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A Critical Realist ERP Implementation in Zimbabwean Mining Industry Organisations

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ABSTRACT

This research uses a critical realist framework to examine the factors influencing the success of enterprise resource planning (ERP) system implementation in Zimbabwean mining industry organisations. From the perspective of critical realism, the mining industry in Zimbabwe faces a complex interplay of opportunities and obstacles while implementing ERP systems. The deployment of ERP in mining firms is critically examined in this paper, emphasising how these systems might improve operational efficiency while considering Zimbabwe's particular socioeconomic circumstances. By exploring underlying structures, mechanisms, and outcomes, the research aims to identify critical challenges and opportunities and develop practical recommendations for improving ERP adoption and effectiveness. The study employs a critical realist approach to comprehend the interconnectedness and feedback loops among structures, mechanisms, and outcomes. The researcher combined qualitative and quantitative data gathering and analysis approaches using a contemporaneous mixed methods design. The researcher conducted four in-depth interviews with key stakeholders to gather rich, contextualised insights and administered eighty cross-sectional survey questionnaires to a broader sample to collect quantitative data. This study examined the multiple obstacles and success aspects of ERP system installation in Zimbabwean mining organisations. The study discovered that while ERP systems offer significant potential benefits, their successful implementation is contingent on several technological, economic, organisational, and regulatory factors. The findings emphasise the need for strong leadership, effective change management, training and development, proper ERP selection, risk management, business process engineering, data migration, and user contact to facilitate successful ERP adoption in the Zimbabwean mining industry. The findings of this research offer valuable guidance for mining organisations in Zimbabwe seeking to implement ERP systems effectively.

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INTRODUCTION

Mining minerals and mineral products have formed the backbone of many businesses worldwide. The mining industry has long been a cornerstone of Zimbabwe's economy, contributing significantly to

GDP, employment, and foreign exchange earnings (Langton et al., 2024). Tanda & Genc, pp. (2024, pp. 1–2) indicated that "according to National Accounts – Zim Stat in 2023, mining products in Zimbabwe account for 60% of the country's foreign exchange earnings and 12% of its Gross Domestic Product (GDP)." The mining industries are characterised by their complex operations, vast resources, and stringent regulatory environments, and they face several challenges: low productivity, high costs, environmental degradation, regulatory compliance, and social responsibility (Muchaendepi et al., 2019). Mining in Zimbabwe has an economic impact that extends beyond direct mining activities, influencing upstream and downstream industries, thereby creating a network of economic linkages (Mlambo & Kwesu, 2021).

With technological advancements, the private industry and the government of Zimbabwe have invested in ICTs, mainly terrestrial optic fibre (Makiwa & Steyn, 2016). However, most of Zimbabwe's small-scale miners and some larger mines did not connect to this infrastructure to improve internet connectivity. This, according to (Tsarwe, 2014), could be due to the lack of organisational processes and the unclear integration of the ICT infrastructure framework. According to a study on coal mines by (Mathu & Scheepers, 2016), the South African mining industry is also grappling with infrastructural and labour relations issues, while the South African government is exploring alternative energy options. Economic instability and challenges in securing investments for technology upgrades have led to the slow adoption of ERP systems in the Zimbabwean mining industry due to financial constraints (Gochero, 2018).

The Mining industry organisations also face various operational and strategic issues, such as resource depletion, low productivity, skills shortages, regulatory compliance, and technological innovation (Ediriweera & Wiewiora, 2021). Implementing ERP systems can facilitate the effective management and coordination of the industry's activities and resources, thereby addressing these issues. ERP systems are integrated software solutions that allow for real-time management of fundamental company processes using technology and software (Jabbarzadeh, 2017). The design of these systems streamlines and optimises various organisational functions such as production, logistics, finance, accounting, sales, marketing, and resource management (Vahidi et al., 2014). Due to the complex nature of the operations of Mining industry organisations, (Anjum et al., 2023) suggest that implementing and adopting ERP systems can support process re-design and automation, which are essential for overcoming challenges related to environmental degradation and regulatory compliance.

Many researchers have proposed several ERP systems frameworks (Dantes & Hasibuan, 2010; Esteves, 2009; Jagoda & Samaranayake, 2017; Luciana et al., 2018; Matolcsy et al., 2005; Sahran et al., 2010). The researchers agreed that most ERP systems implementation frameworks use similar methodologies of "pre-implementation, implementation cycle and post-implementation phases or framework proposed using Critical Success Factors (CSFs)" (Alaskari et al., 2021). However, there is a lack of in-depth analysis using a critical realist perspective, a philosophical approach emphasising the importance of understanding complex systems' underlying structures, mechanisms, and outcomes. This gives a valuable perspective for examining the implementation of ERP in the mining industry. This study aims to investigate the underlying structures, mechanisms, and outcomes influencing ERP implementation success in Zimbabwean mining industry organisations and determine how they interact during ERP implementation. In addition, the study aims to provide practical recommendations for mining companies to improve their ERP implementations' efficiency, effectiveness, and sustainability.

LITERATURE SURVEY

ERP Systems in Zimbabwe

ERP system implementation in Zimbabwe is a critical area that requires attention. Several studies have delved into the factors influencing ERP adoption in various contexts. For instance, Shiau et al. (2009), identified critical constructs related to ERP implementation, such as investment decisions, benefits analysis, cost analysis, and technology analysis. According to Wieder et al. (2006), ERP implementation can lead to efficiency gains in reduced employee numbers and improved employee-to-revenue ratios post-implementation. Moreover, El Sawah et al. (2008), developed a quantitative model to predict ERP implementation success based on CSFs and organisational culture, which could be valuable for organisations in Zimbabwe.

The study by Justin et al. (2023) investigates the impact of ERP systems on internal controls and decision-making processes in Zimbabwean organisations. Research highlights that ERP systems can streamline processes, improve data accuracy, and enhance decision-making capabilities. However, challenges such as resistance to change and the need for staff training are prevalent, which can impede the successful adoption of ERP systems in Zimbabwean companies. The study to establish the effectiveness of ERP systems in Zimbabwean manufacturing entities by (Nduna et al., 2021, p. 51) reveals that " an ERP system has a positive impact "for the managerial, organisational and strategic frames." In addition, the study by Msipa et al. (2014), assessed ERP systems in Zimbabwean entities and established challenges and a readiness tool for a successful implementation framework.

Moreover, the effects of ERP systems on organisational performance in the Zimbabwe mining sector were established (Mawonde & Demberere, 2022). The research indicated both positive and negative effects of these systems on organisational performance. Additionally, Perdana (2020) emphasised how ERP adoption can enhance organisational performance in managing information, products, and financial flows, which could be relevant for Zimbabwean companies looking to improve their operations. ERP systems are crucial in transforming the Zimbabwean mining sector by driving efficiency, transparency, and cost reduction. Despite challenges, the sector stands to benefit significantly from successful ERP implementation, paving the way for a more competitive and sustainable industry in Zimbabwe (Jafari & Nair, 2018).

Key Concepts of Critical Realism

Critical realism shows that when researchers view the world, they create their exposures and perceptions (Baig et al., 2020). Critical realism posits that access to the real world occurs through their social and historical context, regardless of their perspective and interpretation (Bhaskar, 2013). Critical realism distinguishes between three domains of reality, which are empirical, actual, and real (Volkoff & Strong, 2013). The "real" refers to the underlying mechanisms that exist independently of our perceptions, while the "actual" encompasses events that occur, and the "empirical" pertains to our observations of these events (Shaul & Tauber, 2013).

Another essential concept is the idea of generative mechanisms, which are the underlying processes that produce observable outcomes. These mechanisms may include organisational readiness for change, data management quality, and communication strategies' effectiveness in complex systems (Shaul & Tauber, 2013; Wijaya et al., 2023). Additionally, critical realism emphasises the interplay between agency and structure. In the Zimbabwean mining context, the agency of various stakeholders, including government bodies, mining companies, and local communities, plays a crucial role in shaping the outcomes of ERP projects.

Furthermore, critical realism encourages a reflexive approach to research and practice, prompting stakeholders to consider their biases and assumptions when evaluating ERP projects. This reflexivity is essential in ERP implementation, where the interplay of various stakeholder interests can significantly impact outcomes (Hilson et al., 2019; Powell et al., 2012). Critical realism fosters a more holistic understanding of ERP implementation processes by acknowledging the complexity of social interactions and the potential for conflicting interests.

Application of Critical Realism to ERP Implementation

The mining industry in Zimbabwe is characterised by a dual structure comprising formal and informal operations, particularly in artisanal and small-scale mining (Mkodzongi & Spiegel, 2019). This duality complicates ERP implementation by necessitating a nuanced understanding of the diverse stakeholder interests and operational realities. Critical realism posits that social structures, such as the regulatory frameworks governing mining activities, significantly influence the behaviour of actors within the industry (Murombo, 2016). For instance, (Singo et al., 2022) has identified the lack of comprehensive training and capacity-building initiatives for artisanal and small-scale mining operators as a critical barrier to effective ERP implementation. This aligns with the assertion that successful ERP projects require understanding the specific organisational context and the socio-cultural dynamics at play (Ziemba & Oblak, 2013).

Moreover, the mining industry in Zimbabwe faces significant governance challenges, including issues of transparency and accountability (Murombo, 2016). Critical realism emphasises the need to investigate these underlying structures to understand how they affect ERP implementation. For example, the historical context of colonial legislation continues to shape current mining policies, which may hinder the adoption of modern ERP systems (Murombo, 2016). The interaction between these historical structures and modern practices can make people resist ERP initiatives, especially if they think they are forced upon them instead of solutions created together (Mutekwe, 2019).

Critical realism's focus on the interplay between agency and structure further underscores its relevance to ERP implementation. In the Zimbabwean context, the agency of various stakeholders, including government bodies, mining companies, and local communities, plays a crucial role in shaping the outcomes of ERP projects. For instance, the involvement of top management and the alignment of ERP systems with organisational goals are critical success factors that can either facilitate or impede implementation (Bueno & Salmeron, 2008; Maditinos et al., 2011). Recognising these dynamics is essential for developing effective strategies that account for the complexities of the mining industry.

Additionally, critical realism encourages a focus on the mechanisms that enable or constrain ERP implementation. Research indicates that inadequate business process reengineering and a lack of alignment between ERP systems and existing business practices contribute to ERP failures (Larasati et al., 2023). Through a critical realist lens, these mechanisms allow for a more comprehensive approach to ERP implementation that considers the technical, socio-political, and economic contexts that influence these processes.

Empirical Insights and User Engagement

Empiricism informed the critical realist framework by providing evidence-based insights into user experiences and organisational practices. Research indicates that user acceptance is a crucial determinant of ERP success, for instance, Salih et al. (2022) found that user rejection of ERP systems is a significant barrier to achieving expected benefits, highlighting the need for active user engagement throughout the implementation process. This empirical evidence underscores the importance of understanding users' specific needs and concerns within the mining sector, which can be influenced by factors such as training, communication, and organisational support.

Moreover, integrating user feedback into the ERP implementation process can help organisations align the system with their operational realities. Abu Ghazaleh et al. (2019) emphasise that understanding the risks associated with ERP systems and involving users in decision-making can lead to more sustainable outcomes. This aligns with the critical realist perspective that emphasises the agency's role in shaping organisational practices.

Conceptual Framework

The conceptual framework for a critical realist approach to ERP implementation in Zimbabwean mining industry organisations can be constructed by integrating the principles of critical realism with empirical insights specific to the mining sector. This framework helps to understand the complex interplay of structures, mechanisms, and agency that influence ERP outcomes in this unique context. A critical realist framework also necessitates exploring the mechanisms and structures that influence ERP implementation in the mining sector. Mahmood et al. (2019) highlight that project management practices, including risk management and resource allocation, are critical for ERP success. Understanding these mechanisms is essential for effective ERP adoption in Zimbabwean mining organisations, where resource constraints and project management capabilities may vary.

Additionally, the contextual factors specific to the mining industry, such as regulatory requirements and market dynamics, must be considered. The differences in decision-making processes between government and private sectors can significantly impact ERP project outcomes(Alkraiji et al., 2022). This insight reinforces the need for a nuanced understanding of the organisational context in which ERP systems are deployed. Critical realism posits that structures are not deterministic but rather possess the potential to enable or constrain events through inherent mechanisms (Omland & Thapa, 2017). This perspective is crucial when examining ERP systems, which are complex and multifaceted. Implementing ERP systems often necessitates significant changes in organisational structures, processes, and employee roles (Simatupang et al., 2016). The lack of effective change management can lead to diminished project quality and user satisfaction (Sudevan *et al*., 2014), highlighting how structural factors can directly impact the mechanisms of implementation success.

The organisational context, including its capacity and processes, significantly influences the effectiveness of practice changes associated with ERP systems (Gramlich et al., 2017). This aligns with the findings of Ghobakhloo et al. (2019) who argue that ERP investments' financial and non-financial performance outcomes are contingent upon contextual and managerial factors. Thus, the structures within which an ERP system operates can either facilitate or hinder the realisation of desired outcomes. Factors such as top management support, user involvement, and effective project management are crucial for successful ERP implementation (Dezdar & Sulaiman, 2009). Similarly, centralisation, as a structural factor, significantly affects the success of ERP implementations, indicating that power distribution within an organisation can shape the implementation outcomes (Nandi & Kumar, 2016). The feedback loop from outcomes back into structures is equally important. The outcomes of ERP systems are influenced by the social and economic context, which can evolve as organisations learn from their implementation experiences (Asamoah & Andoh-Baidoo, 2018).

Mechanisms in ERP implementation can be understood as the processes, practices, and CSFs that drive the implementation efforts. These mechanisms are not merely operational; they are embedded within the organisational structure and culture, shaping how the ERP system is utilised and perceived by users. Menon et al. (2019) identify critical challenges that impede project performance, suggesting that addressing these challenges through well-defined mechanisms can lead to improved outcomes. Successful ERP implementations can lead to sustainable business practices by improving timeliness and customer relationships, generating positive organisational outcomes (Huang et al., 2019).

Feedback from outcomes into mechanisms is a critical aspect of the learning process within organisations. For instance, Al-Jabri (2015) highlights the importance of user satisfaction as a mediating factor that can influence the effectiveness of ERP systems. Moreover, the iterative nature of this relationship is supported by the findings of Maditinos et al. (2011), who argue that the influence of internal stakeholders is crucial in the ERP consulting process. As organisations learn from the outcomes of their ERP systems, they can adapt their stakeholder engagement strategies, ensuring that future implementations are more aligned with user expectations and organisational goals. This feedback loop is essential for continuous improvement, allowing organisations to refine their mechanisms based on real-world experiences and outcomes. As a result, the authors propose the ERP conceptual framework, as shown in Figure 1.

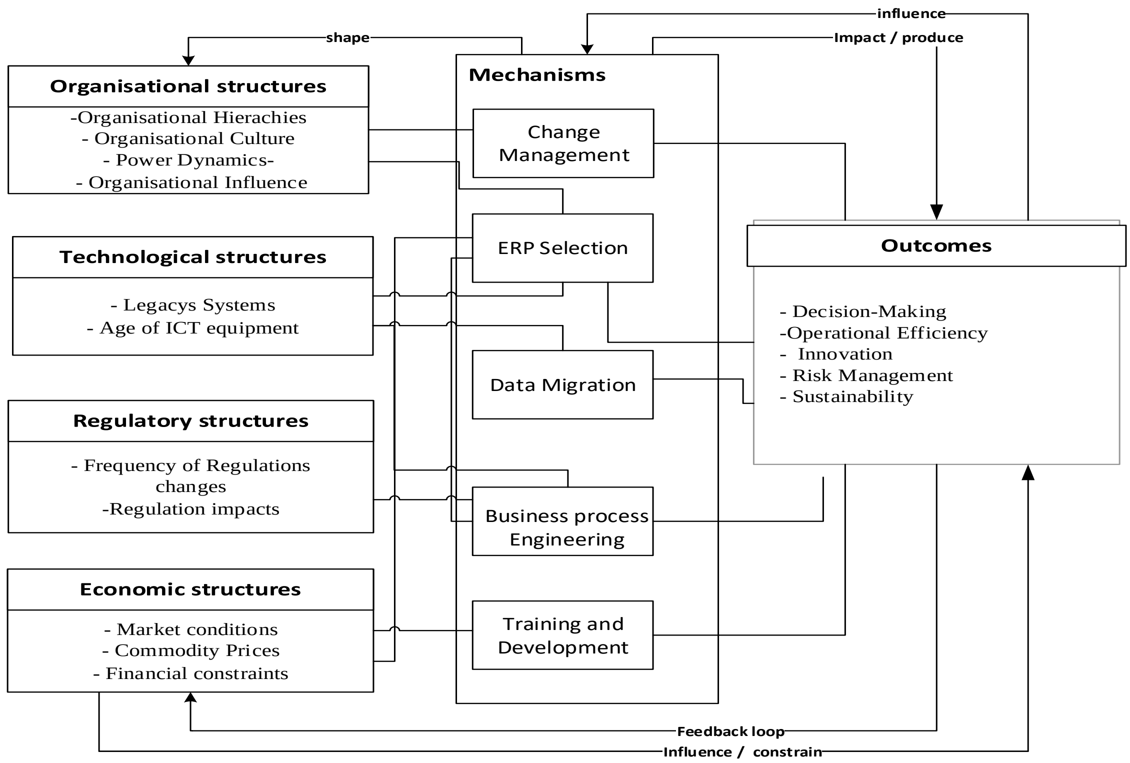

Figure 1: Proposed Conceptual Framework for critical realist ERP implementation.

METHODS AND MATERIALS

Research Philosophy

The underlying philosophy for this research is critical realism (CR). Research approaches based on critical realism present novel avenues for comprehensively investigating intricate organisational phenomena (Wynn & Williams, 2012). Given the ontology of critical realism, which allows for both quantitative and qualitative techniques, the mixed-method approach is the most suitable methodological strategy for the research (Mingers, 2012). According to Creswell (2003), the mixed-method approach entails gathering, analysing, and integrating quantitative and qualitative data at one or more phases of the research process. The researcher used the concurrent mixed method that involves collecting quantitative and qualitative data simultaneously, demonstrating how integrating qualitative and quantitative data can enhance understanding in social research (Kiprugut et al., 2024). This study uses a mixed-methods approach, integrating narrative literature analysis with primary data gathering to obtain thorough insights. It employs a cross-sectional research methodology, drawing respondents from four Zimbabwean mining industry organisations. The authors selected the participants based on their roles and experience in ERP implementation.

Data collection instruments

The primary data was gathered from online interviews with four ICT respondents and 80 online questionnaire respondents. The authors used interviews to gain deeper insights into qualitative analysis. Interviews helped to explore individual perspectives in depth. The interviews explored their perspectives on the structures, mechanisms, and outcomes of ERP implementation in the mining industry. Survey questionnaires were used to collect data for quantitative analysis. The questionnaires helped administer the same questions to many participants, allowing for broad data collection consistency and comparability. The researcher also administered a structured online questionnaire to 80 respondents from Zimbabwean mining organisations. The questionnaire collected data on organisational characteristics, ERP implementation experiences, perceived benefits and challenges, and satisfaction levels.

The research employed content analysis to discern principal patterns in the interview data. The researcher used inferential statistics to summarise the quantitative data and identify critical relationships. The study employed various data collection methods to triangulate findings and bolster the credibility of the results, hence ensuring the research's validity and reliability. In addition, the study strictly adhered to ethical considerations throughout the research process. The researcher protected the privacy and confidentiality of all participants.

RESULTS AND DISCUSSION

This presents an analysis of the findings from qualitative interviews conducted with ICT participants and quantitative findings from the survey questionnaires completed by ICT professionals.

Reliability Analysis

The authors used Cronbach's alpha to assess the internal consistency reliability of a set of items within a questionnaire. This essentially measured how closely related the items were as a group, as given in Table 1.

Table 1: Reliability Statistics

Cronbach's Alpha	N of Items
.878	14

An alpha value of 0.878 is generally considered excellent. It suggests high internal consistency among the questionnaire items, indicating that they reliably measure the same construct related to ERP implementation. The authors also conducted interviews to understand their perspectives and experiences better and further explore the deeper meanings behind the questionnaire results.

Demographic Information

To remove potential gender bias, participants' gender was considered significant in the study. The researcher conducted interviews with two women and two men. Of 80 questionnaire responses, 38 (47.5%) were male and 42 (52.5%) were female. There was a reasonable distribution of participation by gender, with slight variance in percentages. This illustrates the fair examination of both genders' viewpoints and the counteraction of potential gender-based prejudice. The age of participants was considered to guarantee that a bias did not influence the study's conclusions regarding their views and use of ERP systems. According to the results, 41 (52%) of the participants' age was below 30, 17 (21.3%) of the participants' age was between 31 and 40, 17 (21.3%) of the participants' age was between 41 and 50, and 5 (6.33%) of the participants' age was above 50 years. According to the findings, all respondents were old enough to evaluate their companies' ERP systems.

The participant's level of education played a significant role in determining whether they had the necessary qualifications to use and rate the various characteristics of ERP system success. The statistics revealed that 31 (38.8%) had finished university level, 30 (37.5%) had finished diploma level, and 17 (21.3%) had completed National Certificate level. Therefore, we can infer that the respondents' academic qualifications were sufficient to enable them to understand ERP systems in their organisations in depth. The participant's experience level was significant in determining whether they had the necessary experience to utilise and rate the various characteristics of ERP system success. The statistics revealed that 23 (28.7%) of the participants' experience was below 11 years, 38 (47.5%) of the participants' experience was between 11 and 20 years, 16 (20%) of the participants' experience was between 21 and 30 years and 3 (3.8%) of the participants' experience was more than 30 years. Therefore, we can infer that the respondents' experience level was sufficient to provide them with a thorough comprehension of ERP systems inside their businesses. The analysis of data from the questionnaires is given in Table 2.

Table 2: Demographic Information

		Count	Column N %
Gender	Female	42	52.5%
	Male	38	47.5%
Age Range	Less 30 Years	41	51.2%
	31-40 Years	17	21.3%
	41-50 Years	17	21.3%
	51 Years +	5	6.3%
Level of Education	Secondary Level	2	2.5%
	National Certificate level	17	21.3%
	Diploma level	30	37.5%
	University level	31	38.8%
Experience with ERP	0-10 Years	23	28.7%
	11-20 Years	38	47.5%
	21-30 Years	16	20.0%
	31 Years +	3	3.8%

Analysis of Qualitative and Quantitative Data

Interrelationships of organisational structures with associated mechanisms and outcomes

In this study, organisational structures, which encompass the hierarchy, roles, and communication patterns within a company, significantly impact the effectiveness of ERP initiatives. Also, the choice of an ERP system can influence the need for organisational restructuring or changes in reporting relationships. Table 3 gives the correlation analysis of organisational structures with associated mechanisms and outcomes.

Table 3 shows the correlation coefficient (r) between the two variables, organisational structures and ERP selection, is 0.393. The P value is 0.000 < 0.01. Thus, organisational structures and ERP selection have a significant linear relationship. This effectively means organisational structures influence the selection of ERP systems, impacting operational efficiency. This supports the insights from Mahmood et al. (2019), who emphasise that successful ERP implementation hinges on top management commitment, project management, and effective communication, all shaped by the organisational structure. Furthermore, Iyamu & Mphahlele (2014) highlight that the organisational structure influences the deployment of enterprise architecture, which is closely related to ERP selection, as it determines how information flows and how decisions are made within the organisations.

The correlation coefficient (r) between the two variables, ERP selection and operational efficiency, is 0.384. the P value is 0.000 < 0.01. Thus, ERP selection and operational efficiency have a significant linear relationship. This effectively means organisational structures influence the selection of ERP systems, impacting operational efficiency. Similarly, the effectiveness of decision-making is significantly influenced by the quality of the ERP system, which in turn affects operational efficiency (Ouiddad et al., 2021). Furthermore, a well-suited system can enhance efficiency, improve decision-making, and reduce costs, while a poorly chosen system can lead to challenges and inefficiencies. Similarly, outcomes can feedback into structures, leading to organisational hierarchies or technological infrastructure changes. This supports the information discovered from interviews that a hierarchical organisation might favour a centralised ERP system, while a decentralised one might prefer a modular approach. In addition, the improved operational efficiency due to ERP implementation might lead to a flatter organisational structure, reducing layers of management.

The correlation coefficient (r) between the two variables, organisational structures and change management, is 0.291, and the P value is 0.009 < 0.01. Hence, a significant linear relationship exists between organisational structures and change management. It is important to manage roles and responsibilities among stakeholders during ERP implementation, emphasising that a clear organisational structure can enhance the effectiveness of change management strategies (Fulford, 2013). This augments the insights from the interview that different structures may have varying levels of resistance to change, with hierarchical structures potentially being more resistant due to their rigid hierarchy. In addition, effective change management can facilitate organisational transformation and adaptation to the new ERP system. Also, successful change management is essential for overcoming resistance to change and ensuring employee adoption of the ERP system. Inadequate change management can lead to low user adoption, decreased productivity, and project failure.

The correlation coefficient (r) between the two variables, ERP selection and business process engineering, is 0.367. the P value is

0.001 <0.01. Thus, ERP selection and business process engineering have a significant linear relationship. This effectively means that the choice of ERP system can influence the extent of necessary business process reengineering. Cardoso et al. (2011) illustrate that aligning business processes with organisational goals requires a structured approach to harmonising process models with the organisational domain. This augments insights from interviews that the chosen ERP system likely dictates how business processes can be streamlined and integrated. For example, a cloud-based ERP may enable greater flexibility and remote access, facilitating changes to supply chain processes, unlike on-premise ERP, which promotes remote access through VPN access. Also, the chosen ERP system must be able to support the envisioned changes to business processes. This may involve evaluating systems based on their ability to handle specific industry-specific requirements, such as mine planning, geology, and equipment maintenance.

The correlation coefficient (r) between the two variables, ERP selection and change management, is 0.481. the P value is 0.000 <0.01. Thus, ERP Selection and change management have a significant linear relationship. This means that the selection process itself can be a catalyst for change, as it requires careful consideration of existing processes and potential improvements. The chosen system will then dictate the scope and nature of the change management effort. This augments the insights from interviews that change management should be integrated into the ERP selection process from the outset. This ensures that the chosen system is aligned with the organisation's capacity for change and that employees are prepared for the transition.

Table 3: Interrelationships of Organisational Structures

Correlations						
		Organisational Structures	ERP System Selection	Operational Efficiency	Change Management	Business Process Engineering
Organisational Structures	Pearson Correlation	1	.393**	.173	.291**	.165
	Sig. (2-tailed)		.000	.125	.009	.144
	N	80	80	80	80	80
ERP System Selection	Pearson Correlation	.393**	1	.384**	.481**	.367**
	Sig. (2-tailed)	.000		.000	.000	.001
	N	80	80	80	80	80
Operational Efficiency	Pearson Correlation	.173	.384**	1	.322**	.302**
	Sig. (2-tailed)	.125	.000		.004	.006
	N	80	80	80	80	80
Change Management	Pearson Correlation	.291**	.481**	.322**	1	.394**
	Sig. (2-tailed)	.009	.000	.004		.000
	N	80	80	80	80	80
Business Process Engineering	Pearson Correlation	.165	.367**	.302**	.394**	1
	Sig. (2-tailed)	.144	.001	.006	.000	
	N	80	80	80	80	80

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

Interrelationships of technological structures with associated mechanisms and outcomes

Technological structures encompass the existing IT infrastructure, software compatibility, and organisational readiness, which collectively impact the selection of ERP systems, data migration processes, and the overall decision-making framework within organisations. Table 4 gives the correlation analysis of technological structures with associated mechanisms and outcomes.

Table 4 shows the correlation coefficient (r) between the two variables, technological structures and ERP selection, is 0.324. The P value is 0.003 < 0.01. Thus, technological structures and ERP selection have a significant linear relationship. This effectively means that the selection of ERP is vital as rapid advancements in technology can render existing ERP systems obsolete or require significant modifications; hence, selected ERP systems should adapt to changing circumstances and future technological advancements and requirements. Similarly, a robust IT infrastructure is essential for supporting the ERP system and ensuring its smooth operation. Kłos & Trebiina (2014) highlight the importance of evaluating various selection criteria, such as system functionality, total cost of ownership, and vendor experience, which are all contingent upon the current technological landscape. As such, organisations must assess their existing IT infrastructure to ensure compatibility with the chosen ERP system, as inadequate infrastructure can lead to implementation challenges and increased costs (Ahmadzadeh *et al*., 2021).

Table 4: Interrelationships of technological structures

Correlations

		Technological Structures	Business Process Engineering	Data Migration	ERP System Selection	Decision Making	Operational Efficiency
Technological Structures	Pearson Correlation	1	.809**	.490**	.324**	.288**	.952**
	Sig. (2-tailed)		.000	.000	.003	.010	.000
	N	80	80	80	80	80	80
Business Process Engineering	Pearson Correlation	.809**	1	.428**	.413**	.455**	.849**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	80	80	80	80	80	80
Data Migration	Pearson Correlation	.490**	.428**	1	.263*	.229*	.501**
	Sig. (2-tailed)	.000	.000		.018	.041	.000
	N	80	80	80	80	80	80
ERP System Selection	Pearson Correlation	.324**	.413**	.263*	1	.958**	.384**
	Sig. (2-tailed)	.003	.000	.018		.000	.000
	N	80	80	80	80	80	80
Decision Making	Pearson Correlation	.288**	.455**	.229*	.958**	1	.345**
	Sig. (2-tailed)	.010	.000	.041	.000		.002
	N	80	80	80	80	80	80
Operational Efficiency	Pearson Correlation	.952**	.849**	.501**	.384**	.345**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.002	
	N	80	80	80	80	80	80

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The correlation coefficient (r) between the two variables, technological structures and decision-making, is 0.288, and the P value is 0.010 = 0.01. Hence, there is a significant linear relationship between technological structures and decision-making. This effectively means that enhanced data-driven decision-making can drive investments in new technologies or upgrades to existing systems. Also, Ziemba & Oblak (2013) emphasise that decision-making in ERP projects should be informed by critical success factors, including the organisation's technological capabilities. This supports the insights from interviews that the ERP system provides real-time, accurate, and comprehensive data, enabling better-informed decisions. Furthermore, the ERP system provides metrics and key performance indicators that facilitate performance tracking and evaluation, informing decision-making. Moreover, the ERP system can improve communication and collaboration among different departments and stakeholders, leading to better-coordinated decisions.

The correlation coefficient (r) between the two variables, technological structures and data migration, is 0.490, and the P value is 0.001 < 0.01. Hence, technological structures and data migration have a significant linear relationship. This means that the accuracy and completeness of these data migration processes determine the quality of the migrated data, and the rigour and thoroughness of testing activities ensure data integrity. Ahmadzadeh et al. (2021)point out that a well-defined technological infrastructure is vital for ensuring data quality and integrity during data migration. Effective project management and coordination between different teams involved in the migration process should exist. This augments the insights from the interview that legacy systems can constrain the possibilities of ERP integration while a modern IT infrastructure can enable more advanced functionalities that can facilitate a smoother transition. The process of migrating data from legacy systems to the ERP can require adjustments to existing data structures and workflows. In addition, data cleansing, validation, and integration processes must be done thoroughly since poor data quality can lead to inaccurate insights and poor decision-making, undermining the benefits of ERP implementation.

The correlation coefficient (r) between the two variables, technological structures and business process engineering, is 0.809. the P value is 0.000 <0.01. Thus, technological structures and business process engineering have a strong linear relationship. This effectively means that the ERP system's capabilities can drive the need for and shape the nature of business processes. As noted by Mohammad Khashman (2019), business process engineering is increasingly recognised as a necessary approach for enhancing organisational performance and heavily relies on enabling information technologies. This supports the interview insights that ERP systems automate many manual tasks, freeing up process improvement and innovation resources. ERP system data and tools are also used to simulate and model "what-if" scenarios for process improvement. Business process engineering may require the customisation of the ERP system to support new or modified processes fully.

Interrelationships of regulatory structures with associated mechanisms and outcomes

In this study, regulatory structures encompass the laws, guidelines, and standards that govern how organisations operate. They play a significant role in shaping decisions related to ERP systems. Table 5 gives the correlation analysis of regulatory structures with associated mechanisms and outcomes.

Table 5: Interrelationships of regulatory structures

Correlations						
		Regulatory Structures	Business Process Engineering	ERP System Selection	Risk Management	Sustainability
Regulatory Structures	Pearson Correlation	1	.748**	.322**	.280*	.478**
	Sig. (2-tailed)		.000	.004	.012	.000
	N	80	80	80	80	80
Business Process Engineering	Pearson Correlation	.748**	1	.413**	.455**	.428**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	80	80	80	80	80
ERP System Selection	Pearson Correlation	.322**	.413**	1	.958**	.263*
	Sig. (2-tailed)	.004	.000		.000	.018
	N	80	80	80	80	80
Risk Management	Pearson Correlation	.280*	.455**	.958**	1	.229*
	Sig. (2-tailed)	.012	.000	.000		.041
	N	80	80	80	80	80
Sustainability	Pearson Correlation	.478**	.428**	.263*	.229*	1
	Sig. (2-tailed)	.000	.000	.018	.041	
	N	80	80	80	80	80

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

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

The correlation coefficient (r) between the two variables, regulatory structures and business process engineering, is 0.748. The P value is 0.000 < 0.01. Thus, regulatory structures and business process engineering have a strong linear relationship. This effectively means that the pressure exerted by regulatory bodies to ensure compliance can drive business activities, and business process engineering processes are used to identify and mitigate the risks associated with non-compliance. In addition, ERP systems can be used to automate compliance-related tasks and improve the efficiency of compliance processes.

The correlation coefficient (r) between the two variables, regulatory structures and ERP selection, is 0.322. The P value is 0.004 < 0.01. Thus, regulation structures and ERP selection have a significant linear relationship. This effectively means that regulatory requirements significantly influence the evaluation and selection of ERP systems. AlBar & Hoque (2019) found that competitive and regulatory environments are key determinants in adopting cloud-based ERP services. This augments the insights from interviews that organisations must evaluate potential ERP solutions based on functionality, cost, and ability to comply with relevant regulations. The selected ERP should be able to protect sensitive data and ensure compliance with data privacy regulations. Organisations should conduct due diligence on ERP vendors to assess their compliance with relevant regulations and industry standards. In addition, the organisations may seek legal and compliance expertise to advise on selecting an ERP system that meets regulatory requirements. This augments the insights from interviews that the project methodology of the selected ERP system should suit the frequency of regulation changes; for example, waterfall methodology may be less adaptable to changing regulatory requirements, while agile methodology is more flexible and adaptable to changes, including those arising from evolving regulatory landscapes. It allows for continuous evaluation and adjustment of the ERP selection process based on new regulatory information.

The correlation coefficient (r) between the two variables, ERP selection and risk management, is 0.958. the P value is 0.000 < 0.01. Thus, ERP selection and risk management have a strong linear relationship. This effectively means organisations must conduct risk assessments to identify potential regulatory compliance issues and select ERP systems that can mitigate those risks. The correlation coefficient (r) between the two variables, regulatory structures and risk management, is 0.280. the P value is 0.012 < 0.05. this means that organisations must adopt a risk-based approach to compliance, identifying and addressing the most critical risks since non-compliance with regulations poses significant risks to organisations. This has been supported by Ahn & Ahn (2020), who highlight that the regulatory environment significantly influences the intention to adopt cloud-based ERP systems, which can be seen as a risk management strategy to ensure compliance with evolving regulations.

The correlation coefficient (r) between the two variables, regulatory structures and sustainability, is 0.478. the P value is 0.000 < 0.01; thus, ERP Selection and sustainability have a significant linear relationship. This means that regulatory compliance can drive the adoption of sustainable practices within organisations. In this case, regulatory requirements can be integrated into risk management frameworks to identify and mitigate environmental and social risks, where ERP systems can be used to track and report on key performance indicators related to sustainability. This has been supported by Alsaid (2022), who discusses how ERP-enabled management accounting systems can support sustainability efforts within organisations. This supports the insights from interviews that regulatory frameworks promoting sustainability can influence ERP systems' design and functionality, encouraging organisations to adopt practices that align with environmental and social governance criteria.

Interrelationships of economic structures with associated mechanisms and outcomes

In the study, economic structures encompass the financial resources, market conditions, and overall economic environment within which organisations operate. This multifaceted relationship affects how organisations select ERP systems, implement training programs, achieve operational efficiency, and manage risks associated with ERP initiatives.Table 5 gives the correlation analysis of economic structures with associated mechanisms and outcomes.

The correlation coefficient (r) between the two variables, economic structures and training and development, is 0.272. The P value is 0.015 < 0.05. Thus, economic structures and training and development have a significant linear relationship. This means that adequate training and development are essential for employees to use the ERP system and realise its benefits effectively since insufficient training can lead to user errors, decreased productivity, and missed opportunities. This is supported by Arasanmi & Ojo (2023), who discuss how the economic environment can affect the availability of resources for training programs, which are essential for ensuring that employees can effectively utilise the ERP system. Fluctuating commodity prices or financial constraints can impact the available budget for ERP implementation, limiting the scope of the project or requiring trade-offs between different functionalities, and this impacts the need for workforce upskilling or reskilling, affecting training and development initiatives. Market competition drives the need for continuous improvement and innovation, necessitating well-trained employees to leverage the capabilities of the ERP system. In addition, rapid technological advancements require ongoing training to keep employees updated on new features, functionalities, and best practices.

Table 6: Interrelationships of economic structures

Correlations

		Economic Structures	ERP System Selection	Training and Development	Risk Management	Operational Efficiency
Economic Structures	Pearson Correlation	1	.467**	.272*	.470**	.312**
	Sig. (2-tailed)		.000	.015	.000	.005
	N	80	80	80	80	80
ERP System Selection	Pearson Correlation	.467**	1	.293**	.958**	.384**
	Sig. (2-tailed)	.000		.008	.000	.000
	N	80	80	80	80	80
Training and Development	Pearson Correlation	.272*	.293**	1	.346**	.274*
	Sig. (2-tailed)	.015	.008		.002	.014
	N	80	80	80	80	80
Risk Management	Pearson Correlation	.470**	.958**	.346**	1	.345**
	Sig. (2-tailed)	.000	.000	.002		.002
	N	80	80	80	80	80
Operational Efficiency	Pearson Correlation	.312**	.384**	.274*	.345**	1
	Sig. (2-tailed)	.005	.000	.014	.002	
	N	80	80	80	80	80

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

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

The correlation coefficient (r) between the two variables, economic structures and ERP selection, is 0.467. The P value is 0.000 < 0.01. Thus, economic structures and ERP selection have a significant linear relationship. This effectively means that economic conditions influence the available budget for ERP investments and the prioritisation of different selection criteria, such as low-cost ERP or ERP, based on quality and functionality. Similarly, a well-selected ERP system can facilitate better resource management and process integration, improving operational performance, especially in economically stable environments (Johansson et al., 2015). Market competition also drives organisations to select ERP systems that enhance competitiveness through improved efficiency, productivity, and agility. Rapid technological advancements necessitate selecting ERP systems compatible with emerging technologies and can support future innovation.

Furthermore, Menezes et al. (2023) highlight the importance of evaluating the return on investment associated with ERP systems, which is directly influenced by the economic context.

The correlation coefficient (r) between the two variables, economic structures and risk management, is 0.470. the P value is 0.000 < 0.01. Thus, ERP selection and risk management have a significant linear relationship. This effectively means that economic fluctuations require organisations to adapt their risk management strategies to changing economic conditions and resource constraints. This has been supported by Ghosh et al. (2013) who emphasise that effective risk management involves identifying potential challenges and developing strategies to mitigate them, which is particularly important in economically uncertain environments. This augments insights from interviews that show that market competition drives the need for robust risk management to ensure that the ERP implementation project delivers the expected benefits and maintains a competitive advantage. In addition, the rapid pace of technological change necessitates proactive risk management to address the potential risks associated with technological obsolescence and integration challenges.

The correlation coefficient (r) between the two variables, economic structures and operational efficiency, is 0.312. the P value is 0.005 < 0.01; thus, economic structures and operational efficiency have a significant linear relationship. This means that economic conditions influence the prioritisation of operational efficiency. The ERP systems can streamline business processes, reduce operational costs, and improve overall productivity (Ali et al., 2023). This augments the insights from interviews that during economic downturns, improving efficiency may be critical for survival, while during periods of growth, it may be a key driver of competitive advantage. Technological advancements enable new approaches to operational efficiency, such as ERP system implementation and predictive analytics.

CONCLUSION

It was noted that structures constrain mechanisms. In this case, organisational structures, technological infrastructure, regulatory frameworks, and economic conditions can limit or enable certain mechanisms. Also, a hierarchical organisation may favour a centralised ERP system, while a decentralised one might prefer a modular approach. In addition, the mechanisms shape structures; for instance, ERP implementation can lead to changes in organisational structures, technological infrastructure, or regulatory compliance. For instance, the introduction of a new ERP system might necessitate a reorganisation of departments or the adoption of new industry standards.

The mechanisms produce outcomes. That is, the implementation of the mechanisms determines the resulting outcomes. For example, effective change management can lead to successful ERP adoption and user satisfaction, while inadequate training and development can hinder user adoption and limit the system's benefits. The outcomes feedback into mechanisms since the outcomes of ERP implementation can influence future mechanisms. For instance, if an ERP system is not meeting expectations, organisations may need to re-evaluate their implementation strategies or invest in additional training and support.

The structures influence outcomes since the underlying structures shape the potential outcomes of ERP implementation. For example, a company operating in a highly regulated industry may face significant challenges in complying with new regulations, impacting ERP implementation timelines and costs. Outcomes feedback into structures since successful ERP implementation leads to organisational or technological infrastructure changes. For example, improved operational efficiency might necessitate a flatter organisational structure, while enhanced data-driven decision-making can drive investments in new technologies

This study examined the complex interactions among structures, mechanisms, and outcomes that critically influence ERP implementation's effectiveness in Zimbabwe's mining industry. The findings indicate that a solid organisational structure, effective project management practices, and a culture of user adoption are critical for successful ERP implementation. A clearly defined project plan, appropriate resource allocation, and strong support from top management are essential for the project's timely completion and compliance with budget limitations. The study emphasised the significance of user training, change management initiatives, and continuous support to enhance user adoption and reduce resistance to change.

The study results also revealed that Mining industry organisations should invest in upgrading legacy systems and implementing modern ICT infrastructure to support ERP integration. The interplay among these elements is intricate and fluid. An effective organisational structure underpins successful implementation, while efficient mechanisms enable project execution. Structural factors and the quality of implementation mechanisms influence user adoption. The final result of the implementation process, including improved efficiency, enhanced decision-making, or cost savings, is directly associated with aligning these three elements.

The research findings yield several practical recommendations for mining organisations in Zimbabwe. This research advises that mining industries ensure the alignment of ERP implementation with the organisation's strategic goals and business objectives. The organisation should utilise stringent project management methodologies to effectively plan, execute, and oversee the implementation process. The involvement of key users from the beginning is essential, along with providing thorough training to promote user adoption and ownership. They are expected to cultivate a culture of continuous improvement and routinely evaluate the ERP system's performance to pinpoint areas for optimisation. Organisations should establish robust partnerships with ERP vendors to utilise their expertise and support effectively.

The Zimbabwean Mining industry organisations must also implement data governance practices and invest in data cleaning and validation. They must also develop comprehensive change management strategies and business improvement programmes to address resistance to change and ensure employee adoption. This should provide adequate training and development to ensure employees can use the ERP system effectively and realise its benefits. The Mining industry organisations should also consider engaging external consultants or partners with experience in ERP implementation in the mining industry.

In addition, Mining industry organisations might consider implementing ERP systems in phases to manage complexity and mitigate risks. Zimbabwe mining industry organisations should monitor and evaluate performance by defining key performance indicators. These performance indicators help assess the impact of ERP systems on assisting companies in making proactive strategic adjustments. Furthermore, Zimbabwe's mining industries must promote leadership commitment since strong top management support is crucial for driving successful ERP programs and maintaining alignment with organisational goals.

The study acknowledges limitations, such as the fact that a sample size of 4 interviews and 80 questionnaires may not adequately encompass the full spectrum of experiences and viewpoints within the Zimbabwean mining industry. Also, the findings may not be fully generalisable to all mining organisations in Zimbabwe, particularly those with unique characteristics or operating in specific regions. In addition, applying a critical realist framework can be complex and requires a deep understanding of the theoretical concepts and their implications for research.

Recommendations for future research include retesting the results in other Zimbabwean artisanal and larger mines and in developing or emerging Southern African countries. This assists in evaluating whether the study's findings have a similar impact or influence in other emerging nations. Since this study used cross-sectional research, the authors recommend conducting longitudinal research to track changes in the underlying structures, mechanisms, and outcomes that influence ERP implementation success in Zimbabwean Mining industry organisations.

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