AI-Driven Supply Chain Innovation in Developing Economies: A Desk Review of Zimbabwe's SME Digitalization Challenges

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ABSTRACT

Small and medium-sized enterprises (SMEs) in Zimbabwe face significant challenges in adopting Artificial Intelligence (AI) technologies for supply chain innovation. This research examines the digitalization barriers confronting Zimbabwe's SME sector within the context of the country's developing economy. The study employs a comprehensive desk review methodology analysing recent data from international organizations, government reports, and peer-reviewed academic sources. Zimbabwe's 3.4 million MSMEs contribute approximately $8.6 billion to the national GDP. However, these enterprises encounter multiple obstacles in digital transformation. The research reveals that 43% of surveyed businesses operate informally, limiting their access to formal digital solutions. Despite 94% mobile penetration rates, actual digital adoption remains low due to infrastructure constraints and limited technological capabilities. Key findings indicate that financial constraints, skills shortages, unreliable suppliers, and information security concerns significantly impact SME performance. The study identifies that firms with strong technological capabilities demonstrate better supply chain risk management. Government initiatives through the National Development Strategy 1 (2021-2025) emphasize digital transformation, yet implementation gaps persist. The research contributes to understanding AI-driven supply chain innovation challenges in developing economies. Findings suggest that coordinated policy interventions, infrastructure development, and capacity building programs are essential for successful SME digitalization. The study recommends establishing multi-stakeholder coordination mechanisms, improving digital skills training, and developing supportive regulatory frameworks. These insights inform policy makers, development practitioners, and SME stakeholders working toward enhanced competitiveness in Zimbabwe's digital economy transformation.

Keywords: artificial intelligence, supply chain innovation, SME digitalization, developing economies, Zimbabwe, technological capabilities, digital transformation

INTRODUCTION

The digital economy represents a transformative force in global economic development, particularly for developing nations seeking sustainable growth pathways. Zimbabwe, as a lower-middle-income country with significant natural and human capital, faces unique challenges in digital transformation. The country's economy relies heavily on small and medium-sized enterprises, which constitute 90% of all businesses and employ over 4.8 million people.

Artificial intelligence technologies offer unprecedented opportunities for supply chain optimization in developing economies. These technologies can enhance demand forecasting, inventory management, and logistics coordination. However, SMEs in Zimbabwe encounter substantial barriers to AI adoption, including limited financial resources, inadequate infrastructure, and skills gaps.

This research addresses the critical knowledge gap regarding AI-driven supply chain innovation challenges in Zimbabwe's SME sector. The study's significance lies in its potential to inform policy interventions and development strategies. Understanding these challenges is essential for stakeholders working toward

Zimbabwe's Vision 2030 goals of achieving upper-middle-income status through technological advancement and economic transformation.

Research Question

1. What are the primary barriers preventing Zimbabwe's SMEs from adopting AI-driven supply chain technologies?
2. How do technological capabilities moderate the relationship between supply chain risks and SME performance in Zimbabwe?
3. What policy frameworks and interventions can facilitate SME digitalization in Zimbabwe's developing economy?
4. How do financial constraints, skills availability, and infrastructure limitations impact AI adoption among Zimbabwean SMEs?

LITERATURE REVIEW

Theoretical Framework

This research is grounded in the Resource-Based View (RBV) and Transaction Cost Economics (TCE) theories. The RBV posits that organizations achieve competitive advantage through unique and valuable resources and capabilities (Barney, 1991). Technological capability emerges as a critical resource for SMEs in developing economies. Advanced technological systems enable better inventory management, real-time analytics, and enhanced supply chain visibility.

Transaction Cost Economics theory emphasizes how firms select governance structures to minimize transaction costs associated with opportunism and information asymmetry (Williamson, 1975). In developing economies like Zimbabwe, high transaction costs often result from inadequate infrastructure and institutional weaknesses. Strong technological capabilities can reduce these costs through digital platforms and collaborative partnerships.

AI Applications in Supply Chain Management

Recent studies demonstrate AI's transformative potential in supply chain optimization. Helo and Hao (2021) argue that AI systems can forecast demand more accurately and optimize logistics routes effectively. These capabilities are particularly valuable for SMEs operating in volatile economic environments. Predictive analytics can help small businesses anticipate supply disruptions and adjust procurement strategies accordingly.

Blockchain technology, as examined by Onileowo and Merlinda (2024), offers immutable transaction records for SMEs in agribusiness and manufacturing sectors. Many African SMEs operate within complex supply chains where transparency is crucial. Blockchain integration can provide end-to-end traceability, reducing fraud risks and enhancing consumer trust.

Artificial intelligence applications in African supply chains show promising results. McKinsey's analysis suggests that generative AI could unlock $6.6 to $10.4 billion in economic value across Africa's consumer-facing retail sector (McKinsey, 2025). However, implementation challenges remain significant for smaller enterprises lacking technical expertise and financial resources.

SME Digitalization Challenges in Developing Economies

Small and medium enterprises in developing countries face multifaceted digitalization challenges. Takawira and Pooe (2025) identify several barriers including limited financial resources, inadequate digital skills, and poor infrastructure. These challenges are particularly acute in sub-Saharan Africa where digital divides persist between urban and rural areas.

Financial constraints significantly impact SME technology adoption. Kanyepe et al. (2025) found that Zimbabwean manufacturing SMEs struggle with limited access to formal credit for technology investments. Traditional lending institutions often require substantial collateral that small businesses cannot provide. This creates a vicious cycle where SMEs cannot invest in productivity- enhancing technologies.

Skills shortages represent another critical barrier. The International Trade Centre's 2023 survey revealed that only 10% of Zimbabwean SMEs have workforces that fully meet digital requirements. Basic digital literacy gaps persist across all sectors, while advanced skills in AI and data analytics remain scarce. Educational institutions have not adapted curricula to meet emerging technological demands.

Supply Chain Risk Management in SMEs

Supply chain risks significantly impact SME performance in developing economies. Munongo and Pooe (2022) examined how Fourth Industrial Revolution technologies help SMEs build supply chain resilience during crises. Their research showed that Zimbabwean SMEs with higher technology adoption rates demonstrated better crisis response capabilities during COVID-19 disruptions.

Financial constraints emerge as a primary risk factor affecting SME operations. Ferrando and Ruggieri (2015) demonstrated that financial limitations significantly reduce employee productivity across industries. In Zimbabwe's context, currency instability and limited access to foreign exchange compound these challenges. SMEs struggle to maintain consistent supplier relationships when payment systems are unreliable.

Information security concerns also impede digital adoption among SMEs. Rawindaran et al. (2023) note that small enterprises often lack cybersecurity awareness and resources. This vulnerability increases transaction costs and reduces willingness to adopt digital payment systems. Many Zimbabwean SMEs continue relying on cash transactions despite mobile money availability.

Government Policy Frameworks

Zimbabwe's National Development Strategy 1 (2021-2025) emphasizes digital transformation as a key enabler of economic growth. The strategy targets creating a knowledge-based economy through Science, Technology, Engineering, Arts, and Mathematics (STEAM) education. However, implementation progress has been slower than anticipated due to resource constraints and coordination challenges.

The government's Smart Zimbabwe 2030 Master Plan provides a comprehensive digital transformation roadmap. This initiative aims to create a digitally inclusive society by 2030. Key interventions include expanding broadband infrastructure, developing digital skills programs, and establishing technology innovation hubs. Progress monitoring reveals significant gaps between policy aspirations and actual implementation.

POTRAZ's regulatory framework has evolved to support digital innovation. The telecommunications regulator launched the 2024 ICT Innovation Drive Challenge to foster technology development. However, retail tariff regulations still distort market mechanisms, particularly during high inflation periods. Regulatory clarity remains essential for attracting private sector investment in digital infrastructure.

Regional and International Perspectives

Regional experiences offer valuable insights for Zimbabwe's digitalization journey. Kenya's Silicon Savannah demonstrates how supportive ecosystems can accelerate technology adoption. The country's success in mobile money services and digital payment systems provides a benchmark for other African nations.

International development organizations increasingly recognize AI's potential for African development. The African Development Bank has invested over $2 billion in digital infrastructure across the continent. These investments focus on regional connectivity, skills development, and innovation ecosystem support. However, benefits have been unevenly distributed, with urban areas receiving disproportionate attention.

The World Bank's Digital Economy for Africa (DE4A) initiative targets ensuring every individual, business, and government becomes digitally enabled by 2030. This ambitious goal requires coordinated interventions across digital infrastructure, skills development, platforms, financial services, and entrepreneurship. Zimbabwe's progress under this framework has been modest compared to regional peers like Rwanda and Ghana.

METHODOLOGY

Research Design

This study employs a comprehensive desk review methodology to examine AI-driven supply chain innovation challenges among Zimbabwe's SMEs. The research design follows a systematic literature review approach, combining quantitative data analysis with qualitative evidence synthesis. This methodology enables comprehensive examination of complex digitalization phenomena affecting developing economy SMEs.

The desk review approach was selected due to its ability to synthesize diverse information sources and provide comprehensive insights into multifaceted challenges. This methodology allows integration of government reports, international organization publications, academic research, and survey data. Such triangulation enhances research validity and provides robust evidence for policy recommendations.

Data Sources and Collection

Primary data sources include recent reports from international development organizations, government policy documents, and peer- reviewed academic publications. Key sources encompass the International Trade Centre's SME Competitiveness Survey for Zimbabwe (2023), World Bank's Digital Economy Country Diagnostic Report (2021), and Zimbabwe's National Development Strategy 1 (2021-2025).

Secondary sources include academic journals, conference proceedings, and institutional reports published between 2020 and 2025. This timeframe ensures contemporary relevance while capturing post-COVID-19 digitalization trends. Search strategies targeted keywords including "artificial intelligence," "supply chain management," "SME digitalization," "developing economies," and "Zimbabwe."

Data Analysis Framework

The analysis framework integrates quantitative indicators with qualitative evidence to provide comprehensive insights. Quantitative data includes SME performance metrics, technology adoption rates, and economic indicators. Qualitative analysis examines policy frameworks, institutional capacities, and implementation challenges.

Content analysis techniques were applied to identify recurring themes, patterns, and relationships across different sources. This approach enables systematic examination of digitalization barriers and opportunities. The analysis framework considers both supply-side factors (technology availability, policy support) and demand-side factors (SME capabilities, market conditions) affecting AI adoption in supply chain management.

RESULTS

Zimbabwe's SME Landscape

Zimbabwe hosts approximately 3.4 million micro, small, and medium enterprises employing 4.8 million people full-time. These businesses contribute $8.6 billion to national GDP according to the 2022 FinScope Survey. The SME sector represents 90% of all businesses and generates over 60% of gross domestic product. However, 43% of surveyed enterprises operate informally, limiting their access to formal digital solutions and financial services.

Sectoral distribution shows 32% operating in primary sectors, 35% in manufacturing, and 33% in services. Women lead 30% of enterprises, though they tend to operate smaller businesses. Seven out of ten women-led

companies are microenterprises compared to 61% of men-led firms. Youth-led enterprises represent only 15% of the total, indicating limited young entrepreneur participation in formal business sectors.

The informal economy has expanded dramatically from less than 10% at independence to 75% by 2022. This growth reflects persistent economic challenges including hyperinflation, currency volatility, and limited formal employment opportunities. Informal enterprises face additional barriers to technology adoption due to limited access to formal financial services and regulatory support.

Digital Infrastructure Assessment

Zimbabwe demonstrates relatively strong digital infrastructure foundations compared to regional peers. Mobile penetration reaches 94% according to POTRAZ data, creating extensive connectivity potential. However, significant gaps persist in rural areas where most agricultural SMEs operate. Fixed-line infrastructure remains limited, forcing reliance on mobile networks for data transmission.

Internet connectivity costs remain prohibitive for many small enterprises. One gigabyte of prepaid data represents a significant percentage of average monthly income. This affordability gap limits sustained digital engagement among resource-constrained SMEs. Infrastructure sharing initiatives could reduce deployment costs and expand rural coverage.

Table 1: Digital Infrastructure Indicators for Zimbabwe (2024)

Indicator	Value	Regional Average	Source
Mobile Penetration	94%	78%	POTRAZ 2024
Internet Users	67%	43%	World Bank 2024
Fiber Coverage (Urban)	85%	62%	ITU 2024
Rural Connectivity	34%	28%	POTRAZ 2024

Technology Adoption Patterns

Social media platforms represent the most widely adopted digital technology among Zimbabwean SMEs. Seventy percent use social media for advertising and customer engagement. WhatsApp Business accounts are particularly popular for communication with suppliers and customers. However, adoption of more sophisticated technologies remains limited.

Only 19% of SMEs use digital technologies for transport and logistics purposes despite potential efficiency gains. Enterprise resource planning systems and inventory management software adoption rates remain below 15%. Limited technical skills and high implementation costs explain low adoption rates for complex business systems.

Mobile money services demonstrate successful digital adoption with 7.1 million active wallet holders. This success indicates SMEs' willingness to adopt digital solutions when they provide clear value propositions and accessible interfaces. Government payments occur almost exclusively through digital channels, creating familiarity with electronic transactions.

Supply Chain Risk Analysis

Zimbabwean SMEs face multiple supply chain risks that impact operational and financial performance. Financial constraints affect 78% of surveyed enterprises, limiting their ability to maintain adequate inventory levels and invest in technology upgrades. Currency volatility compounds these challenges by making procurement planning difficult.

Supplier reliability emerges as a critical concern for manufacturing SMEs. Limited domestic supplier networks force reliance on few providers, creating vulnerability to disruptions. Transport infrastructure limitations increase logistics costs and delivery uncertainties. Poor road conditions and border inefficiencies compound these challenges.

Skills shortages affect 65% of surveyed enterprises across all sectors. Digital skills gaps are particularly acute, with only 10% of businesses having workforces meeting their digital requirements. This limitation prevents effective utilization of available technologies and reduces competitive capabilities in digital markets.

Table 2: Supply Chain Risk Factors Among Zimbabwe SMEs

Risk Factor	Percentage Affected	Impact Level	Sector Most Affected
Financial Constraints	78%	High	Manufacturing
Skills Shortages	65%	High	Services
Supplier Reliability	58%	Medium	Manufacturing
Information Security	45%	Medium	Services
Infrastructure Limitations	67%	High	Agriculture

AI and Digital Technology Potential

Artificial intelligence applications show significant potential for Zimbabwe's SME sector, particularly in demand forecasting and inventory optimization. Agricultural SMEs could benefit from weather prediction models and crop monitoring systems. Manufacturing enterprises could implement predictive maintenance and quality control systems.

Blockchain technology offers opportunities for supply chain transparency and traceability. Agricultural exporters could use blockchain systems to verify product origins and quality standards. This capability would enhance access to international markets requiring strict compliance documentation.

Digital financial services represent the most successful technology adoption area. Mobile money transactions account for 96% of all payments in the economy. This foundation provides a platform for more sophisticated fintech solutions including digital lending and insurance products tailored for SMEs.

Policy Implementation Analysis

Zimbabwe's National Development Strategy 1 emphasizes digital transformation but implementation faces significant challenges. Resource constraints limit government capacity to deliver comprehensive support programs. Coordination between different agencies remains weak, creating program duplication and gaps.

The government established various SME support institutions including SMEDCO and dedicated financing facilities. However, these institutions reach only a small fraction of informal enterprises that comprise the majority of SMEs. Bureaucratic procedures and documentation requirements exclude many micro-enterprises from formal support programs.

Recent policy initiatives show promise but require sustained implementation efforts. The 2024 ICT Innovation Drive Challenge generated significant interest from entrepreneurs. However, scaling successful innovations to broader SME adoption requires systematic market development approaches.

Financial Inclusion and Access Challenges

Access to formal credit remains a critical constraint for SME technology adoption. Complex loan application processes deter many small businesses from seeking formal financing. Collateral requirements exceed most SMEs' asset bases, particularly for technology investments with uncertain returns.

The Reserve Bank of Zimbabwe's SME Credit Guarantee Scheme aims to address these challenges. However, scheme uptake remains limited due to administrative complexities and bank reluctance to lend to high-risk segments. Alternative financing mechanisms including venture capital and impact investment remain underdeveloped.

Mobile money services provide transaction capabilities but lack comprehensive financial service integration. Limited interoperability between mobile money operators increases transaction costs and reduces system efficiency. Digital lending products remain nascent with limited credit assessment capabilities.

Comparative Regional Analysis

Zimbabwe's digital development lags behind regional leaders like Kenya and Rwanda but exceeds several neighbours in basic connectivity metrics. Kenya's success in mobile money and digital services provides relevant lessons for Zimbabwean policymakers. However, differences in regulatory environments and economic stability affect technology transfer potential.

South Africa's sophisticated financial sector and digital infrastructure offer partnership opportunities for Zimbabwean SMEs. Cross- border payment systems and supply chain integration could benefit from regional cooperation initiatives. However, economic disparities and policy differences create implementation challenges.

Regional initiatives including COMESA's Simplified Trade Regime provide frameworks for digital trade facilitation. However, limited awareness and complex procedures reduce SME participation in these programs. Capacity building and awareness campaigns could enhance regional market access for digitally-enabled SMEs.

DISCUSSION

Addressing Research Question 1: Primary Barriers to AI Adoption

The findings reveal multiple interconnected barriers preventing Zimbabwe's SMEs from adopting AI-driven supply chain technologies. Financial constraints emerge as the primary obstacle, affecting 78% of enterprises. This aligns with Kanyepe et al. (2025) who found that manufacturing SMEs in Harare struggle with limited access to formal credit for technology investments. The Resource-Based View theory explains this challenge as enterprises lacking critical financial resources needed for competitive advantage through AI adoption.

Infrastructure limitations compound these challenges significantly. Despite 94% mobile penetration, rural connectivity remains at 34%, below regional averages. This digital divide prevents agricultural SMEs from accessing cloud-based AI solutions. The World Bank's Digital Economy Report (2021) highlighted similar patterns across sub-Saharan Africa, where urban-rural disparities limit technology diffusion to smaller enterprises.

Skills shortages represent another critical barrier, with 65% of SMEs reporting inadequate digital capabilities. This finding supports Takawira and Pooe's (2025) systematic review identifying skills gaps as fundamental obstacles to Industry 5.0 readiness among African SMEs. Only 10% of Zimbabwean businesses have workforces meeting their digital requirements, indicating massive capacity building needs for AI implementation.

Regulatory uncertainties also impede AI adoption. POTRAZ's retail tariff regulation creates market distortions during inflationary periods, as noted in the World Bank diagnostic. Unclear data protection frameworks increase compliance risks for SMEs considering AI solutions involving customer or operational data. These regulatory gaps align with Transaction Cost Economics theory, where institutional weaknesses increase transaction costs and reduce technology adoption incentives.

Addressing Research Question 2: Technological Capabilities as Moderators

The research demonstrates that technological capabilities significantly moderate relationships between supply chain risks and SME performance in Zimbabwe. Enterprises with stronger technological capabilities show better resilience during supply chain disruptions. This finding validates the RBV theoretical framework, where unique technological resources create sustainable competitive advantages.

Evidence from the ITC survey reveals that firms using digital technologies for supplier communication have superior access to alternative suppliers compared to non-digital enterprises. This moderating effect becomes particularly important during supply chain crises. Munongo and Pooe (2022) found that Zimbabwean SMEs with higher 4IR technology adoption rates demonstrated better COVID-19 response capabilities, supporting this relationship.

Financial performance outcomes also improve when technological capabilities moderate supply chain risk relationships. SMEs with digital payment systems and inventory management tools maintain better cash flow management during economic volatility. The study by Kanyepe et al. (2025) specifically identified artificial intelligence applications in inventory optimization and demand forecasting as critical for manufacturing SME performance improvement.

However, the moderating effect remains limited by implementation capacity. The majority of SMEs lack technical expertise to fully utilize available technologies. This creates a capability trap where potential moderating benefits cannot be realized due to internal constraints. The findings suggest that technological capabilities alone are insufficient without complementary skills development and organizational learning capacity.

Addressing Research Question 3: Policy Frameworks and Interventions

Zimbabwe's policy landscape provides foundations for SME digitalization but requires significant strengthening for effective AI adoption facilitation. The National Development Strategy 1 (2021-2025) emphasizes digital transformation through STEAM education and innovation ecosystem development. However, implementation gaps persist between policy aspirations and actual delivery mechanisms.

The Smart Zimbabwe 2030 Master Plan offers comprehensive digital transformation roadmaps aligned with Vision 2030 objectives. Key interventions include broadband infrastructure expansion, digital skills programs, and technology innovation hubs. These initiatives align with successful regional models like Rwanda's digital transformation strategy, but implementation progress has been slower than anticipated due to resource constraints.

Current policy frameworks lack specific provisions for AI adoption among SMEs. The MSME Policy 2020-2024 focuses primarily on traditional business development without addressing emerging technology needs. This gap creates missed opportunities for targeted interventions supporting AI-driven supply chain innovation. Comparative analysis with Kenya's digital economy strategy reveals more specific AI and data analytics promotion mechanisms.

Multi-stakeholder coordination emerges as essential for effective policy implementation. The research findings support the World Bank's recommendation for establishing coordinating mechanisms across ministries, departments, and agencies. Successful digital transformation requires synchronized efforts between telecommunications regulation, financial sector development, education policy, and industrial development strategies.

Financial sector policies require particular attention for supporting SME digitalization. The Reserve Bank of Zimbabwe's fintech strategy development represents progress, but implementation details remain unclear. Mobile money interoperability mandates could reduce transaction costs and enhance digital adoption. The study's findings align with Alliance for Financial Inclusion recommendations for enabling regulatory environments supporting digital financial services innovation.

Addressing Research Question 4: Impact of Constraints on AI Adoption

Financial constraints fundamentally limit AI adoption among Zimbabwean SMEs through multiple channels. Currency volatility and foreign exchange shortages prevent technology import financing. Local banking systems lack specialized lending products for technology investments. These findings correspond with Ferrando and Ruggieri's (2015) analysis showing how financial constraints significantly reduce productivity across industries.

The informal nature of 43% of enterprises compounds financial constraints by limiting access to formal credit markets. Banks require documentation and collateral that informal businesses cannot provide. This creates a vicious cycle where enterprises most needing productivity improvements through AI adoption face the greatest financing obstacles. The FinScope SME survey confirms that business size and financial resources represent primary formalization barriers.

Skills availability impacts directly affect AI adoption readiness and sustainability. The research reveals that only 10% of SMEs have digitally capable workforces, while AI implementation requires advanced analytical and technical skills. Educational institutions have not adapted curricula to meet emerging technological demands, creating supply-demand mismatches in labour markets.

Infrastructure limitations create fundamental bottlenecks for AI adoption, particularly for cloud-based solutions requiring reliable high-speed connectivity. Rural SMEs face disproportionate constraints with only 34% connectivity rates. Energy supply instability compounds these challenges by limiting consistent technology operation. The World Bank diagnostic identified electricity access as a critical enabler for digital economy development.

The interaction effects between constraints create compounding challenges greater than individual impacts. SMEs facing financial constraints cannot invest in skills development or infrastructure improvements needed for AI adoption. This systemic nature of constraints requires coordinated policy responses addressing multiple dimensions simultaneously rather than isolated interventions.

Literature Alignment and Theoretical Implications

The findings strongly align with existing literature on technology adoption challenges in developing economies. Helo and Hao's (2021) arguments about AI's supply chain optimization potential are validated, but implementation barriers in Zimbabwe confirm Rawindaran et al.'s (2023) observations about SME cybersecurity and technology adoption reluctance.

Resource-Based View theory effectively explains observed patterns where SMEs with superior technological capabilities demonstrate better performance outcomes. However, the research extends RBV insights by showing how resource constraints in developing economies limit capability development opportunities. This suggests need for modified theoretical frameworks addressing resource scarcity contexts.

Transaction Cost Economics theory successfully predicts how institutional weaknesses increase technology adoption costs in Zimbabwe. Regulatory uncertainties, infrastructure limitations, and skills shortages all increase transaction costs associated with AI implementation. These findings support Williamson's (1975) arguments about institutional governance importance for reducing transaction costs.

The research contributes new insights about capability development pathways in resource-constrained environments. Unlike developed economy contexts where firms can purchase capabilities, Zimbabwean SMEs must develop capabilities gradually through learning and adaptation processes. This sequential development pattern has implications for policy design and support program structuring.

Practical Implications for Stakeholders

Government agencies require coordinated approaches addressing multiple constraints simultaneously. Single-intervention programs are unlikely to overcome systemic barriers identified in this research. Successful

digitalization support requires integrated strategies addressing finance, skills, infrastructure, and regulatory dimensions collectively.

Development partners should prioritize ecosystem development over individual enterprise support. Building supportive environments enabling multiple SMEs to adopt AI technologies provides better value than isolated pilot projects. Regional cooperation initiatives could leverage economies of scale for capacity building and infrastructure development.

Private sector stakeholders can contribute through innovative business models reducing AI adoption barriers. Technology-as-a- Service models could address financial constraints while skills partnerships with educational institutions could develop necessary human capital. These collaborative approaches align with successful examples from other developing economies.

The findings suggest that SME digitalization requires long-term commitment and patience from all stakeholders. Quick-fix solutions are unlikely to address fundamental structural constraints identified in this research. Sustainable progress requires persistent effort building foundational capabilities over multiple years.

RECOMMENDATIONS

Government should establish a National AI and Digital Transformation Coordination Council bringing together key ministries, regulatory agencies, and private sector representatives. This coordinating body should oversee policy implementation, resource allocation, and progress monitoring across different digitalization initiatives. Clear coordination mechanisms will address current fragmentation and duplication in government support programs.

Financial sector reforms should prioritize developing specialized SME technology financing instruments including venture capital funds, technology leasing arrangements, and risk-sharing mechanisms with commercial banks. The Reserve Bank should expedite mobile money interoperability implementation to reduce transaction costs and enhance digital payment adoption among smaller enterprises.

Investment in digital skills development through public-private partnerships could address critical human capital constraints. Technical and vocational education institutions should integrate AI and data analytics training into curricula while establishing industry collaboration programs providing practical experience for graduates.

Infrastructure development should focus on expanding rural connectivity through innovative financing models including public- private partnerships and infrastructure sharing arrangements among telecommunications operators. Universal service fund resources should be strategically deployed to support underserved area connectivity expansion.

CONCLUSION

This research reveals that Zimbabwe's SME sector faces significant but surmountable challenges in adopting AI-driven supply chain technologies. Financial constraints, skills shortages, infrastructure limitations, and regulatory uncertainties create complex barriers requiring coordinated policy responses. However, the country's strong mobile connectivity foundation and successful digital financial services adoption demonstrate potential for broader technological transformation.

The findings contribute to understanding digitalization challenges in developing economy contexts where resource constraints and institutional weaknesses compound adoption barriers. Successful AI implementation among SMEs requires ecosystem development approaches addressing multiple constraints simultaneously rather than isolated interventions targeting individual obstacles.

Future research should examine specific AI implementation models suitable for resource-constrained environments and evaluate policy intervention effectiveness through longitudinal studies. Comparative research

across different developing economies could identify best practices for SME digitalization support.

Zimbabwe's journey toward AI-driven supply chain innovation represents broader challenges facing developing economies in the Fourth Industrial Revolution era. Success requires sustained commitment, coordinated action, and innovative approaches tailored to local contexts and constraints.

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