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E-Commerce and the Emergence of Just-in-Time (JIT) Inventory: Significance for SMEs in Guyana

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Abstract

This study explores the connection between e-commerce literacy and Just-in-Time (JIT) inventory management practices among Small and Medium Enterprises (SMEs) in Guyana, a developing country with varying levels of digital adoption. As SMEs face increasing pressure to meet higher customer expectations and manage more complex supply chains, JIT inventory management can be an effective way to implement lean practices without maintaining excess stock. Successfully using JIT requires SMEs to enhance real-time inventory visibility and coordinate purchasing, logistics, and supplier deliveries. These improvements can be particularly challenging for small, resource-limited SMEs. This qualitative study employs a mixed-methods approach, collecting quantitative data through structured surveys from 248 SMEs and qualitative data via semi-structured interviews with 11 stakeholders across industries such as retail, agriculture, manufacturing, and services. The analysis of the quantitative data supports the hypothesis, showing that SMEs utilizing digital tools, such as procurement apps, cloud-based inventory systems, or e-commerce platforms, experience operational benefits, including shorter lead times, improved stock availability, faster inventory turnover, and more efficient order fulfillment. Furthermore, there is a strong negative correlation between firms using digital procurement tools and procurement and inventory inefficiencies, indicating that e-commerce facilitates successful JIT. However, structural barriers still hinder many firms from fully adopting JIT, especially in remote areas. These barriers include digital literacy gaps, limited access to affordable technology, and inadequate digital infrastructure with reliable connectivity. The findings suggest that while e-commerce has significant potential to aid JIT adoption, SME success depends on initial and ongoing investments in digital infrastructure, staff training, and supply chain coordination. This research contributes to the growing literature on digital transformations guided by lean principles in the Southern Hemisphere, providing both theoretical insights and practical recommendations for policymakers and SME managers. Ultimately, the study emphasizes the importance of adopting universal digital strategies that can help SMEs in emerging economies, like Guyana, improve inventory management, organizational resilience, and business growth.

Keywords: *Digital Transformation, E-commerce, Guyana, Inventory, Just-in-Time (JIT), SMEs, Supply Chain.*

Introduction

The success and viability of small and medium enterprises (SMEs) are recognized as crucial to economic growth, innovation, and job creation, especially in developing economies like Guyana. SMEs operate across various sectors, including retail, agriculture, manufacturing, and services, and make significant contributions to the national economy. However, SMEs in Guyana face structural challenges related to inventory management, procurement, and supply chain management. These issues, stemming from manual systems, inconsistent supplier

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relationships, and outdated operational models, lead to higher costs, excess inventory, and stockouts, ultimately limiting growth and customer satisfaction.

Historically, many SMEs depended on buffer-stock strategies and holding excess inventory to handle demand swings or supply chain disruptions. While this approach offers a sense of security in the short term, it leads to inefficiencies over time, such as higher storage costs, outdated inventory, and constrained working capital [1]. These issues arise from inadequate logistics infrastructure, technological weaknesses, and poor information flow among supply chain participants. This challenge has driven SMEs in an increasingly competitive and digital environment to adopt leaner, more adaptable inventory practices, with Just-in-Time (JIT) inventory becoming their preferred choice.

The JIT (Just-in-Time) inventory management strategy originated in Japan, emphasizing the reduction of excess stock and acquiring inventory on demand to match actual needs, thereby eliminating wasteful surplus. The documented benefits of JIT, such as cost savings, responsiveness to demand shifts, and process discipline, are well-supported in the literature related to manufacturing and advanced industrial settings. However, the full adoption of JIT in resource-limited economies, such as Guyana, remains uncommon due to issues including unreliable internet, inaccurate demand data, and limited supplier integration. E-commerce offers a promising platform for linking lean inventory principles with digital tools. By digitizing procurement, inventory control, and stock management, e-commerce solutions allow even micro and small enterprises to become more agile in their supply chains. With affordable options such as mobile apps, cloud-based inventory tracking, and real-time analytics dashboards, SMEs can enhance procurement efficiency, improve order accuracy, and minimize overstocking. Digital systems are increasingly seen as a valuable way to implement JIT principles in low-resource environments.

Along with significant operational change, e-commerce and JIT both play roles in promoting new methods to reduce waste and link inventory to demand. E-commerce companies support JIT principles by enabling automated stock reordering, providing real-time inventory access, and offering other predictive analytics solutions [2]. Best of all, these tools are no longer exclusive to large firms. The shift to low-cost, accessible digital systems allows SMEs in emerging markets to use these systems, which previously required significant capital and technical resources [3].

Unfortunately, recent studies show that rapid adoption and use are more common in certain parts of Guyana than others. Smaller firms supported by institutions like Georgetown and New Amsterdam tend to connect better, have higher digital literacy rates, and maintain more links to local, regional, and international markets compared to rural firms, which lack the same resources and are hindered by outdated infrastructure, limited training opportunities, and unreliable electricity [4]. The rural-urban digital divide serves as a barrier to inclusive digital transformation and also prevents uniform JIT adoption across the SME sector. However, early digital inventory adopters in Guyana are beginning to see tangible benefits. Companies that utilize cloud-based software and mobile procurement systems have seen improvements in lead times, stock accuracy, and customer response times. These examples align with international research indicating that SMEs in countries like India, Kenya, and Southeast Asia, which utilize e-commerce platforms, have increased inventory turnover ratios and procurement efficiency [5, 6]. Musara [7] provided evidence from Southern Africa that SMEs adopting digital and JIT strategies simultaneously can reduce holding costs by over 40% and increase order fulfillment rates by more than 25%.

The value of this study lies in its focus on detailed operational insights and its relevance to the context. It first connects JIT inventory theory to the digital capabilities that SMEs in developing economies face. Then, it provides analysis based on metrics collected from SMEs in Guyana, offering precise empirical data that is likely valuable for similar groups in other emerging markets.

To illustrate this framework, "Figure 1" shows a schematic of the e-commerce-enabled JIT ecosystem. It highlights the connections among digital tools, supply chain nodes, inventory processes, and customer feedback loops, where SMEs can adopt lean inventory models supported by digital platforms.

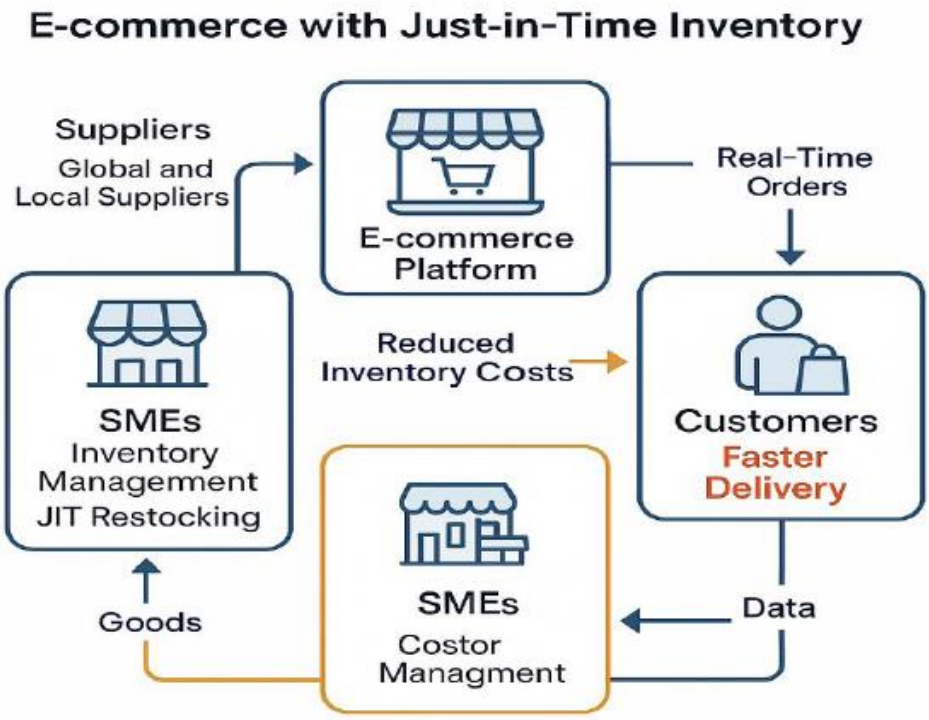

Figure 1. E-commerce-Enabled JIT Model for SMEs in Guyana

This paper examines how effectively e-commerce adoption supports JIT inventory practices among SMEs in Guyana by identifying various enabling factors, obstacles, and operational outcomes related to digital transformation in inventory management. It combines both quantitative and qualitative data to contribute to the ongoing discussion on digital resilience and lean operations in emerging economies, providing practical recommendations for SME leaders, policymakers, and supply chain stakeholders to enhance competitiveness in Guyana's retail and service sectors.

Materials and Methods

This study examined the relationship between e-commerce adoption and Just-in-Time (JIT) inventory practices among SMEs in Guyana by using a mixed-methods research approach. The combination of survey data, interview insights, and secondary sources supported a triangulated approach, enhancing the validity, detail, and contextual understanding of the study's findings [1].

Description of the Site

The study aimed to sample SMEs across various administrative regions of Guyana, including urban areas like Georgetown and

New Amsterdam, as well as rural interior settlements such as Essequibo and Linden. The selection was stratified to reflect regional differences in digital capacity, market access, and SME capabilities. The study population included registered SMEs involved in retail, agriculture, manufacturing, and service sectors. Participants were limited to firms with four or fewer employees, or fewer than 100 employees, at least one year of operation, and engaged in business activities involving inventory.

Stratified random sampling was used to ensure proportional representation across key geographic regions and industry sectors. The sampling maintained equal proportions of industry samples while covering nine regions of Guyana. It also helped reduce sampling biases and was utilized to analyze sector and regional trends related to digital implications with inventory.

Questionnaire and Survey Process

The survey tool was designed as a structured questionnaire to collect quantitative data on key operational areas. These included the use of digital tools, supply chain setup, inventory turnover rates, stock-out frequencies, lead times, ordering habits, and supplier coordination. The tool featured a combination of closed-ended questions, such as Likert scales and multiple-choice questions, along with open-ended questions to gather explanatory responses and detailed perceptions.

For data collection, a final sample of 248 SMEs was obtained with an approximate response rate of 83%. Field teams distributed the survey through in-person methods, while SMEs with reliable online access received an electronic version of the survey. Data were entered and processed using IBM SPSS Statistics, where they were coded, cleaned, and analyzed. The researchers used descriptive statistics (e.g., frequency, mean, and standard deviation) to summarize the data. Then, a bivariate correlation analysis was conducted to examine the relationships between e-commerce adoption and the other primary JIT performance indicators of interest: lead time, fulfillment rates, and inventory levels [8].

Qualitative Interviews and Thematic Analysis

To complement our survey results and explore underlying processes, semi-structured interviews were conducted with 11 strategically selected stakeholders, including an SME Owner, Manager, Logistics Officer, and IT Consultant. Participants were chosen because they were directly involved in inventory processes and had previously used digital tools. Interview questions focused on several topics relevant to the SMEs: organizational readiness, perceived benefits and costs of digital transformation, spatial coordination with suppliers, and challenges to digital adoption.

All interview transcriptions were done verbatim. Analysis was conducted using NVivo software. Each transcript was analyzed in two stages. First, researchers performed open coding to identify emerging concepts. Then, they applied axial coding to group findings by themes. Several themes emerged, including constraints in digital infrastructure, the visibility of inventory, the non-utilization of technology, and the need for workflow adaptation.

Secondary Data and Validation

Secondary data sources were utilized to contextualize the primary findings and verify the researchers' thematic interpretations. Key documents included the Guyana Digital Master Plan 2021–2025 [9], the World Bank Doing Business Report [10], and UNCTAD's SMEs publication [2]. These documents provide national indicators of digital readiness, broadband access, and regulatory frameworks that result from the digital adoption of SMEs. The supplementary use of secondary materials employed a more comprehensive structure and connotation, enabling the observed trends to be

contextualized and interpreted within the broader impact of policies and infrastructure.

The research followed ethical standards. Willing participants received a consent form and were informed about the study's goals and procedures. Participation was voluntary, and participants were assured of the confidentiality and anonymity of their data throughout the research.

Results

The results of the mixed-methods study, involving 248 SMEs across Guyana, emphasize the empirical data collected. The findings address key aspects of e-commerce adoption and its effect on Just-in-Time (JIT), as indicated in related literature. Each subsection concentrates on a crucial dimension, including digital tool use, sector-specific patterns, infrastructural challenges, supplier integration, and measures related to their target markets. The data, both quantitative and qualitative, are combined to reflect the realities faced by the study SMEs and to identify systemic challenges across the landscape.

E-commerce Adoption and Tool Use

Of the SMEs surveyed, 62% reported using some form of digital tool to help manage their inventory and procurement processes. The most popular technologies include:

1. Mobile applications (42%) that are used for order-tracking and customer communications
2. Basic inventory software (35%) that includes cloud-based programs like QuickBooks Commerce and Zoho Inventory, and
3. Third-party e-commerce applications (23%), including platforms like Shopify and Square, encompass features like real-time ordering and payments.

These tools affected companies' measurable operations related to JIT applications. Firms that reported using a cloud-based inventory experienced an average 53% reduction in lead times, decreasing from 5.8 days to 2.7 days. An impressive 72% of the sample (from SMEs that adopted digital solutions) reportedly completed orders faster than previous lead times, and 65% of the group noted a decrease in over-stocking, aligning concepts with JIT by maintaining low to moderate inventory levels and coordinating their procurement or acquisition.

An Owner of a Retail Operation (in Georgetown) Shared

"Inventory turnover has doubled since we have been using app-based restocking. We were always either overstocked or out of key items."

The above evidence shows that adopting technologies doesn't need to be extravagant to match operational standards like JIT and inventory discipline, even for SMEs.

Sectoral and Regional Patterns of Adoption

By sector, retail SMEs had the highest rate of digital tool adoption at 78%, followed by services at 64%, manufacturing at 59%, and agriculture at 47%. The observed trends were similar, reflecting operational demands and varying levels of digital readiness. Retail and service companies, in particular, that often handle high-frequency transactions, were more likely to benefit from real-time inventory intelligence and e-commerce [1].

Regional differences in the findings were also evident. SMEs in urban centers like Georgetown and Linden were more likely to adopt digital tools and reported more advanced usage of these tools. Meanwhile, firms in more rural areas were less engaged in the digital space and cited infrastructure issues as barriers to adopting digital tools.

An agricultural SME Owner in Essequibo Made the Following Remark

"I know those tools are out there, but I have no idea how to use them, and no one around here really trains us. And besides all that, the internet drops all the time."

These observations were consistent with the conclusions in the UNCTAD E-commerce and

Development Report [2], which identified infrastructure and education inadequacies as primary barriers to inclusive digital transformation.

Infrastructure and Capability Gaps

Three main barriers were identified across the SME sample:

1. 38% cited unreliable internet connectivity as a major obstacle.
2. 34% reported concerns about the affordability of digital subscriptions and software licenses.
3. 29% reported a lack of in-house technical capacity to deploy or use these tools. These challenges disproportionately affected rural and micro-enterprises, which reinforced the dual-channel digital environment where only better-resourced firms could achieve JIT practices through e-commerce (6).

Additionally, several interviewees mentioned the underuse of existing tools. Although many firms used software for accounting and invoicing, few utilized features for purchase orders or inventory management. This highlights the gap between having a digital presence and effectively leveraging digital tools.

Supplier Integration and Procurement Practices

JIT systems depend on integrated procurement and supplier management. Only 21% of SMEs reported using automated or scheduled orders. The majority of SMEs rely on traditional (manual) procurement methods, which causes uncertainty and variability in their supply chains.

That said, companies that had worked with their supplier for a long time were better able to coordinate their digital procurement. For example, some wholesalers in Georgetown had established digital supplier portals, while others relied on manual systems, such as phone calls or messaging apps. As one respondent noted: "I have upgraded on my side, but many of my suppliers still take orders by phone or WhatsApp, so it is difficult to automate reordering even if I want to."

The lack of digital integration with suppliers acts as a bottleneck to otherwise efficient systems. It aligns with Musara's [7] findings on coordination challenges faced by SMEs across Southern Africa.

Comparative Performance Metrics

In evaluating the operational impact of e-commerce and its alignment with JIT practices, several key performance metrics were used to differentiate digital adopters from non-adopters, including lead time, inventory turnover, stock-outs, customer fulfillment, and the frequency of reorders.

Table 1. Sourced from Questionnaire Data Analysis - Comparison of Key Performance Metrics between JIT adopting SMEs and Non-Adopting SMEs

Metric	**JIT-Adopting SMEs**	**Non-Adopting SMEs**
Average Lead Time (days)	2.7	5.8
Inventory turnover (times)	8.3	4.1
Monthly average stock-outs (monthly avg)	1.2	3.9

Customer fulfilment rate (%)	94.7	78.3
Reordering Frequency (per month)	4.8	2.1

Metric JIT Adopting SMEs Non-Adopting SMEs

From "Table. 1", above, it is clear that JIT-adopting SMEs using digital tools compatible with JIT processes perform better than non-adopters. Even without lead time and stock-outs, the performance benefits in customer fulfillment and turnover rate indicate operational advantages for JIT processes enabled by e-commerce (7). However, the differences in performance are more pronounced for firms with prior digital experience, strong supplier networks, and organizational alignment.

However, the data shows a pattern of dependency; digital tools alone are not enough. Without proper infrastructure, skill development, and coordination across the ecosystem, JIT systems cannot be fully implemented, regardless of whether the environment has low connectivity or limited capacity (8).

Discussion

The findings of this study show that e-commerce effectively supports just-in-time (JIT) inventory practices among SMEs in Guyana. Companies utilizing digital tools, such as cloud-based inventory systems, mobile provisioning apps, and integrated e-commerce platforms, have reported significant improvements in inventory turnover, reduced lead times, and enhanced customer fulfillment. The results include many performance goals aligned with the core JIT principle of waste minimization. The data demonstrate how digital transformation is implemented in real-world SME settings. However, the limitations hindering technology adoption, especially the urban-rural gap among SMEs, highlight inherent challenges that could lead to uneven adoption and ultimately inefficient operations.

E-Commerce as a Digital Accelerator of JIT

The study shows that e-commerce infrastructure is essential for applying JIT principles in resource-limited environments. Gunasekaran and Ngai [8] emphasize that lean inventory systems depend on synchronized information across the supply chain, which is accessed through e-commerce platforms, highlighting apparent differences. E-commerce platforms enable synchronization, allowing companies to operate with real-time visibility, predictive analytics, and automated stock replenishment. These features would allow SMEs to synchronize their procurement cycles with demand fluctuations, thereby reducing resource waste and enhancing their responsiveness.

JIT implementation has traditionally relied on proximity, emphasizing the physical closeness of supply chain actors and their trust-based relationships as key factors for inventory control. However, as Ramírez Martínez et al. [6] have proposed in the digital age, proximity is not determined by physical distance but by connectivity. Digital platforms like WhatsApp Business, QuickBooks Commerce, or Shopify, used by SMEs in Guyana and regions such as Georgetown, New Amsterdam, and Linden, enable real-time interactions with suppliers and customers, allowing companies to implement incremental lean practices across extensive geographic areas. The evolving nature of JIT in this scenario shows that digital transformation is more than just an addition to existing models; it serves as a force for reorganization and should be integrated. In Guyana, where ongoing issues with reliability and infrastructure affect suppliers, the future JIT environment will not

be an exact copy of that in the industrialized world. Instead, it will be a digitally built and locally adapted reinterpretation of lean operations theory [2, 3].

Comparative Evidence from Other Developing Contexts

The findings align with a global trend of SME digitalization. In India, ERP-based inventory systems across SMEs reduced lead time variability and increased stock accuracy by 45% [11]. Similarly, mobile-enabled platforms improved traceability and lowered post-harvest losses among agribusinesses in Kenya [12]. The experiences of Caribbean countries are also significant. Jamaica's experience closely resembles Guyana's: urban SMEs used e-commerce to improve customer access and fulfillment; however, inefficient delivery networks and digital divides have hampered widespread adoption [4].

The Musara prefix examination, which supports this proposition in Southern Africa, also serves as a relevant case study in this context. Musara [7] found that SMEs that integrated digital strategies with lean inventory management experienced a 25-40% increase in operational efficiency. Overall, these examples support the idea that e-commerce can democratize lean supply chain practices, provided institutions build on enabling infrastructure to facilitate the realignment of supply chains. These comparisons reinforce the Guyanese story and show that, while the perceived relationship between digital adoption and inventory efficiency is similar in many emerging market contexts, primarily where the same structural constraints exist in SMEs.

Conditions Vulnerable to Limiting the Scope of Digital-JIT Synergy

Although the potential exists, combining e-commerce and JIT doesn't work for everyone. The study results reveal that only certain groups of enterprises benefit. SMEs need specific conditions in infrastructure, organization, and supplier coordination to maximize value from digital adoption.

There were three specific, consistent key constraints:

1. Infrastructure gaps: limited broadband access and inconsistent electricity in rural areas hinder both tool access and functionality.
2. Affordability: subscription costs and high initial investment restrict access to digital systems, especially for microenterprises.
3. Skills gaps: Many small and medium-sized enterprises lack the technical knowledge or know-how to implement, maintain, and use inventory systems.

Key challenges are commonly recognized in UNCTAD [2] and ITU [13] studies: that technology gaps are more than simply technological deficits; they are rooted in socio-economic and spatial inequalities.

Furthermore, even when tools are available, many SMEs fail to use all their features. For example, several companies used accounting systems but had not activated inventory modules or automated communications with their suppliers. These firms' goal of digitally integrating their inventory and logistics does not fully reflect the potential ROI they have invested in those platforms, presenting an opportunity to develop a more comprehensive digital adoption strategy that emphasizes process redesign, user training, engagement, and management support.

The Influence of Managerial Mindset and Company Culture

A key insight from background information is the importance of a managerial mindset for successfully adopting digital products. SMEs with innovation-driven managerial mindsets are more likely to invest in staff training, improve existing workflows, and build relationships with suppliers to implement digital products. These companies see better results even with less-than-ideal digital infrastructure. This aligns with Bhatt's [14]

study, which indicates that managerial culture plays a more crucial role in digital success than technological sophistication.

Digital tools are most effective when integrated into a business's core operations, rather than just changing behaviors in peripheral tasks. In the examples above, managers employed a strategic mindset to integrate technology into customer service and procurement processes, while also aligning objectives with long-term growth goals.

This interpretation is valuable for program and policy designers. Besides providing infrastructure and financial incentives for technology adoption, development actors should also consider supporting entrepreneurial capacity-building programs that focus on digital confidence, adaptive reasoning, and leadership readiness for SMEs.

Rethinking JIT in an Age of Risk and Uncertainty

It is hard not to see the efficiency benefits of JIT; however, the study warns against using JIT everywhere in fragile supply ecosystems. The COVID-19 pandemic highlighted the vulnerability of hyper-lean supply chains and prompted companies to reassess their inventory strategies, introducing buffers to enhance resilience [15].

In a context like Guyana, where multiple layers of uncertainty exist due to logistics and reliance on imports, a hybrid inventory model may be a better option. This model could combine JIT principles for fast-moving, low-risk products with traditional stockpiling of items that have long lead times or are seasonal. Sector-specific assessment guidelines can help SMEs evaluate inventory risk and adopt strategies tailored to their unique environment.

This alternative approach aligns with newer literature on resilient lean systems, which advocates for flexibility, risk reduction, and adaptive supply chain design in uncertain environments.

Equations

Although this research does not employ rigorous econometric models or advanced mathematical simulations, it depends on basic inferential statistics to examine the link between e-commerce adoption and operational performance, especially within a Just-in-Time (JIT) setting. The primary measure is the Pearson correlation coefficient (r), which assesses the strength and direction of the relationship between two continuous variables: the use of digital tools and the reduction of lead time [16].

The formula applied is as follows

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \cdot \sum(y_i - \bar{y})^2}}$$

Where:

- x = *digital tool usage score*,
- y = *observed lead time reduction (days)*,
- $\bar{x}$ *and* $\bar{y}$ = *mean values of* x *and* y, *respectively*.

This was a logical choice as a statistical tool for capturing textual linear relationships between the primary variables when parametric assumptions were met, and the goal was to measure distance rather than causality.

Illustrative Example

Let's use five SMEs as an example, which show different levels of adoption of digital tools and the associated improvements in procurement lead time.

SME Digital Tool Usage Score (x) Lead Time Reduction (y).

Table 2. Sourced from Questionnaire data analysis – Pearson Formula Dataset

SME	Digital Tool Usage Score (x)	Lead Time Reduction (y)
A	5	4.0
B	3	2.0
C	4	3.0
D	2	1.5
E	1	1.0

Therefore, applying the Pearson formula using the "Table. 2" dataset to this example, r = 0.98, indicating a nearly perfect positive linear relationship between digital tool adoption and the reduction in procurement lead time.

Interpretation and Implications

The strength of this correlation indicates a clear operational benefit from adopting digital tools in inventory and procurement systems. Specifically, companies that utilized digital solutions (e.g., mobile inventory apps, supplier portals, and cloud-based reordering systems) experienced greater reductions in lead times compared to those with limited or no digital solution usage.

This outcome supports the theoretical argument that e-commerce tools improve the viability of JIT systems, as they provide real-time data visibility and automate procurement [10, 2]. This finding aligns with previous global research from Musara [7] and Ramírez Martínez et al. [6], who also reported strong correlations between digital maturity and inventory responsiveness to end-market changes in emerging markets.

Causation cannot be established solely through correlational analysis; however, this analysis confirms the empirical link between digital enablement and the benefits of lean performance [17]. Additionally, the results emphasize the need for increased investment in SME-level digital infrastructure and education, especially in under-connected areas of Guyana.

This study does not utilize advanced econometric models or complex math simulations; however, it is a significant study that relies on basic inferential statistics to explore the link between e-commerce adoption and operational performance within a Just-in-Time (JIT) framework [18]. The primary analytical method employed is Pearson's product-moment correlation (r), which examines the direct relationship between two continuous variables: digital tool usage and lead time reduction. Using the Pearson formula, the correlation coefficient is approximately r = 0.98, indicating a powerful positive linear relationship between the level of digital tools adopted by SMEs and reductions in inventory lead time.

What Does it Mean?

The strong correlation indicates that digital adoption has provided operational benefits, including those in inventory and procurement activities. Specifically, SMEs that invested in digital systems, such as mobile inventory apps, supplier portals, and cloud-based inventory reordering, experienced larger reductions in inbound lead times compared to those that either could not adopt technology or chose not to do so.

This observation supports the idea that using e-commerce tools enhances implementation potential aligned with JIT principles through real-time data visibility and automation in procurement [4, 5]. Additionally, the results and analysis also echo earlier international research by Musara [7] and Ramírez Martínez et al. [6], who similarly found high correlations between digital maturity and inventory response in emerging markets.

It is also important to note that causation can never be inferred solely from correlation; however, our results confirm the empirical relationship between digital enablement and lean gains performance. This further investigation involves investing in digital infrastructure and education at the SME level, especially in Guyana's regions, where we suspect a reduction in opportunities that could have been greatly aided by connectivity.

Conclusion

The purpose of this study was to investigate how the adoption of e-commerce facilitates the implementation of Just-in-Time (JIT) inventory practices in Small and Medium Enterprises (SMEs) in Guyana. As an emerging economy with fragmented infrastructure and uneven e-commerce adoption, Guyana provides an ideal context for exploring a significant gap in the literature regarding how lean supply chain principles can be localized and digitally enabled in resource-constrained areas.

A mixed-methods approach analyzed the structured survey questionnaire used by 248 SMEs, along with semi-structured interviews with eleven stakeholders from urban and rural areas of Guyana. Overall, the results confirm that e-commerce adoption is significantly linked to JIT performance metrics, including lead time, inventory turnover, and customer fulfillment. These confirmed correlations demonstrate that even basic e-commerce capabilities can be powerful enablers of inventory efficiency in practice, as long as the relevance within an operation remains focused on waste reduction and responsiveness.

This study also highlighted significant limitations that hinder the scalability and inclusiveness of digital JIT adoption, particularly issues related to infrastructure, such as broadband and energy supply, as well as limited technical skills within the SME workforce and insufficient supplier integration [19]. Rural SMEs, in particular, continue to lag behind urban SMEs, thereby reinforcing a two-tiered operational readiness business model for manufacturers. Furthermore, the benefits of e-commerce adoption are highly contextual: technology is essential to realizing these benefits, but it will only be effective when combined with strategic alignment, managerial engagement, and supplier collaboration.

These findings contribute to a growing understanding of JIT as more than just something transferred from developed countries to be implemented elsewhere; JIT can be reinterpreted in a digitally fragmented, low-infrastructure context. The findings demonstrate how e-commerce facilitates a more flexible approach to JIT compared to a rigid model. JIT might be best understood as a framework that can be refined by technological tools to adapt or respond to the specific conditions of individual emerging economies. The advancement of technology-supported structures depends not only on the technology itself but also on context-specific factors that enable learning, coordination, and innovation by SMEs [20].

In conclusion, this manuscript contributes to the ongoing discussion about the modernization of supply chains and the digital transformation of SME firms within Global South. It improves both theoretical and practical understanding of e-commerce-enabled JIT systems, including their planning and operation. It also identifies barriers to adopting e-commerce-enabled JIT systems that can be addressed or avoided altogether. For policymakers, the findings underscore the need for comprehensive

strategies that foster rural connectivity, offer subsidies to SMEs for e-commerce adoption, and establish incentives for suppliers to engage digitally. For SME managers, the results emphasize the operational benefits of making further, though incremental, investments in the digital economy. For researchers, several new avenues emerge, based on hybrid inventory tracking models, industry-specific JIT systems, and the adoption of SME-supported institutional assistance for transitioning digitally to more efficient operations.

As Guyana advances its digitization agenda and industrial growth, a key focus should be strengthening the digital-JIT interface in the SME sector. This will help firms reduce waste, improve responsiveness, and build resilience. Ultimately, this will make SMEs more competitive and adaptable players in the emerging economy, both regionally and globally.

Conflict of Interest

There is no conflict of interest.

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