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Analyzing the Effects of E-Commerce on Enhancing Cross-Border trade in the Food and Beverage Processing Industry among Lusaka-Based SMEs

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Abstract

Small and Medium Enterprises (SMEs) are pivotal to Zambia's economic development, contributing approximately 70% of GDP and providing over 80% of employment opportunities. Food and beverage processing SMEs play a key role in supporting agribusiness value chains and producing export-ready products. E-commerce presents these SMEs with opportunities to expand cross-border trade, reduce transaction costs, and improve operational efficiency. However, adoption is constrained by low digital literacy, unreliable internet connectivity, high costs of digital tools, and weak regulatory frameworks. This study evaluates how e-commerce adoption influences cross-border trade performance among Lusaka-based food and beverage processing SMEs. Specifically, it investigates the effect of e-commerce adoption on trade performance, key enablers facilitating effective use, major barriers hindering adoption, and the contribution of e-commerce platforms to trade growth and competitive advantage. A mixed-methods case study was conducted with 20 purposively selected SMEs engaged in cross-border trade. Structured questionnaires captured quantitative data analysed in SPSS, including hypothesis testing, while semi-structured interviews provided qualitative insights analysed thematically to identify enablers, barriers, and strategic considerations. Findings indicate that 95% of SMEs had formalized e-commerce policies, with 41–80% of transactions conducted online for most firms. All four alternative hypotheses (H_1–H_4) were accepted. H_1 confirmed that e-commerce adoption significantly improves cross-border trade performance ($\beta = 0.48$, $p < 0.01$). H_2 indicated that technological infrastructure, including reliable internet, affordable data, and trained staff, significantly enhances e-commerce utilization ($\beta = 0.35$, $p < 0.05$). H_3 demonstrated that barriers such as limited digital skills, high costs, and regulatory complexity negatively influence adoption ($F = 7.12$, $p = 0.01$). H_4 showed that e-commerce use significantly contributes to trade growth and enhances competitive advantage (factor loadings: policy comprehensiveness = 0.84; staff competency = 0.76). Key enablers included mentorship programs, platform partnerships, and supportive institutional policies, while major barriers encompassed cybersecurity risks, limited digital access, and complex customs procedures. Overall, the study concludes that e-commerce adoption is a critical driver of operational efficiency, market reach, and competitiveness among Lusaka-based food and beverage processing SMEs, with smaller firms facing greater adoption challenges due to infrastructural and financial constraints.

Keywords: E-Commerce Adoption, Cross-Border Trade, SMEs, Trade Performance, Digital Skills/Barriers

1. Introduction

1.1 Background

Small and medium-sized enterprises (SMEs) are essential to Zambia's socioeconomic environment because they are vital catalysts for economic diversification, job development, and poverty reduction. The International Trade Centre (ITC, 2023) estimates that SMEs account for over 80% of job opportunities in Zambia and contribute roughly 70% of the country's GDP. These businesses are crucial to the development of both urban and rural areas because they encourage entrepreneurship, innovate, and support domestic value chains. Due to their contributions to improving food security, bolstering agricultural value chains, and producing processed goods that are ready for expert, SMEs in the food and beverage manufacturing industry stand out above the rest.

Global trade dynamics have changed dramatically as a result of the quick rise of e-commerce, which has given SMEs, especially those involved in the food and beverage manufacturing industry. New chances to reach a wider audience. SMEs can

connect with global clients, lower transaction costs, simplify distribution, and improve operational efficiency by utilizing digital platforms like websites, social media, and online marketplaces (UNCTAD, 2022). Global research indicates that SMEs that use e-commerce outperform those that only use physical trade channels in terms of revenue growth and export diversification E-commerce offers food and beverage producers, whose goods frequently have a regional appeal, a crucial avenue for exposure, direct marketing, and access to international consumer markets (OECD, 2021).

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The adoption and efficient use of e-commerce by Zambian food and beverage SMEs, particularly those engaged in cross-border trade, is still rather limited, despite the potential of digital trade. Digital transformation is nevertheless hampered by a number of contextual and structural issues. As of 2023, about 36% of Zambians were online, and many SMEs do not have reliable access to broadband connectivity, reasonably priced data, or appropriate digital tools. Significant obstacles include high operating costs, erratic electricity supplies, and inadequate ICT infrastructure, especially for small processors and unofficial businesses (ITU, 2023).

In addition to infrastructure, a lack of technical skills and low digital literacy make it difficult for employees and owners of food and beverage SMEs to embrace and successfully operate e-commerce systems. Setting up online stores, managing perishable logistics, and protecting online transactions are all things that many people are not familiar with. Further discouraging uptake are worries about fraud, data privacy, and cybersecurity. The GSMA (2023) asserts that these risks are more noticeable in developing nations with less developed regulatory frameworks and consumer protection laws.

The lack of a clear, all-encompassing policy framework to regulate and encourage e-commerce in Zambia exacerbates these issues. Low participation rates among SMEs can be attributed to a number of factors, including inadequate enforcement of digital trade rules, a dearth of tailored incentives, and a lack of clear guidance on cross-border digital transactions. Both buyers and sellers lack confidence in online trade processes in the absence of robust legal protections and support systems.

This study aimed to assess how e-commerce adoption, technological infrastructure, important facilitators, and barriers affect cross-border trade outcomes, given the growing significance of digital trade and the particular opportunities and difficulties faced by Zambia's SMEs engaged in food and beverage processing. In order to give policymakers, business associations, and development partners useful information for enhancing Zambia's involvement in regional and international digital trade ecosystems, the study focused on SMEs in Lusaka that produce food and beverages.

1.2 Statement of the Problem

The expanding global usage of e-commerce has altered trade by enabling enterprises, including SMEs, to access regional and international markets at lower operational costs (UNCTAD, 2022). Despite Zambia's significant potential for export diversification and value addition, adoption of e-commerce for cross-border trade remains low, notably among Lusaka-based SMEs in the food and beverage manufacturing sector (ZDA, 2023). While digital platforms provide potential for market visibility and competitiveness, SMEs confront challenges such as insufficient digital infrastructure, unpredictable electricity, and costly internet fees. Over 99% of internet subscribers in Zambia are mobile-based, although mobile internet is still expensive and unstable for corporate use (GSMA, 2024). Limited broadband coverage further limits digital engagement (World Bank, 2021). Adoption is also hampered by disparities in digital literacy. Many SME owners in the food and beverage industry are not equipped to handle online sales, employ digital marketing, or put cybersecurity safeguards in place (AfDB, 2022). Trust in digital trade systems is diminished by cyber threats and lax data protection regulations (ITU, 2023; OECD, 2023). Furthermore, the cost of cross-border transactions is increased by intricate customs processes and trade obstacles, particularly for perishable items (COMESA, 2022). Many SMEs are consequently unable to compete locally or scale digitally. This study looks into how cross-border trade performance and competitiveness among SMEs that process food and beverages in Lusaka are impacted by e-commerce adoption, infrastructure, enablers, and barriers.

1.3 General Objective

The general objective of this study was to evaluate the role of e-commerce in enhancing cross-border trade among Lusaka-based SMEs in the food and beverage manufacturing sector.

1.3.1 Specific Objectives

1. To analyse e-commerce adoption by the cross-border traders in the food and beverage processing by Lusaka based SMEs.
2. To examine determinants on effective use of e-commerce by the Lusaka based SMEs in the food and beverage processing sector.
3. To ascertain the relationship between the effective use of e-commerce platform and SMEs business performance in food and beverage processing.
4. To identify limitations in the utilisation of E-commerce by SMEs in the food and beverage processing sector.

1.4 Conceptual Framework

This study investigated four key variables influencing cross-border trade outcomes among Lusaka's food and beverage processing SMEs.

E-commerce Adoption refers to the degree SMEs integrate digital tools, such as online ordering, mobile apps, and digital payments, into their operations. Higher adoption enables SMEs to process transactions faster, overcome market entry barriers, and efficiently reach regional clients,

thereby directly improving cross-border trade performance through increased sales volume and export frequency (UNCTAD, 2021).

Technological Infrastructure Access is defined by the availability, quality, and affordability of digital tools, including reliable internet connectivity, digital devices, and ICT support systems. Effective access to this infrastructure allows SMEs to manage orders, promote perishable goods online, and process payments efficiently, which fundamentally improves the effective utilization of e-commerce platforms and overall operational performance (World Bank, 2023).

Limitations to E-commerce Adoption encompass key challenges that prevent SMEs from fully engaging in digital trade. These include low digital literacy, inadequate regulatory support, high operational costs, complex logistics for perishable goods, and prevalent cybersecurity threats. The presence of these limitations hinders adoption and negatively affects e-commerce utilization, competitiveness, and market reach (UNCTAD, 2022).

Use of E-commerce Platforms reflects the extent to which SMEs actively market and sell products through specific digital venues like BuyZed, Facebook Marketplace, and global e-commerce websites. Consistent and active utilization of these platforms provides SMEs with increased market visibility, lower marketing costs, and improved access to regional buyers, directly contributing to enhanced trade growth and a competitive advantage in cross-border markets (Finextra, 2024).

2. Literature Review

2.1 E-commerce Adoption by Food and Beverage SMEs in Cross-Border Trade

E-commerce has emerged as a fundamental and revolutionary force in global trade, altering old business models and reinventing how products and services are exchanged across borders. Small and Medium Enterprises (SMEs), who have historically been disadvantaged, can now overcome geographical, logistical, and structural barriers to international trade by exploiting digital technology (Rahayu and Day, 2017) [41]. This transformation is especially important for SMEs in underdeveloped countries, where problems such as poor transportation networks and limited access to global markets have traditionally hampered corporate growth. E-commerce allows smaller businesses to connect directly with international buyers and suppliers without relying heavily on physical intermediaries or costly retail infrastructure (Omwansa & Sullivan, 2024) [40].

The extensive use of e-commerce platforms is strongly linked to improved trade performance across several critical areas, notably by significantly lowering coordination and transaction costs (Garicano and Kaplan, 2001) [18]. This digital shift broadens market access and enhances operational efficiency, which is vital given the infrastructural and technological constraints often faced by SMEs in developing nations (Mthembu *et al*., 2018) [27]. Empirical research has strongly supported this correlation, revealing that digitally capable SMEs saw a substantial increase in export volumes over a two-year period, largely attributed to their improved capacity to enter specialized foreign markets and better meet client demands (Li *et al*., 2023) [25]. Furthermore, the introduction of e-commerce enables SMEs to respond to changing market conditions with greater agility (Sung, 2021) [45]. Businesses may now utilize digital analytics and customer data to estimate demand and customize marketing campaigns for particular consumer categories across several locations, an advantage previously exclusive to major international firms.

The accessibility of e-commerce has been bolstered by the emergence of international platforms like Alibaba and Shopify, as well as the development of cloud computing and mobile technology. Cloud-based services offer scalable and reasonably priced options, minimizing the need for significant proprietary software investment. Similarly, mobile commerce (m-commerce) has created new opportunities, especially in areas where mobile phone penetration is high, becoming the main means of online transactions and consumer interaction in Sub-Saharan Africa. The rise of mobile money platforms like M-Pesa has been particularly transformative in East Africa, enhancing e-commerce adoption by providing accessible and secure payment methods even without formal banking infrastructure.

Consequently, e-commerce has fundamentally shifted the way SMEs handle trade, positioning it as a vital element of business survival and expansion in the twenty-first-century economy. This transition provides many SMEs, particularly those in the food and beverage manufacturing sector, with enhanced resilience, agility, and long-term competitiveness.

2.2 Determinants of Effective E-commerce Use by Food and Beverage SMEs

The effective participation of Small and Medium Enterprises (SMEs) in cross-border e-commerce is fundamentally shaped by a complex mix of technological, financial, and policy-driven enablers. At the core of these determinants is the proliferation of global e-commerce platforms such as Amazon, Alibaba, and Etsy, which serve as virtual marketplaces. These platforms provide embedded support features, allowing SMEs to engage in trade even without direct access to physical supply chains or extensive international trade networks. Studies demonstrate that firms using such platforms experience significantly higher export volumes and up to 30% faster market entry (Kharas *et al*., 2021) [24].

In parallel, cloud computing and Software-as-a-Service (SaaS) models have drastically lowered the technological entry barrier. Services like QuickBooks and Xero provide scalable, user-friendly solutions for critical back-office functions such as bookkeeping, inventory control, and customer engagement. Research has shown that SMEs utilizing automated inventory and fulfillment software experienced notable improvements in stock accuracy, thereby enhancing customer satisfaction and minimizing international delivery delays, a critical factor for the perishable food and beverage industry (Chen and Lin, 2020) [14]. Moreover, the global expansion of logistics infrastructure, driven by multinational courier services and emerging third-party logistics (3PL) startups, further empowers SMEs by providing integrated solutions that cover warehousing, customs brokerage, and last-mile delivery, services once exclusive to large multinational corporations (Sahoo & Pillania, 2022) [42].

Equally critical for effective use is the availability of secure and interoperable digital payment systems, which reduce the friction associated with cross-border transactions. In Sub-Saharan Africa (SSA), the widespread adoption of mobile money platforms such as M-Pesa, MTN MoMo, and Airtel

Money has been transformative, enabling secure, real-time payments without requiring formal banking infrastructure (Mutiso *et al*., 2020; Sithole & Ncube, 2022) [33, 44]. This accessibility allows SMEs to manage quick payment cycles and high transaction volumes essential for the food sector. Furthermore, the emergence of regionally tailored platforms like Jumia and Konga, which offer context-sensitive features such as regional warehousing and logistics, fill crucial gaps left by global platforms (Moyo *et al*., 2020) [26]. Government initiatives, such as those in Kenya and South Africa, have also created enabling environments through investments in broadband infrastructure, digital literacy, and streamlined trade regulations, contributing to documented increases in SME revenue (Mwangi & Mugo, 2023; Tshabalala & Dlamini, 2023) [34, 46].

Despite these powerful regional enablers, SMEs in Zambia, particularly those in Lusaka's food and beverage sector, face systemic challenges that constrain scalability. One major limitation is the policy asymmetry and fragmented regulatory landscape. For instance, Zambia lacks clear and enforceable regulations on critical aspects such as VAT collection on digital sales, digital contract enforcement, and platform liability standards (Njenga *et al*., 2022) [39]. This legal ambiguity creates uncertainty, often leading SMEs to restrict operations to domestic markets to avoid potential disputes or penalties (Simutanyi and Kaputo, 2023) [43]. Additionally, while the National Financial Switch (NFS) has improved domestic interoperability (Musonda *et al*., 2021) [30], many Zambian SMEs still face difficulties integrating with global payment gateways due to stringent foreign exchange controls and restrictions, which severely inhibit the ability to complete cross-border transactions efficiently (Banda & Mwape, 2022) [6]. Ultimately, while global and regional enablers offer a strong pathway, their effectiveness in the Lusaka context remains contingent upon overcoming local infrastructural deficits, policy fragmentation, and persistent socio-cultural barriers to digital transformation (Kambwili and Phiri, 2024) [21].

2.3 The Effective Use of E-Commerce Platform and SME Business Performance

The literature affirms that e-commerce platforms are fundamental catalysts for boosting small and medium-sized enterprises (SMEs) performance globally. These platforms fundamentally restructure how SMEs compete by enabling them to transcend traditional barriers of size and geographic location, thereby facilitating greater access to international markets (Amit & Zott, 2020). Leading virtual ecosystems integrate critical functions like digital marketing, secure payments, and logistics coordination into a single interface, which not only lowers operational costs but also provides superior market intelligence (Dube *et al*., 2021; Bouwman *et al*., 2019). This integration empowers SMEs to operate efficiently, enhance responsiveness, and achieve a sustained competitive advantage, a capability that Zeng *et al*. (2021) suggest helps democratize international trade participation.

In the Sub-Saharan African context, e-commerce has rapidly become a transformative enabler for SME growth, with prominent examples found in Kenya, South Africa, and Nigeria. In Kenya, platforms have been vital in expanding SME market reach, allowing firms to bypass intermediaries and utilize integrated mobile money solutions and consumer analytics to sharpen their product-market fit (Munyaka & Njoroge, 2020; Kendi & Gikandi, 2021). Similarly, South African SMEs have leveraged digital platforms to mitigate economic volatility and expand into remote areas, while benefiting from optimized supply chains and automation (Govender *et al*., 2021; Van Der Merwe & Mentz, 2020). Nigeria's digital transformation, supported by government initiatives, has also resulted in significant SME growth and broadened market access domestically and internationally (Abiola, 2021).

However, the effective use of these platforms remains constrained by significant structural and capacity-related barriers, particularly in low-income markets like Zambia. Systemic challenges include limited broadband access, insufficient ICT infrastructure, and low digital literacy, which often restrict SMEs to basic online presence rather than full transactional engagement (Brown *et al*., 2020; Chatterjee & Kar, 2022). Furthermore, cybersecurity threats and financial fraud pose substantial risks that SMEs often lack the resources to mitigate, undermining the trust essential for digital trade (Amin *et al*., 2021). Specifically for Lusaka, Musonda and Zulu (2020) found poor internet access and high data costs are primary inhibitors, while a shortage of specialized e-commerce skills and lack of localized platforms further hinder the maximization of digital benefits (Mwansa, 2024; Mwila & Phiri, 2024). Ultimately, while international and regional evidence confirms the transformative potential of e-commerce for SME performance, realizing this potential fully in the food and beverage sector requires addressing these specific infrastructural and digital skill deficits.

2.4 Limitations in the Utilization of E-commerce by Food and Beverage SMEs

The adoption of e-commerce by manufacturing small and medium-sized enterprises (SMEs), particularly those operating in the food and beverage sector, is significantly hampered by a distinct and persistent set of challenges spanning operational, technological, regulatory, and financial dimensions. These limitations create a layered and often interdependent web of barriers that inhibit the full realization of e-commerce's potential in international trade.

One of the most significant barriers lies in the operational complexity of integrating e-commerce into existing manufacturing value chains. Unlike service-sector SMEs that can scale easily, food and beverage firms must navigate production scheduling, specialized packaging, warehousing, and cold-chain logistics across multiple borders. This physical infrastructure introduces substantial fixed and variable costs (Chanda *et al*., 2023) [11]. A related challenge is the lack of integration between e-commerce platforms and internal enterprise systems, such as inventory control and production management. Many SMEs rely on disjointed systems or manual processes, which results in order delays and stockouts, diminishing the operational efficiencies that e-commerce promises and reducing responsiveness to real-time market changes.

Cybersecurity vulnerabilities represent a critical global barrier, particularly acute for SMEs with limited IT expertise. As food and beverage SMEs digitize customer records and payment details, they become prime targets for cybercrime. Studies reveal that many SMEs exhibit reluctance to scale their e-commerce activities due to concerns over cyber fraud, data breaches, and a general lack of trust in online security measures (Chibesa & Kalumba, 2024) [15].

In tandem with security issues, SMEs must navigate substantial regulatory complexity when entering foreign digital markets. Exporting food and beverage products subjects SMEs to overlapping national and international laws concerning food safety, packaging, labelling, and customs clearance procedures (Njenga *et al*., 2022) [39]. For smaller firms without legal counsel, these obligations are often misunderstood or overlooked. Furthermore, financial and transactional challenges disproportionately affect manufacturing SMEs. Many small exporters incur high costs for foreign currency conversion, suffer from slow settlement processes, and lack access to multi-currency digital wallets (Mwila & Phiri, 2024). This financial friction is compounded by a persistent lack of interoperability between domestic mobile money platforms and essential international payment gateways.

In the Zambian context, these limitations are magnified by infrastructural and human capital deficits. Inadequate broadband internet access and chronic power supply interruptions in peri-urban industrial zones undermine the stability and continuity required for effective digital operations (Chanda *et al*., 2023) [11]. Additionally, human capital deficits and behavioural barriers play a pivotal role in slowing adoption. Cultural factors such as risk aversion, preference for traditional face-to-face dealings, and reliance on cash payments inhibit the uptake of digital platforms (Simutanyi & Kaputo, 2023) [43]. A pervasive lack of awareness and specialized training means many producers fail to meet digital market entry standards due to lack of procedural familiarity (Kambwili & Phiri, 2024) [21]. Overcoming these issues requires the establishment of robust data protection legislation and the design of sector-specific capacity-building programs.

3. Research Methodology

3.1 Research Design

The study adopted a case study research design embedded within a mixed-methods approach to investigate the role of e-commerce in enhancing cross-border trade.

3.2 Target Population

The target population comprised Small and Medium-sized Enterprises (SMEs) operating within the food and beverage manufacturing sector in Lusaka, Zambia, that are either actively engaged in cross-border trade or have intentions to participate in such trade through e-commerce.

3.3 Sampling

Purposive sampling approach was employed to select participants who are most relevant to the study, specifically firms actively involved in processing cross-border trade, and utilizing e-commerce platforms.

3.4 Sample Size

Based on a finite population correction calculation, the calculated appropriate sample size for this study was 20 SMEs.

3.5 Data Collection Methods

The study employs a mixed-methods approach utilizing Semi-structured interviews with SME owners/top managers.

4. Result Presentation

The study surveyed 20 SMEs in Lusaka's food and beverage processing sector.

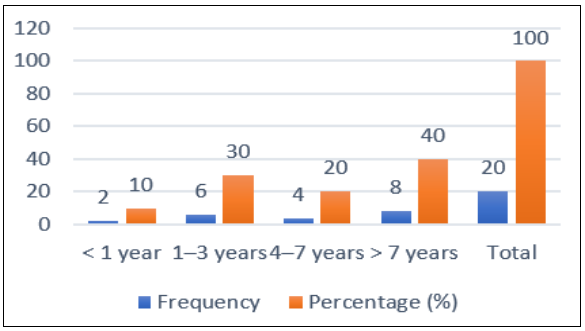


Fig 4.1: Firm Age Distribution

The analysis of firm age among Lusaka's food and beverage SMEs engaged in cross-border trade reveals a sector characterized by both maturity and digital dynamism. While a significant majority (60%) of the businesses have been operating for over three years, indicating an established base of experienced firms, the younger SMEs (aged one to three years, representing 30%) are notably driving e-commerce adoption, reporting comparatively higher use of digital platforms for cross-border transactions. In contrast, the largest group, older SMEs (over seven years old, at 40%), appear to rely more on traditional trade practices, suggesting slower adaptation to new digital models. The presence of these mature firms provides stability, yet the younger, more flexible entrants are embracing digital tools for quicker regional market access, creating an evolving balance between established methods and innovation within the sector.

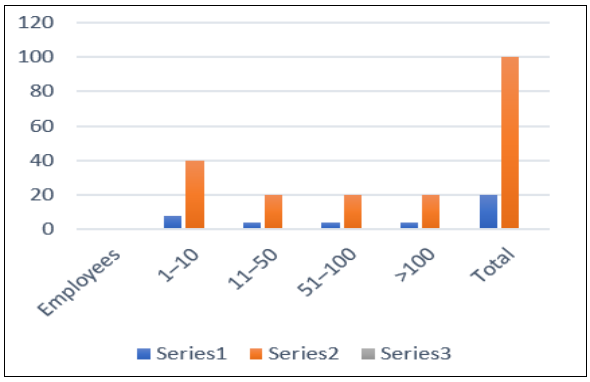


Fig 4.2: SME Size by Number of Employees

The sample of Lusaka's food and beverage SMEs engaged in cross-border trade displays significant size diversity, ranging from micro-enterprises (40% with under 10 employees) to those with over 100 workers (20%). Crucially, the study found that firm size does not directly predict e-commerce adoption. While larger SMEs possess greater resources, they often adopted e-commerce more slowly due to internal structural and logistical complexities. Conversely, micro and medium-sized firms showed greater agility and reliance on digital platforms, using e-commerce as a strategic tool to effectively expand their market reach and enhance regional competitiveness.

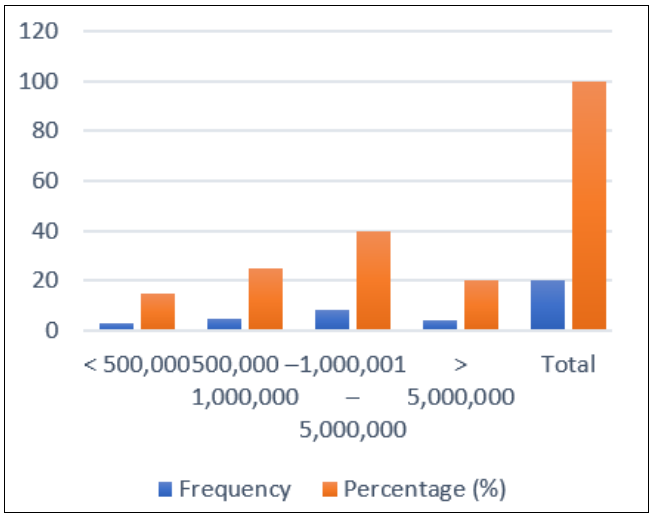


Fig 4.3: Annual Turnover of SMEs (ZMW)

The turnover analysis of Lusaka's food and beverage SMEs in cross-border trade indicates that the sector's backbone consists of moderately sized, financially stable firms, with a combined 65% reporting annual earnings between ZMW 500,000 and ZMW 5,000,000. While smaller enterprises (15% with turnover below ZMW 500,000) may struggle with scaling and digital investment, the higher-turnover SMEs (20% earning over ZMW 5,000,000) leverage their scale for wider regional reach and efficient logistics. However, the study shows that higher revenue doesn't automatically equate to higher e-commerce adoption, as many financially strong firms still rely on traditional trade channels. This suggests that the choice between digital and conventional trade is driven more by strategic priorities and operational models than by financial capacity alone.

4.1 Cross-Border Trade & E-Commerce Usage

4.1.1 Descriptive Statistics

All twenty sampled SMEs participate in cross-border trade, mainly with regional partners. While all firms use e-commerce, the degree of adoption varies significantly.

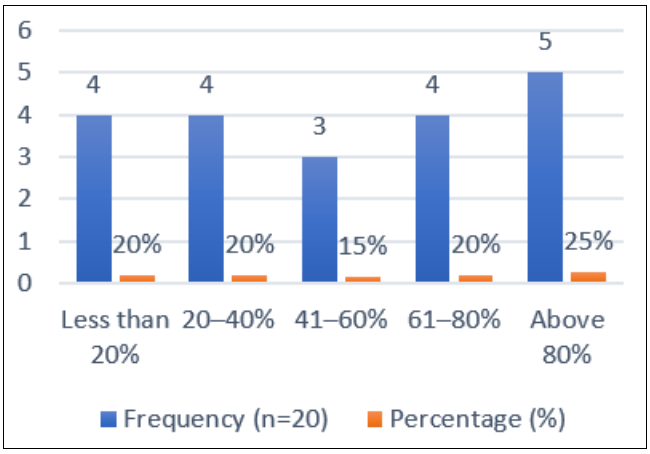


Fig 4.4: Percentage of Cross-Border Transactions Conducted via E-Commerce

E-commerce adoption among Lusaka's food and beverage SMEs is highly uneven, with a mean adoption rate of 48% (SD = 28). Adoption ranges dramatically from full integration, where a quarter of firms conduct over 80% of their cross-border trade online, viewing e-commerce as a core strategic tool for market expansion, to limited engagement, with 20% of SMEs using digital platforms for less than 20% of their transactions, likely constrained by skill or infrastructure gaps. The majority of firms (55%) fall into the moderate adoption category, using e-commerce to complement existing physical trade channels rather than fully replace them. This variation highlights that while e-commerce is widely acknowledged, its depth of integration depends heavily on individual firm resources, managerial capacity, and operational strategy.

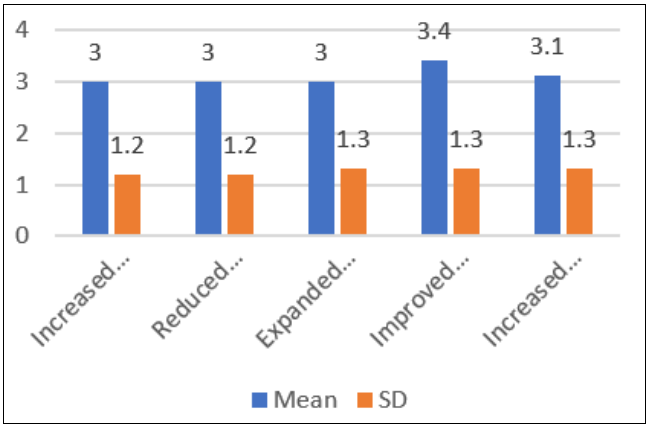


Table 4.5: Perceived Impact of E-Commerce on Cross-Border Trade Performance

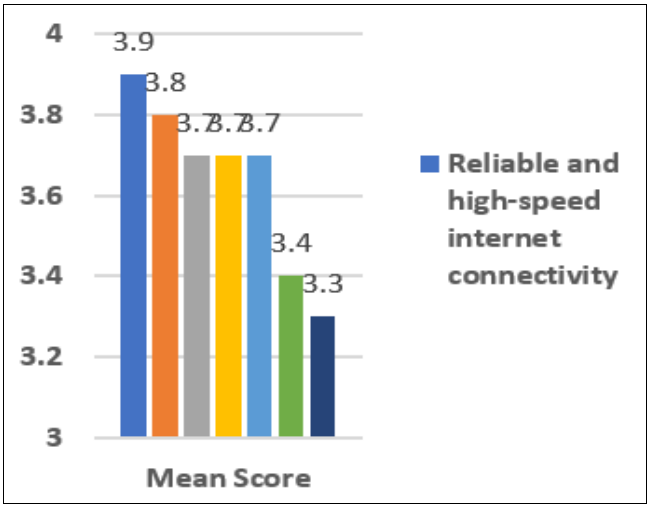
SMEs perceive the impact of e-commerce on cross-border trade performance as generally moderate (mean scores 3.0 to 3.4), suggesting benefits are not yet fully realized across the sector. The most strongly perceived advantage is improved speed and reliability (Mean = 3.4) in transactions. Other key measurable benefits, such as increased export volumes, reduced costs, expanded market reach, and increased profitability, received only neutral to slightly positive ratings (Means approximately 3.0–3.1). The high variation in responses (SD approximately 1.2–1.3) indicates that the extent of positive impact differs significantly based on each firm's technological readiness and level of adoption. While e-commerce has positively influenced trade operations, its potential for boosting exports and profitability remains modest for many firms.

4.1.2 Hypothesis Testing (H_1)

The hypothesis test confirmed that e-commerce adoption significantly enhances cross-border trade performance among Lusaka's food and beverage SMEs (beta = 0.49, p = 0.003), leading to the rejection of the null hypothesis. Strong evidence showed that higher digital transaction shares increase export volumes and reduce operational costs. However, the link to increased profitability was comparatively weaker, suggesting that while e-commerce improves trade efficiency, its ultimate financial benefit depends on factors like firm size, logistics, and managerial capability, necessitating a holistic approach to digital transformation.

4.2 Determinants of E-Commerce Adoption

To identify factors enabling effective e-commerce use by Lusaka-based food and beverage SMEs, respondents rated the importance of various enablers (Table 4.6).



SMEs identified reliable internet connectivity (mean = 3.9) and efficient logistics services (mean = 3.8) as the most critical enablers for successful e-commerce adoption, highlighting the vital role of infrastructural support for digital trade. Other highly important factors include affordable data/device access, digitally trained staff, and strong platform partnerships (all mean = 3.7), pointing to the necessity of human capital and collaboration. Interestingly, while recognized, secure payment systems (mean = 3.4) and supportive government policies (mean = 3.3) were ranked as only moderately important, as firms prioritize immediate operational challenges like connectivity and logistics. Qualitative data further stressed the value of mentorship and peer learning in enhancing digital readiness.

4.2.1 Hypothesis Testing (H_2)

The hypothesis test confirmed that access to technological infrastructure has a statistically significant positive effect on the effective use of e-commerce by food and beverage SMEs engaged in cross-border trade. Both correlation and regression analyses rejected the null hypothesis (beta = 0.51, p = 0.002), showing that infrastructure accounts for over half the variance in e-commerce adoption. Internet reliability (r = 0.56) and logistics efficiency (r = 0.53) were the strongest predictors of online transaction levels, underscoring the centrality of infrastructure readiness in driving digital trade participation.

4.3 Contribution of E-Commerce to Trade Growth and Competitive Advantage

The third objective examined if e-commerce platforms significantly contribute to trade growth and enhance the competitive advantage of Lusaka's food and beverage SMEs (Hypothesis 3). This was tested using both quantitative data (measuring sales growth, customer base expansion, market responsiveness, and overall competitiveness on a Likert scale) and qualitative interview data to provide contextual insights into how digital platforms affect trade outcomes.

4.3.1 Quantitative Analysis

Correlation analysis showed that higher e-commerce usage for cross-border transactions is positively linked to stronger trade outcomes, including improved market reach (r=0.50), sales growth (r=0.47), and overall competitiveness (r=0.52), confirming that digital adoption enhances both trade performance and strategic positioning.

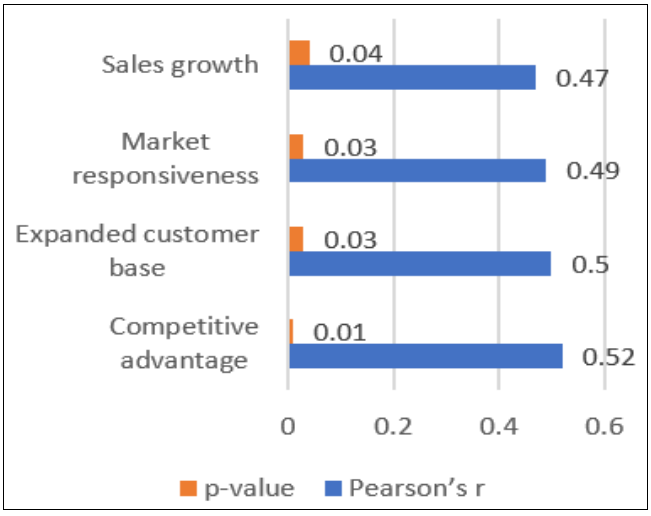


Fig 4.8: Correlation Analysis of E-Commerce Usage and Trade Growth Indicators

Multiple regression analysis strongly confirmed the significant contribution of e-commerce usage to trade growth and competitiveness, showing a positive and statistically significant effect ($\beta = 0.55$, $p = 0.001$) on the composite trade performance index.

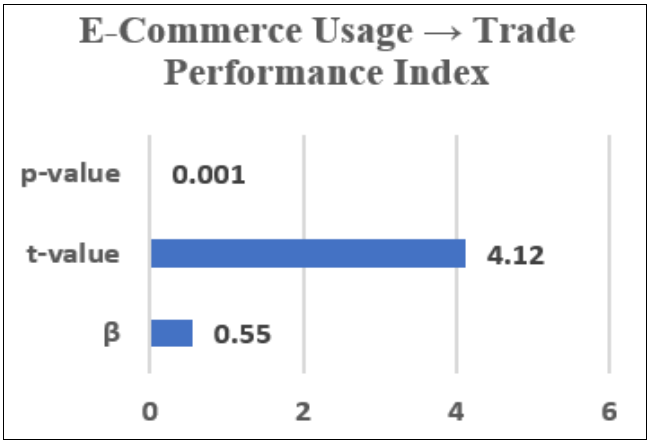


Fig 4.9: Regression Analysis of E-Commerce Usage Predicting Trade Growth & Competitiveness

4.3.2 Hypothesis Testing (H_3)

The hypothesis test confirmed that the use of e-commerce platforms significantly contributes to trade growth and enhances the competitive advantage of food and beverage SMEs. The null hypothesis was rejected (p = 0.001), as regression analysis yielded a strong positive effect (beta = 0.55) on the composite trade performance index. Correlation results supported this, showing positive links between higher e-commerce usage and improved market reach (r=0.50), sales growth $r=0.47), and overall competitiveness (r=0.52).

4.4 Effect of Limitations on E-Commerce Utilization

Analysis of e-commerce limitations revealed a consistent negative correlation with the actual use of digital platforms for cross-border trade. Specifically, high costs of data and digital tools (r = -0.51) and limited logistics access (r = -

0.49) were the strongest deterrents to e-commerce adoption. Other significant obstacles included lack of digital skills (r = -0.48), complex customs regulations (r = -0.46), and cybersecurity/fraud risks (r = -0.42), all of which show that as these barriers intensify, SMEs significantly reduce their use of digital platforms.

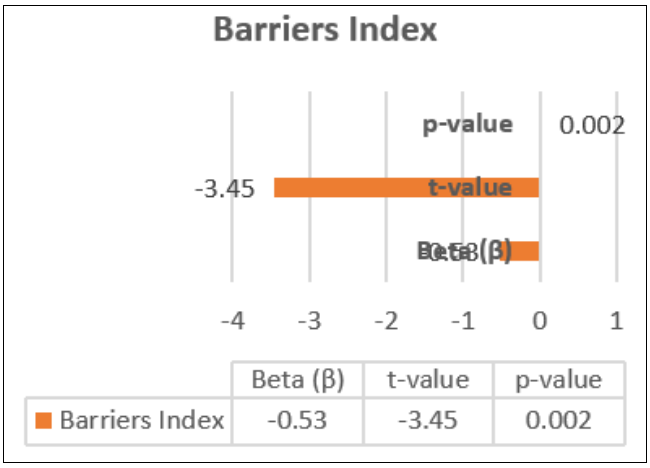


Fig 4.10: Regression Analysis of Limitations Predicting E-Commerce Utilization

4.4.1 Hypothesis Testing (H_3)

The hypothesis test confirmed that limitations in e-commerce adoption have a statistically significant negative effect on the level of e-commerce utilization among food and beverage SMEs. Regression analysis rejected the null hypothesis (beta = -0.53, p = 0.002), proving that a higher prevalence of barriers significantly reduces the proportion of cross-border transactions conducted online. Key obstacles driving this reduction include digital skill gaps, high data costs, complex customs, and logistical limitations, highlighting the critical need for targeted interventions to boost SME digital trade engagement.

4.4.2 Thematic Insights

Qualitative insights confirmed that e-commerce drives trade growth and competitive advantage by enabling five key themes. Firstly, it enhances operational efficiency and speed, simplifying order processing and minimizing cross-border delays. Secondly, it vastly improves market visibility and reach, allowing SMEs to expand their customer base and gather crucial market data to tailor products. Thirdly, it facilitates strategic partnerships with platforms and logistics providers, lending credibility and technological access. Fourthly, it fosters investment confidence and growth orientation by providing business predictability. Finally, it builds resilience and adaptability, allowing firms to sustain operations during market disruptions. Collectively, these themes validate e-commerce as a critical strategic enabler for SMEs, positioning them competitively in regional markets.

5. Discussion

The comprehensive analysis of Lusaka's food and beverage SMEs revealed a sector undergoing a significant digital transition, with firm characteristics proving influential in the pace of change. Specifically, younger, more agile SMEs demonstrated a higher propensity for e-commerce adoption, leveraging digital platforms as a core strategy for efficient market access, contrasting with larger firms constrained by organizational inertia. This digital engagement is not merely an option; the study conclusively confirmed that e-commerce adoption significantly enhances cross-border trade performance ($\beta = 0.49$, $p=0.003$). This positive impact is tangible, primarily manifesting through increased export volumes ($r=0.52$) and notable reductions in operational and transaction costs (r=0.47).

However, realizing these benefits depends on critical supporting factors. Technological infrastructure was established as the foundational enabler (beta = 0.51, p=0.002), with the reliability of internet connectivity and the efficiency of logistics systems emerging as the strongest predictors of consistent e-commerce usage. Furthermore, the presence of skilled human capital and the formation of strategic partnerships with online marketplaces and payment providers were deemed vital for translating technological access into operational success and competitive advantage. While e-commerce successfully drives efficiency, its financial benefits on overall profitability were found to be moderated by external factors like persistent logistical bottlenecks and internal structural complexities, underscoring the need for a holistic approach to digital transformation.

6. Conclusion

The aim of this study was to assess how e-commerce adoption influences the cross-border trade performance of Lusaka-based food and beverage SMEs, specifically examining the roles of technological infrastructure, barriers, human capital, and strategic partnerships. The findings strongly supported the alternative hypotheses (H_1–H_4), proving that e-commerce has a positive and significant impact on SME trade outcomes. Firms integrating digital platforms saw measurable gains in export volumes, transaction efficiency, and operational management. This confirmed Hypothesis 1 (H_1) and aligned with the Diffusion of Innovations Theory, suggesting that agile, digitally literate firms gain substantial strategic advantages from early technological adoption.

Technological infrastructure was a decisive determinant of adoption intensity, validating Hypothesis 2 (H_2). Quantitative results showed significant positive correlations between e-commerce usage and access to reliable internet, affordable data, and efficient logistics systems. Regression analysis confirmed that better infrastructure directly increases e-commerce utilization (beta = 0.51, p = 0.002). This was reinforced by qualitative evidence highlighting that cloud-based systems, digital payments, and logistics integration are crucial for sustaining efficient cross-border operations, leading to smoother transactions and enhanced supply chain coordination.

Conversely, the study confirmed that barriers to adoption—including inadequate financial resources, cybersecurity vulnerabilities, and complex regulatory frameworks—had a negative impact on digital trade, supporting Hypothesis 3 (H_3). These challenges disproportionately restricted smaller enterprises with limited capital. However, firms successfully mitigated these barriers through capacity-building and institutional support. Human capital was particularly influential, as digitally competent staff were better equipped to manage platforms securely, navigate compliance, and adapt to market changes.

Finally, the study demonstrated that strategic partnerships with online marketplaces, logistics providers, and financial institutions were major catalysts for digital expansion,

confirming Hypothesis 4 (H_4). These collaborations boosted market visibility, optimized delivery systems, and provided access to essential digital financial services. Partnerships, combined with institutional support (e.g., training and tax incentives), fostered trust and reduced operational uncertainty, positioning SMEs to compete effectively. Adoption patterns were also influenced by demographic characteristics, with younger and medium-sized firms showing greater adaptability, while older, larger firms were often constrained by risk-aversion and traditional models.

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