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Digitising Supply Chains: A Literature Review on Digital Transformation in Supply Chains for the Emerging Economies

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Abstract
This literature review abstract offers a comprehensive overview of the crucial role that digital transformation (DT) plays in shaping supply chains in emerging economies, particularly focusing on Zambia. It posits that although global trends in DT, propelled by technologies such as IoT, big data analytics, and blockchain, present unparalleled opportunities for efficiency and resilience, their execution in developing countries encounters distinct challenges. The review is organized into three sections. Initially, it synthesizes existing research regarding the theoretical frameworks and practical applications of supply chain digitalization in developing contexts, pinpointing common obstacles such as insufficient infrastructure, limited digital literacy, and substantial investment costs. Subsequently, it places these findings within the context of Zambia's national landscape by analyzing the government's strategic policies and initiatives, including the National Digital Transformation Strategy, alongside the status of its business sectors. Lastly, the abstract delineates the future implications of DT for Zambia's business, education, and governance. It underscores how digital supply chains can improve business productivity and market access for Small and Medium Enterprises (SMEs), reform educational curricula to bridge the skills gap, and foster transparency and efficiency in governance. This review concludes that a coordinated, multi-stakeholder approach is vital for Zambia to effectively harness digital transformation to attain sustainable and inclusive economic development.
***Keywords**: Digital Transformation (DT); Supply Chain Digitalization; Emerging Economies; Economic Development; and Internet of Things (IoT), Big Data, and Blockchain*

Introduction

The emergence of the Fourth Industrial Revolution has initiated a period of unparalleled technological transformation, with digital transformation being central to this change. This trend encompasses the deliberate incorporation of digital technologies across all facets of an

organization, fundamentally reshaping its operations and the value it provides (Bharadwaj et al., 2013). Although developed countries have led this transition, the effects on emerging economies are arguably more significant, presenting a distinctive chance to bypass conventional development routes and expedite economic advancement (Brechko, 2021). This literature review seeks to deliver a thorough examination of the influence of digital transformation on supply chains in emerging economies, particularly regarding its effects on business operations, education and skills enhancement, as well as governance and policy structures. The review consolidates existing studies to pinpoint essential trends, challenges, and opportunities, thus providing a comprehensive view of the future landscape of business, education, and governance in a world increasingly driven by digital technology.

The background of Digital Transformation in emerging economies

The context for this literature review is framed within the dynamic and complex environment of emerging economies that are experiencing rapid globalization and technological progress. While these regions present significant opportunities for growth, they are also contending with distinct and ongoing challenges. Traditionally, supply chains in emerging economies have been marked by fragmentation, inadequate infrastructure, and a lack of transparency. These challenges are intensified by intricate socio-economic factors, including political instability, restricted access to finance, and a substantial informal sector. This situation renders conventional supply chain management ineffective and vulnerable, exposing businesses to disruptions (World Bank, 2020).

The advent of digital transformation, heralded by the digital revolution, offers a robust solution to these issues. Technologies such as the Internet of Things (IoT), blockchain, artificial intelligence (AI), and big data are not just minor enhancements; they are fundamentally altering the operational landscape of supply chains (Rogers, 2003). These innovations facilitate a transition from static, reactive systems to dynamic, transparent, and resilient digital ecosystems. This shift promises considerable economic advantages, including enhanced efficiency, lower costs, and broader market access for businesses of all sizes, particularly Small and Medium-sized Enterprises (SMEs) (Teece, 2018).

Moreover, the implications of this transformation extend beyond mere business operations. It significantly affects education, creating an urgent demand for new skills and digital literacy to align with the evolving workforce requirements. Educational institutions must revise their curricula to equip students for a future where technical skills and data-driven decision-making are essential. Additionally, the digital transition calls for a reassessment of governance (Freeman et al., 2020).

Governments in emerging economies are required to formulate supportive policies and regulatory frameworks that promote digital adoption, guarantee equitable access, and tackle new challenges such as cybersecurity and data privacy. The objective is to establish an enabling environment that fosters inclusive growth and prevents the digital divide from exacerbating existing inequalities; thus, the research imperative presented in this literature review is crucial for comprehending the intricate relationship between technology, business, education, and governance within these distinct contexts. By analyzing the existing body of research, this review

seeks to offer a thorough overview of the opportunities and challenges associated with digital transformation, pinpoint critical research gaps, and outline direction for future investigation to assist these economies in fully leveraging the potential of the digital era.

Objectives for digital transformation in emerging economies

i. identifying the primary factors driving the adoption of digital technologies in supply chains within emerging economies
ii. To synthesize the key theoretical frameworks that explain the digital transformation of supply chains.
iii. To evaluate the multidimensional impact of digital transformation on business, education, and governance within the context of supply chains
iv. assess the impact of digital transformation on supply chains in emerging economies, with a specific focus on Zambia.

Digital Transformation in Supply Chain Management and Business

The existing literature strongly indicates that digital technologies are transforming the supply chain environment in emerging economies, improving efficiency, transparency, and resilience (Mishra, 2020). The incorporation of technologies such as the Internet of Things (IoT), blockchain, and artificial intelligence (AI) serves as a key catalyst for this transformation.

Digital Transformation in Supply Chain

Digital transformation is significantly changing the operational dynamics of supply chains in emerging economies, transitioning them from conventional, fragmented systems to cohesive, data-driven networks. The implementation of technologies like the Internet of Things (IoT), blockchain, and artificial intelligence (AI) is leading this evolution (Mishra, 2020). For example, IoT devices facilitate real-time tracking of goods, offering unparalleled visibility and control over logistics operations. This advancement has proven especially advantageous in areas with difficult infrastructure, as businesses can now oversee assets, manage inventory, and react to disruptions with enhanced agility. Conversely, blockchain technology is utilized to improve supply chain transparency and traceability, which is essential in sectors where authenticity and ethical sourcing are critical (Wamba, 2021). By establishing a secure, decentralized ledger, blockchain can monitor the complete journey of a product from its source to the final consumer, thereby fostering consumer trust and addressing challenges such as counterfeiting.

Enhancing Efficiency and Transparency

The implementation of IoT devices facilitates real-time tracking of goods, offering a level of visibility that was previously unattainable in areas with fragmented logistics infrastructure. Organizations can now oversee inventory levels, monitor the location of shipments, and receive notifications for potential disruptions, allowing them to make proactive decisions and enhance their operations (Wamba, 2021). This is especially significant for small and medium enterprises

(SMEs), which can utilize these technologies to compete on a global scale by enhancing their operational efficiency (Brunswicker & Vanhaverbeke, 2015).

Improving Trust and Traceability with Blockchain

Blockchain technology is emerging as a formidable tool for fostering trust and ensuring the integrity of supply chains. By establishing a secure, decentralized, and immutable ledger, blockchain can trace the entire journey of a product, from the sourcing of raw materials to delivery to the end consumer (Wamba, 2021). This degree of traceability is invaluable in sectors susceptible to counterfeiting or ethical sourcing challenges, such as pharmaceuticals and agriculture. For example, a case study on Al-Rumman Pharma, an SME in an emerging economy, demonstrated how the adoption of an integrative technological approach, despite initial resistance to change, was essential to tackle challenges from key suppliers and enhance efficiency (Hasan, & Al-Rumman, 2020).

The Role of Artificial Intelligence and Data Analytics

AI and big data analytics are becoming essential for optimizing supply chain processes. Machine learning algorithms can scrutinize extensive datasets to predict demand with greater precision, while AI-driven systems can automate routine tasks such as inventory management and route planning. This not only minimizes human error and costs but also empowers companies to respond more adeptly to market fluctuations and consumer demands (Berman, 2012). The capacity to utilize data for making decisions is a crucial aspect of the digital transformation occurring in both upstream and downstream businesses, which subsequently improves the resilience of the overall supply chain (Elsevier, 2024).

Education and Skills Development

As technological tools for digital transformation become increasingly accessible, a major challenge faced by emerging economies is the digital skills gap. The literature emphasizes that a successful transition necessitates a skilled workforce capable of utilizing these new technologies (ITU, n.d.)

The Digital Skills Gap

The digital divide in emerging economies extends beyond mere access to technology; it also encompasses the insufficient capacity and skills required to use it effectively. Numerous existing educational systems are not structured to fulfill the requirements of the digital economy, resulting in a disconnect between the skills possessed by the workforce and the demands of businesses (Conde & Wasiq, 2021). The OECD (2022) points out that many future jobs will necessitate some degree of digital skills, highlighting the pressing need for educational reform.

Adapting Educational Curricula

To bridge this gap, there is an increasing agreement on the necessity to modify educational curricula from an early age. This involves incorporating digital literacy, data analytics, and

programming skills into school systems (DBSA, n.d.). Additionally, lifelong learning is becoming essential. Companies and governments are progressively investing in upskilling and reskilling initiatives for the current workforce to ensure they remain pertinent in a swiftly evolving labor market (ITU, n.d.). The effectiveness of these initiatives frequently relies on the collaboration among academic institutions, private sector enterprises, and government agencies (DBSA, n.d.).

Governance and Policy Frameworks

The effectiveness of digital transformation within supply chains is significantly reliant on the existence of supportive governance and policy frameworks. Governments in developing nations play an essential role in fostering an environment conducive to technology adoption.

The Need for Digital Infrastructure

A key component of digital transformation is a strong digital infrastructure. This encompasses dependable and affordable internet access, which continues to pose a considerable challenge in numerous emerging economies (UNDP, n.d.). Government investment in broadband networks, mobile connectivity, and data centers is vital for bridging the infrastructure gap and ensuring that the advantages of digitalization are broadly accessible. Case studies from nations such as Rwanda and Jamaica underscore the significance of national initiatives and the persistent challenges of achieving widespread access (World Bank, 2020).

Regulatory and Legal Frameworks

The literature further highlights the necessity for clear and supportive regulatory frameworks. This encompasses policies that promote e-commerce and cross-border trade, data protection laws that foster consumer trust, and cybersecurity regulations that reduce risks (UNDP, n.d.). The OECD (2025) stresses that governments must be "digital by design," incorporating technology into their own operations to enhance efficiency and transparency. This includes the responsible development and deployment of AI in the public sector and the creation of robust data governance frameworks.

Promoting Inclusive Digital

Transformation ultimately, governance policies should prioritize inclusivity. As noted in a World Bank report, the advantages of digital transformation are frequently not equitably distributed, thereby exacerbating existing inequalities (World Bank, 2020). Governments must enact policies aimed at bridging the digital divide and ensuring that marginalized communities are not overlooked. This necessitates strategic planning, community involvement, and a commitment to guarantee that digital advancements
benefit all (Cambridge University Press, 2025).

Theoretical application

Digital transformation in supply chains for emerging economies is a multifaceted topic that is well-supported by various fundamental business and management theories. These theories

elucidate the drivers, challenges, and outcomes associated with the adoption of digital technologies in these distinct contexts. Below are some of the principal theories and their respective authors, along with their significance.

Resource-Based View (RBV)

The Resource-Based View was introduced by Barney, J. B. in 1991 and serves as a cornerstone theory in strategic management. It asserts that a firm's enduring competitive advantage arises from its unique and valuable resources and capabilities that are challenging for competitors to replicate. The Natural Resource-Based View (Hart, 1995) expands this concept to encompass a firm's capacity to manage its environmental impact. The relevance of this theory to the subject matter lies in its explanation of how firms in emerging economies can achieve a competitive edge by strategically acquiring and leveraging digital technologies (Barney 2018). It also highlights the significance of intangible assets, such as knowledge and organizational culture, in facilitating successful digital transformation.

Transaction Cost Economics (TCE)

Formulated by Oliver Williamson in 1975, Transaction Cost Economics (TCE) posits that firms exist primarily to minimize the costs associated with transactions in a market. Firms are inclined to internalize a process (such as a supply chain activity) when the cost of doing so is lower than the cost of engaging with an external entity. Digital technologies contribute to the reduction of transaction costs by enhancing transparency and facilitating information sharing (Williamson, 2010). For example, blockchain technology can significantly decrease the costs associated with transaction verification and ensure the traceability of goods. In emerging economies, where market uncertainties and information asymmetry are frequently prevalent, TCE elucidates how digital platforms and technologies can foster more efficient and reliable supply chain relationships. Consequently, this can facilitate the emergence of new business models and partnerships.

Dynamic Capabilities

The Dynamic Capabilities framework, introduced by David Teece, Gary Pisano, and Amy Shuen in 1997, builds upon the Resource-Based View (RBV) by emphasizing a firm's capacity to identify and capitalize on new opportunities, as well as to reconfigure its resources to gain a competitive edge. This framework is especially pertinent in environments characterized by rapid change. Its relevance to the topic lies in the fact that digital transformation, viewed as an ongoing and dynamic process, utilizes the dynamic capabilities framework to illustrate how firms in emerging economies can adjust to the unpredictable and volatile aspects of the digital landscape (Teece, 2018). It underscores the necessity for firms to continuously modify their supply chain processes and business models in response to technological innovations and market fluctuations, rather than merely relying on a fixed set of resources.

Innovation Diffusion Theory (IDT)

The Innovation Diffusion Theory (IDT), formulated by Everett Rogers in 1962, elucidates the mechanisms through which new ideas and technologies disseminate across cultures, including the reasons and pace of this spread. It delineates five key factors that affect the adoption of an innovation: relative advantage, compatibility, complexity, trialability, and observability. IDT serves as a framework for examining the uptake of digital technologies within supply chains in emerging economies. It aids in comprehending the sluggish adoption rates frequently observed in small and medium-sized enterprises (SMEs), which may stem from limited resources, perceived complexity, or an inability to recognize the advantages (Rogers, 2003). This theory is vital for policymakers and educators aiming to expedite digital transformation by tackling these obstacles and enhancing the perceived value of new technologies.

Stakeholder Theory

Pioneered by R. Edward Freeman in 1984, Stakeholder Theory posits that the success of an organization is contingent upon how effectively it manages its relationships with various stakeholders, which include employees, customers, suppliers, and government entities. The impact of digital transformation on supply chains influences a multitude of stakeholders. This theory is pertinent as it underscores the necessity of considering the interests of all stakeholders during the digitalization process (Freeman, et.al. 2020). For instance, a company must evaluate the digital capabilities of its suppliers, the regulatory framework established by the government, and the consumers' demand for transparency. Neglecting any of these stakeholders could hinder the successful execution of a digital supply chain strategy, particularly in emerging economies where governance and collaboration may not be as developed.

A fundamental conclusion drawn from this theory is that the unsuccessful outcomes of numerous past ICT projects in developing nations, including Zambia, can be linked to insufficient stakeholder engagement (Kroczek et al., n.d.). For digital transformation to succeed, it is essential that the interests and concerns of all key stakeholders are acknowledged. The government, for instance, must not only establish a legal framework but also ensure that policies are inclusive and advantageous to even the most marginalized stakeholders, such as rural farmers. Likewise, large corporations spearheading digital initiatives must engage their SME suppliers and distributors throughout the process to facilitate a smooth transition and foster trust. By addressing the needs and concerns of all stakeholders, from the highest echelons of government to the individual small business owner, the digitalization process becomes more collaborative, legitimate, and ultimately sustainable.

Recommendations

i. **Digital Transformation of Supply Chains in Emerging Economies:** There should be an aim to deliver a comprehensive overview of the global trends and theories surrounding the digitalization of supply chains. It is essential to define key terms, identify significant technologies,

and discuss the overall impacts. Key Concepts and Technologies: In the context of supply chain management (SCM), digital transformation (DT) should be defined.

ii. Key technologies such as the Internet of Things (IoT) for real-time tracking and monitoring, Big Data Analytics (BDA) for demand forecasting and optimization, and blockchain for ensuring transparency and security must be explained. It is important to discuss how these technologies enhance visibility, increase agility, and improve operational efficiency.

iii. **Challenges and Opportunities**: An examination of the unique challenges that emerging economies face in adopting these technologies is necessary. This includes issues such as limited digital infrastructure, a shortage of technical skills, high investment costs, and regulatory uncertainty. In contrast, the opportunities presented by DT should be highlighted, including greater access to global markets, enhanced resilience to disruptions (such as the COVID-19 pandemic), and the capacity to "leapfrog" conventional SCM models.

iv. **The Future**: Business, Education, and Governance: This section will serve as the synthesis of your review, linking the essential elements of business, education, and governance to the future of digital supply chains in Zambia.

v. **Business:** Examine how digital transformation (DT) in supply chain management (SCM) can revolutionize Zambian businesses, especially Small and Medium Enterprises (SMEs). Digital platforms and e-commerce can enable businesses to reach new markets, lower operational expenses, and enhance customer service. Provide examples, such as the digital tracking of agricultural products or the implementation of Transport Management Software (TMS) to optimize logistics, to support your arguments.

vi. **Education:** Concentrate on the significance of education in closing the skills gap. Discuss the necessity for a reassessment of business and logistics education to incorporate digital skills such as data analytics, artificial intelligence (AI), and cybersecurity. Highlight the critical role of collaborations between educational institutions and the private sector to ensure that curricula remain relevant and that graduates are prepared for employment. Mention the potential of digital learning platforms to enhance access to quality education.

vii. **Governance**: There is need to investigate how digital transformation in supply chain management can foster improved governance. This may involve increased efficiency and transparency in public procurement and logistics, as well as the utilization of data to guide policy-making. Digital systems can mitigate corruption, enhance accountability, and streamline bureaucratic processes, ultimately fostering a more conducive business environment.

viii. Digitalization in Zambian Context: It is essential to examine the current digital landscape of the country, the existing policies, and the condition of its business sectors. This will anchor the theoretical concepts within the specific context of Zambia based on the Ministry of Technology and Science, to coordinate these efforts and ensure a cohesive approach. It is essential to examine the current digital environment of the country, the existing policies, and the condition of its business sectors.

ix. The National Digital Agenda through the Electronic Government Division (EGD) & SMART Zambia Institute should recognize the Zambian government's dedication to digital transformation. Reference significant policies and initiatives such as the National Digital Transformation Strategy and the creation of the Electronic Government Division. Pertinent legislation should be discussed, including the Electronic Government Act and the Data Protection Act, which establish a legal framework for digitalization.

x. Challenges and opportunities in Zambia to be mitigated based on the government's current digital policy, as outlined in the National Digital Transformation Strategy (NDTS), and closely aligned with the Southern African Development Community (SADC) Digital Transformation Strategy (SADC), 2020): Emphasize the challenges that Zambia encounters. Recognize the ongoing digital divide, especially in rural regions, along with the difficulties in digital literacy and skills development. Discuss how the logistics and transport sectors, crucial for a landlocked nation like Zambia, continue to depend heavily on paper-based and manual systems, which presents a considerable opportunity for enhancement. Highlight the potential for digital financial services, which are already gaining momentum, to further improve the efficiency of supply chains.

Conclusion

In summary, digital transformation represents a multifaceted and intricate process that offers significant potential for supply chains in emerging economies. The literature reviewed indicates that the future of business in these areas is closely tied to the adoption of technologies that improve efficiency, transparency, and resilience. However, this transformation transcends mere technology; it is a comprehensive process that necessitates concurrent advancements in education and governance. Future research should concentrate on several areas to enhance our understanding. There is a pressing need for more industry-specific case studies across various emerging economies to grasp the unique challenges and best practices within different sectors. Furthermore, a heightened emphasis on the socio-economic ramifications of digital transformation, including its impact on employment and income distribution, would yield a more nuanced understanding of its long-term effects.

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