by ERP success, are crucial considerations for achieving successful ERP implementation (Alimohamadian & Abdi, 2014; Subanidja & Mercurius, 2019). This study sought to establish key success factors, obstacles and outcomes of the ERP systems implementation in the Zimbabwean mining sector organizations.

Potential conflicts/synergies between different CSFs

Various CSFs influence ERP system implementation in the mining sector, and these influences can sometimes conflict. Understanding these dynamics is essential for effective project management and successful ERP outcomes. Top management support is often cited as a critical factor for ERP success, as it ensures adequate resource allocation and strategic alignment (Ziemba & Oblak, 2013). However, excessive focus on top-down directives can lead to a lack of user involvement, crucial for understanding the practical needs and challenges end-users face in mining operations. This disconnect can result in resistance to change and underutilisation of the ERP system (Finney, 2011). To mitigate this conflict, it is essential to foster a culture of collaboration in which top management actively seeks user input during the planning and

implementation phases. Regular workshops and feedback sessions can help bridge the gap between strategic objectives and operational realities.

Effective training and change management ensure employees can adapt to new systems and processes (Dey et al., 2010). However, the urgency of project timelines can lead to inadequate training programs, which may compromise the overall effectiveness of the ERP system. In the mining sector, where operational efficiency is critical, this can lead to significant disruptions (Shaul & Tauber, 2013). Prioritising a phased implementation approach can help balance the need for thorough training with project deadlines. This allows for incremental changes and adequate training, reducing the risk of operational disruptions. Relying heavily on vendor support can create a dependency that undermines the development of internal capabilities (Bawack & Kamdjoug, 2023). In the mining sector, where specialised knowledge of operations is crucial, this can lead to challenges in sustaining the ERP system post-implementation. To mitigate this, organisations should aim to build internal expertise by involving key personnel in the implementation process and providing them with training and resources. This can help ensure the organisation retains critical knowledge and can operate independently of vendor support in the long term.

Various CSFs influence the implementation of ERP systems in the mining sector, which can sometimes create interactions. Understanding these dynamics is essential for effective project management and successful ERP outcomes. Engaging users in the ERP implementation process can enhance training effectiveness. When users are involved in the design and testing phases, they are more likely to understand the system's functionalities and feel a sense of ownership over the new processes (Kirmizi & Kocaoglu, 2022). This synergy can lead to higher acceptance rates and better utilisation of the ERP system. Effective change management strategies that include clear communication can facilitate smoother transitions during ERP implementation. By keeping all stakeholders informed about changes and the reasons behind them, organisations can reduce resistance and foster a supportive environment for change (Nour & Mouakket, 2011). Strong project management

practices that include stakeholder engagement can enhance the overall success of ERP projects. By ensuring that all relevant parties, including end-users, management and IT staff, are involved in the decision-making process, organisations can align their goals and expectations, leading to more cohesive project outcomes (Beheshti et al., 2014).

ERP Systems Challenges

It should be noted that ERP system implementation remains the utmost critical concern for businesses in Zimbabwe and other developing countries because of the considerable investment required in terms of money, procedures and time. Hence, Haddara and Moen (2017) indicated that organizations should reduce the possibility of disheartening effects of poor system implementation. The challenges of implementing and adopting ERP systems in developing countries are multifaceted and require careful consideration. The challenges in developing countries include inadequate internal expertise, lack of resources, incompatible governmental policies with ERP requirements, no proper vetting of systems, resistance to change, and many others (Haddara & Moen, 2017). The literature highlights several key issues that contribute to the difficulties faced in these contexts. The impact of external reference pricing of ERP systems across countries can lead to launch delays, price instability and convergence (Fontrier et al., 2019).

Moreover, the challenges of ERP implementation in developing countries are exacerbated by factors, such as a weak economy, inadequate IT infrastructure, government regulations, lack of skills and cultural issues (Talasi & F Seymour, 2022). Hasheela-Mufeti and Smolander (2022) emphasised that developing countries' telecommunications, internet, and public database systems are less advanced than developed countries, negatively affecting ERP implementation. To overcome these challenges, organisations need leadership commitment to secure the necessary resources and foster a culture that embraces change (Ali & Miller, 2017). Organisations should ensure that top executives are actively involved in the ERP projects, providing clear direction and support throughout the implementation process. ERP systems often need to be customised to fit the specific needs of organisations in developing

countries. Soltan et al. (2015) discuss the importance of adapting ERP solutions to local contexts, including regulatory requirements and cultural practices.

Organizations in developing countries overcome infrastructure limitations and reduce the overall cost of ERP implementation by leveraging cloud ERP systems (Salih et al., 2021). Also, cultural dimensions play a significant role in differentiating ERP systems acceptance, with potential implementation difficulties and lack of user adoption in non-western developing countries (Alhirz & Sajeev, 2015). To mitigate this challenge, organisations must consider local cultural dynamics and employee attitudes towards technology (Ali et al., 2023). Tailoring communication and training strategies to align with cultural values can enhance user acceptance and engagement.

Benefits of ERP Systems

Implementing and adopting ERP systems in developing countries offers numerous benefits despite the challenges associated with their deployment. ERP systems provide flexibility, cost efficiency, scalability, adaptability, availability and configurable data to various companies, improving operational performance and customer service (AlBar & Hoque, 2019). Furthermore, ERP systems have been found to facilitate business agility, meet customer needs and enhance organizational performance, particularly in the context of large manufacturing firms with make-to-order production approaches (Katerattanakul et al., 2014; Velcu, 2007). Moreover, ERP systems have been associated with improved employee productivity, smoother information flow, faster business processes and better support for decision-making, highlighting the positive impact of ERP features on organisational efficiency (Eid & Abbas, 2017). However, it is important to note that the benefits of ERP implementation are contingent on various factors, including economic status, government regulations, IT maturity, firm size, business process management experience and costs, emphasising the need for a comprehensive understanding of the implications of ERP adoption (Findik et al., 2012).

Theoretical Underpinnings

The study is underpinned by critical realism, a philosophical approach developed by Roy Bhaskar in the 1970s. Critical realism

demonstrates that when researchers see the world, they form their own experiences and perceptions (Baig et al., 2020). According to critical realism, individuals can access the natural world through their social and historical context, regardless of their perspective or interpretation (Bhaskar, 2013). Critical realism distinguishes three real domains: empirical, actual, and real (Volkoff & Strong, 2013). The "real" refers to fundamental mechanisms that exist independently of our senses, whereas the "actual" encompasses events that occur and the "empirical" relates to our observations of these occurrences (Shaul & Tauber, 2013).

Critical realism addresses the research problem by insisting that understanding ERP implementation challenges in Zimbabwe's mining sector requires uncovering deep-seated structures, such as historical governance, colonial legacy, policies and generative mechanisms, such as socioeconomic constraints, organizational dynamics that causally influence outcomes, moving beyond surface-level symptoms. To operationalise the investigation, critical realism is integrated with the Technology-Organisation-Environment (TOE) framework (Tornatzky & Fleischer, 1990) and the Technology Acceptance Model (TAM) (Davis et al., 1989). This combined approach provides a holistic lens to analyze the interaction of technological, organizational, environmental and user-acceptance factors within this unique context, exploring the underlying causes enabling or hindering ERP implementations.

The study draws on the TOE and TAM for the research. The critical realist approach provides a philosophical foundation for understanding the complex interactions between technology, organization and the environment. TOE Framework is a popular theoretical tool for analyzing factors influencing innovation implementation and adoption in businesses (Awa et al., 2016). The TOE framework posits that the three primary contexts—technological, organisational and environmental—affect the adoption and implementation of technologies, such as ERP systems. In the Zimbabwean mining sector, technological factors include the quality and compatibility of the ERP system with existing infrastructure.

Research indicates that system quality significantly influences user satisfaction and

overall ERP success (Anjum, 2011; Ghayas et al., 2022). Moreover, the organisational context encompasses factors, such as management support, organisational culture and employees' readiness to adopt new systems. Studies have shown that strong organisational support correlates positively with successful ERP implementation, as it fosters an environment conducive to change (Garg & Agarwal, 2014; Lee et al., 2010). Environmental factors, including regulatory pressures and market conditions, also play a crucial role, as they can either facilitate or hinder the implementation process (Soltan et al., 2015).

The TAM model further complements the TOE framework by focusing on user acceptance and the perceived usefulness of the ERP system. User satisfaction is a critical determinant of ERP success, as it directly impacts the likelihood of continued use and engagement with the system (Anjum, 2011; Lee et al., 2010). The perceived ease of use and perceived usefulness are essential components of TAM that can be particularly relevant in the Zimbabwean mining sector, where user training and support may be limited. Research has demonstrated that when users perceive an ERP system as beneficial and easy to use, their acceptance and satisfaction levels increase, leading to higher implementation success rates (Anjum, 2011; Lee et al., 2010).

Integrating these frameworks allows for a comprehensive analysis of critical success factors influencing the ERP implementation in the Zimbabwean mining sector. For instance, aligning technological capabilities with organizational needs and external environmental conditions can enhance the perceived usefulness of the ERP system, thereby fostering user acceptance. Additionally, the identification of specific CSFs, such as top management support, user training and effective communication, can be framed within the TOE and TAM contexts to provide a more robust understanding of the factors that contribute to successful ERP implementation (Rahayu & Dillak, 2018; Soltan et al., 2015).

Moreover, the literature highlights the importance of contextual factors unique to the Zimbabwean mining sector, such as the socioeconomic environment and the specific challenges organizations face in this industry. Understanding these contextual elements

through a critical realist lens allows researchers to appreciate the complexities of the ERP implementation beyond mere technical specifications, emphasizing the need for a holistic approach that considers both the structural and agency aspects of organizations (Lumadi & Nyasha, 2024; Soltan et al., 2015). In conclusion, incorporating the TOE framework and the TAM model into a critically realistic approach provides a comprehensive lens to analyse the critical success factors for ERP implementation in the Zimbabwean mining sector. By recognizing the interplay between technological, organizational and environmental factors alongside user acceptance dynamics, this approach can inform the development of a conceptual ERP framework that addresses the sector's unique challenges and opportunities, as shown in Figure 1 at the end of this work.

Methodology

Design

The study employed a critical realism-guided literature review design. The design focused on systematically identifying, analyzing and synthesizing existing scholarly literature on ERP implementation, particularly within the Zimbabwean mining sector. The critical realism philosophy shaped the entire process, driving the search for underlying structures, such as historical policies and governance issues, as well as generative mechanisms, including socioeconomic constraints, organizational dynamics and technology affordance interactions that explain ERP implementation outcomes, moving beyond surface-level descriptions.

Population and Sampling

The population comprised all relevant academic publications (peer-reviewed journal articles, conference proceedings, books/book chapters, dissertations) and credible industry reports concerning ERP implementation, critical realism, the Zimbabwean mining sector, and related contextual factors. Purposive sampling was the primary strategy. Literature was selected based on its direct relevance to the research, focusing on ERP implementation success and failure factors, critical realism applications in IS/ERP research, the structure, challenges and technology adoption landscape of Zimbabwe's mining sector and the integration of TOE and TAM frameworks. Key databases, for example, Scopus, Web of

Science, EBSCOhost, Google Scholar and specific journals/conferences in IS, management, and African studies were targeted. Seminal works, for example, those by Bhaskar and key TOE/TAM authors, as well as recent publications, were prioritized.

Instruments

The primary instruments were structured analytical frameworks derived from the study's theoretical foundation, which consisted of critical realism ontology, used to categorize findings into the Real (structures/mechanisms), Actual (events/case outcomes), and Empirical (reported experiences/perceptions) categories. The other instrument used was the integrated TOE-TAM-Critical Realism Lens, which was a matrix combining TOE factors with TAM, constructing (Perceived Usefulness, Perceived Ease of Use), all analyzed through the critical realism focus on uncovering causal powers and contextual depth specific to Zimbabwe. The last instrument used was a data extraction template, a structured form designed to capture key information from each source. This included details such as authors, year, research focus, key findings, identified structures and mechanisms, TOE/TAM factors, and the Zimbabwe-specific context.

Validity and Reliability

The validity was achieved through theoretical triangulation, utilizing multiple integrated theories, including critical realism, TOE, and TAM, to analyse the literature and enhance interpretive validity. Source triangulation was also employed by incorporating diverse literature types, such as academic articles and industry reports, to provide multiple perspectives. In addition, critical engagement was used to actively analyse literature for methodological rigour, author positionality and contextual limitations, consistent with essential principles of realism. Additionally, a transparent process was employed by clearly documenting search strategies, inclusion and exclusion criteria, and analytical steps. The Reliability was achieved through following a documented, replicable process for literature search, screening and analysis, applying consistent Critical realism, TOE, and TAM frameworks for categorization and interpretation and discussing interpretations with peers and

supervisors while maintaining reflexivity about the researcher's role in knowledge construction.

Ethical Considerations

The authors ensured that all sources were rigorously and accurately cited, using a consistent academic APA referencing style to avoid plagiarism and give proper credit to original authors. Furthermore, the findings from the literature were represented accurately and without distortion, acknowledging the limitations and potential biases inherent in the source material. While primarily analyzing publicly available literature, any sensitive information potentially gleaned from specific reports was handled with discretion.

Findings and Discussion

This section presents the findings derived from a comprehensive literature review, concerning ERP implementation within Zimbabwe's mining sector, guided by the critical realism perspective.

Critical Realism Concepts

The literature review revealed several core critical realism concepts as highly relevant in analyzing the ERP implementations in the Zimbabwean mining sector. Primarily, the distinction between real, that is generative mechanisms, actual, that is, events, and empirical, that is, experiences/observations domains, is crucial. ERP success or failure is often attributed to empirical observations, yet critical realism prompts an investigation into the underlying generative mechanisms, such as organisational culture, power dynamics, resource availability and technological infrastructure, that produce these outcomes (Volkoff & Strong, 2013). The concept of stratification, where reality is composed of interconnected layers, helps in understanding how macro-level economic policies, meso-level industry regulations and micro-level organisational structures interact to influence ERP projects. Furthermore, the idea that properties at one level cannot be reduced to properties of another is evident in how integrated ERP systems create emergent organizational capabilities not present in fragmented legacy systems.

ERP Implementation Dynamics

Analysis of the reviewed literature indicates that ERP implementation in Zimbabwe's mining

sector presents a complex interplay of both successes and significant challenges. Successes, though less frequently documented in detail, are often linked to improved data integration, enhanced operational visibility and the potential for greater compliance with regulatory frameworks. However, literature predominantly highlights challenges. These include, but are not limited to, resource constraints, such as limited foreign currency for software licenses and expert consultants, skills gaps among local IT personnel and end-users, and resistance to change within established organisational cultures (Haddara & Moen, 2017). Furthermore, issues related to data quality and migration from legacy systems are consistently cited as major hurdles. The literature suggests that while the aspirational benefits of ERP are understood, the practical execution often grapples with the unique operational and economic realities of the Zimbabwean context.

Causal Mechanisms in ERP

From a critical realism perspective, the literature review highlights several generative mechanisms that influence ERP implementation outcomes. Financial viability and access to capital emerge as a fundamental mechanism, directly impacting the choice of ERP system, the quality of implementation partners, and the ability to sustain post-implementation support. Human agency, specifically the commitment and leadership of senior management, acts as a crucial mechanism, enabling or hindering resource allocation, policy enforcement and overcoming resistance. Conversely, a lack of skilled human capital and insufficient training programs serve as underlying causal mechanisms leading to poor user adoption and system under-utilization. Organisational culture, particularly its adaptability and willingness to embrace standardised processes, functions as another potent mechanism; cultures resistant to change often impede the necessary business process re-engineering (Garg & Agarwal, 2014). Lastly, the state of national infrastructure, such as reliable internet and power supply, acts as a contextual mechanism, either facilitating or disrupting the ongoing operation and optimization of cloud-based or heavily networked ERP solutions.

Contextual Influences

Zimbabwe's broader socioeconomic and political landscape has a profound contextual influence on ERP implementation in its mining

sector. The prevailing economic instability, characterized by inflation, currency fluctuations and foreign currency shortages, directly impacts project budgeting, vendor payments and the affordability of ongoing maintenance and upgrades. Regulatory frameworks and government policies, while aiming to promote mining sector efficiency, sometimes introduce complexities or uncertainties that affect long-term technology investments (Soltan et al., 2015). The historical legacy of fragmented systems and ad-hoc processes in some mining operations also shapes the ERP implementation journey, necessitating extensive clean-up and process harmonisation efforts. Furthermore, the global nature of mining operations, juxtaposed with local constraints, often creates tension, where international best practices meet localised realities, requiring significant adaptation during implementation. This contextual analysis underscores that ERP success is not solely a technical endeavour but is deeply embedded in and shaped by the broader societal and economic structures.

Discussion

This section delves into a discussion of the findings from the literature review, examining the intricate dynamics of ERP system implementation within the Zimbabwe's mining sector through the lens of critical realism. The study synthesizes the observed phenomena, identifies underlying generative mechanisms and explores the profound influence of the broader socioeconomic and political context.

Reconciling Empirical Observations with Generative Mechanisms

The literature review provides robust support for the application of critical realism, particularly its tripartite distinction between real, actual and empirical domains, in understanding the ERP implementation. The findings reveal that while empirical observations often highlight immediate successes, such as improved data integration, a critical realist perspective compels us to look beyond these surface-level events. Conversely, failures, including project delays and under-utilization, are also noted. The true explanatory power lies in uncovering the underlying generative mechanisms. For instance, enhanced operational visibility, that is, an empirical observation is not merely a consequence of the ERP system itself, but rather an emergent property, that is, a critical

realism concept arising from the interplay of mechanisms such as data standardization, process automation, and improved information flow, all underpinned by the real causal powers of the integrated system.

Conversely, widely reported challenges, such as resistance to change, which is an empirical observation, are not simply random occurrences. They are often the actualized effects of deeper generative mechanisms, including deeply entrenched organizational cultures resistant to process re-engineering, inadequate leadership commitment that fails to drive adoption, or insufficient training programs that leave users unprepared. This reinforces Bhaskar's notion that science aims to explain not just what happens but why it happens by identifying the necessary conditions and mechanisms that produce particular outcomes. The stratification concept further illuminates this, showing how macro-level economic instability in Zimbabwe, a structural mechanism, directly influences micro-level organizational decisions regarding ERP investment and sustainability, leading to resource constraints, which is an actual event that then manifests as project hurdles, as observed empirically.

Unpacking the Interplay of Successes, Challenges and Causal Mechanisms

The findings underscore a stark contrast between the aspirational benefits of the ERP system and the challenging realities of its implementation in the Zimbabwean mining sector. While theoretical benefits, such as enhanced operational visibility and regulatory compliance, are recognized, the practical journey is fraught with significant obstacles. The predominant documentation of challenges over successes in the literature suggests a prevailing struggle, where the actual events of implementation often fall short of the real potential of ERP systems.

Key generative mechanisms, such as financial viability, human agency, especially leadership commitment, skilled human capital, organizational culture and national infrastructure, do not operate in isolation. They are deeply interconnected, and their combined causal powers determine implementation outcomes. For example, the lack of foreign currency, a financial mechanism influenced by the macroeconomic context, directly constrain

the ability to secure expert consultants and licenses, which in turn exacerbates skills gaps, a human capital mechanism that ultimately leads to poor user adoption, an empirical outcome. The concept of structuration is particularly pertinent where human actors, such as IT personnel and end-users, both shape, for example, through resistance or championing and are shaped by, for example, existing organizational structures or technological limitations, in the ERP implementation process. This reciprocal relationship underscores the ongoing dialectic between agency and structure, where successful implementation necessitates a dynamic interplay between top-down structural changes and bottom-up agency.

The Overarching Shadow of Contextual Influences

Perhaps the most salient finding is the profound and pervasive influence of Zimbabwe's socio-economic and political landscape. This external contextual mechanism acts as a powerful conditioner, shaping the emergence and activation of other generative mechanisms. Economic instability, currency fluctuations and foreign currency shortages directly impede financial viability, making long-term technology investments precarious and maintenance challenging. This aligns with broader development literature, suggesting that technology adoption in developing economies is heavily contingent on stable macroeconomic environments.

Furthermore, the historical legacy of fragmented systems within some mining operations necessitates extensive data cleanup and process harmonization, adding layers of complexity to ERP projects. This highlights the concept of path dependency, where past decisions and existing structures significantly influence future technological trajectories. The tension between global best practices and localized realities, driven by regulatory frameworks and specific operational conditions, demands significant adaptation during implementation. This emphasizes that ERP implementation is not a generic, universally applicable process but a context-dependent endeavour, where off-the-shelf solutions often require substantial localization to achieve desired outcomes.

Therefore, viewing ERP implementation in Zimbabwe's mining sector through a critical realism lens offers a richer and more nuanced understanding. It allows us to move beyond mere description of events to uncover the hidden causal powers and mechanisms at play, acknowledging the complex interplay between deep-seated structures and human agency, all within a unique and challenging socioeconomic context. This understanding is crucial for developing more effective strategies and policies aimed at successful technology adoption in similar developing contexts.

Conclusions and Recommendations

The study offers a comprehensive and nuanced understanding of ERP system implementation within Zimbabwe's mining sector. By rigorously applying the critical realism concepts, this study transcends mere surface-level descriptions to illuminate the deeper causal powers influencing ERP outcomes. The study concludes that ERP system implementation in Zimbabwe's mining sector is a complex process with both successes and significant challenges. While some mining companies experience benefits like improved data integration and regulatory compliance, many face major hurdles. The most common challenges are foreign currency shortages, skills gaps and resistance to change. The overall success of these projects is profoundly impacted by Zimbabwe's unique microeconomics and political landscape.

The study concludes that ERP implementation is not merely a technical task but a context-dependent process. Success hinges on understanding and addressing the interplay between deep-seated organizational structures, human actions and challenging socioeconomic conditions. This understanding is crucial in developing effective and sustainable strategies for technology adoption in developing contexts. The study suggests that future studies should employ the field research approach, gathering data on real-world implementations, to validate the proposed framework. Longitudinal studies are also recommended to track ERP systems beyond initial implementation to establish their sustained use, evolution and long-term benefits or challenges.

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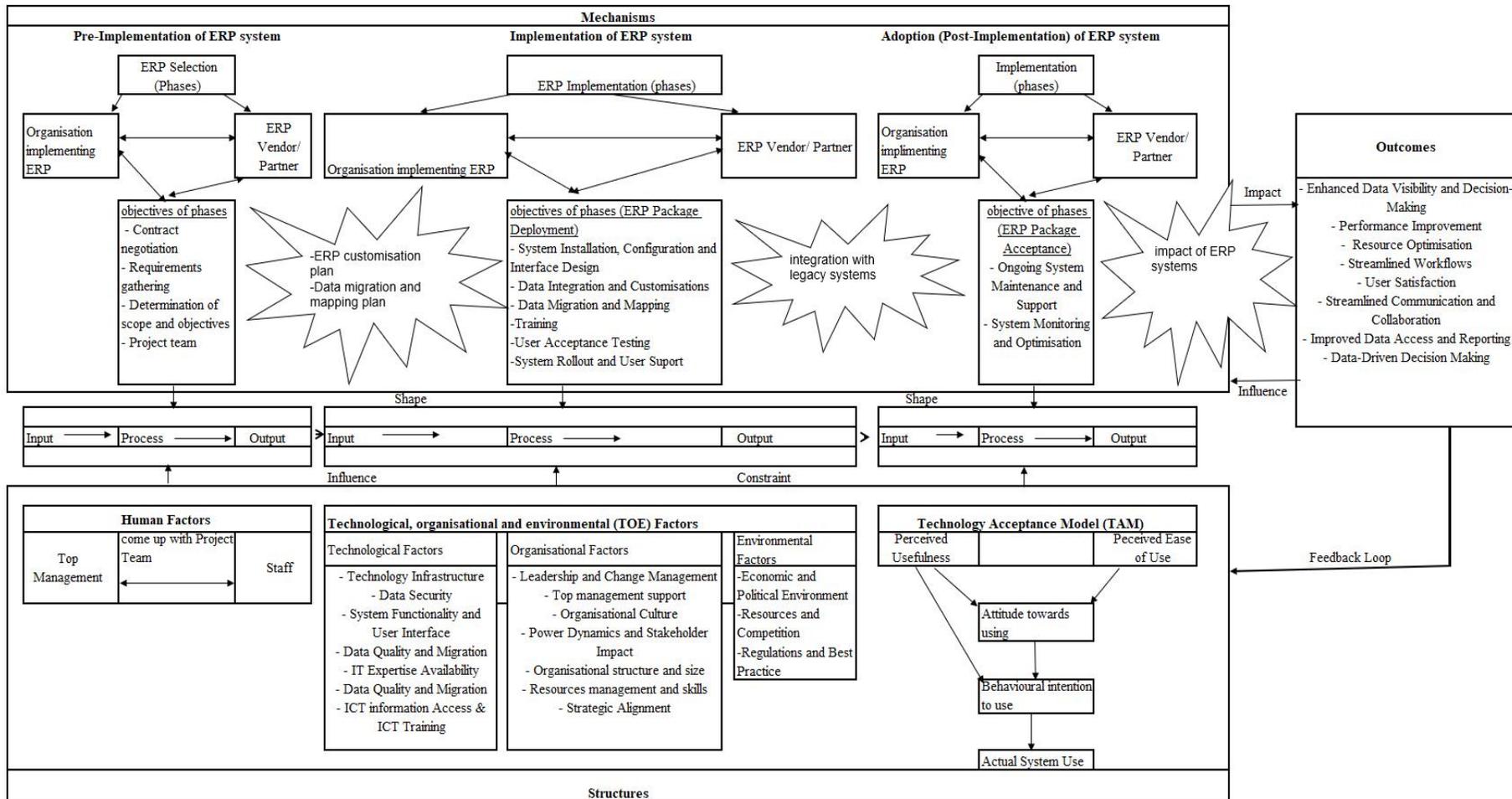


Figure 1: Conceptual ERP System Implementation and Adoption Framework