Barriers to Digital Transformation in Guangxi′s SMEs: Financial, Technological, and Cultural Challenges

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Abstract: Digital transformation has become a critical factor for business growth and sustainability in the modern era. However, small and medium-sized enterprises (SMEs) in Guangxi Province, China, face significant barriers in adopting digital technologies. Despite government initiatives and advancements in technology, many SMEs in the region remain hesitant or unable to embrace digital transformation. This paper examines the financial, technological, organizational, and external challenges hindering digitalization in Guangxi's SMEs, based on qualitative case studies of five representative companies from different industries. The findings reveal that limited financial resources, insufficient technological infrastructure, resistance to change, and inadequate policy support are key factors contributing to the digital transformation dilemma. Practical recommendations for overcoming these barriers and fostering a more conducive digital ecosystem are discussed, emphasizing the importance of tailored approaches for SMEs in less developed regions.

Keywords: Digital transformation, SMEs, Guangxi Province, financial constraints, technological infrastructure, resistance to change

1. Introduction

Small and medium-sized enterprises (SMEs) serve as the backbone of China's economy, accounting for over 60% of GDP, 70% of technological innovation, and 80% of urban employment (China SME Development Report, 2022). These enterprises play a crucial role in promoting regional development, particularly in less economically advanced provinces such as Guangxi. Located in southern China, Guangxi occupies a strategic position as a gateway to Southeast Asia and a key participant in the Belt and Road Initiative. Despite these advantages, Guangxi remains an economically disadvantaged region, with many SMEs struggling to scale their businesses and enhance their competitiveness.

Despite national initiatives such as "Internet Plus" and "Digital China," which aim to drive digital adoption across various sectors, the digital transformation of SMEs in Guangxi has been slow and uneven. While SMEs in China's coastal regions have leveraged these policies to adopt advanced technologies and expand their businesses, those in inland provinces like Guangxi lag behind. Several factors contribute to this disparity, including limited financial resources, inadequate technological infrastructure, low levels of digital literacy, and organizational resistance to change. Furthermore, the region's unique socioeconomic and cultural context, characterized by a predominance of traditional industries and limited exposure to global markets, exacerbates the challenges faced by SMEs in adopting digital technologies. Understanding why SMEs in Guangxi are slow to embrace digitalization is critical, as their reluctance not only undermines their own growth but also hampers the region's overall economic development. By identifying the barriers to digital transformation, stakeholders can develop targeted interventions to address these challenges and create a more supportive ecosystem for digital adoption.
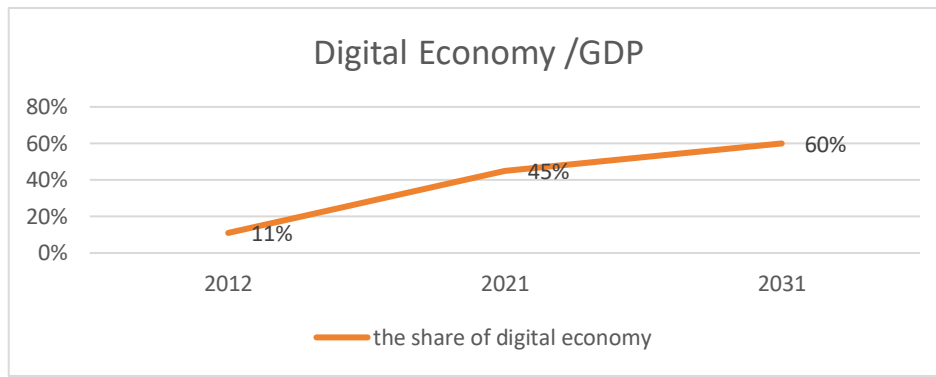
Figure 1. The percentage of digital economy in GDP
Source: Data from "China Digital Economy Development Report (2022)"

In the digital era, embracing technology is no longer optional but a necessity for business growth and sustainability. Digitalization offers numerous benefits for SMEs, including improved operational efficiency, broader market access, enhanced customer engagement, and data-driven decision-making. For SMEs in Guangxi, digital transformation holds the potential to bridge regional economic disparities and integrate these businesses into national and international supply chains. However, many SMEs in the region remain hesitant or unable to adopt digital technologies, posing a significant challenge to their long-term competitiveness and resilience.

1.1 Significance of Study

This study holds significant implications for various stakeholders. For practitioners, particularly SME owners and managers, it provides valuable insights into the barriers to digital transformation and offers practical strategies for overcoming them. By understanding the factors that impede digital adoption, businesses can make more informed decisions and develop targeted plans to enhance their digital capabilities. For policymakers, the study highlights the need for region-specific interventions to support digital transformation in economically disadvantaged areas like Guangxi. Recommendations such as targeted subsidies, improved infrastructure, and tailored digital literacy programs can inform the design of policies that address the unique challenges faced by SMEs in the region.

For researchers, this study contributes to the growing body of literature on digital transformation in SMEs, with a focus on the underexplored context of Guangxi Province. By examining the interplay between financial, technological, organizational, and external factors, the study offers a nuanced understanding of the barriers to digitalization and identifies areas for future research. In conclusion, this study seeks to shed light on the digital transformation dilemma facing SMEs in Guangxi and to provide actionable solutions for fostering a more inclusive and sustainable digital economy. By addressing the barriers to digital adoption, stakeholders can empower SMEs in Guangxi to enhance their competitiveness, drive regional development, and contribute to China's broader digitalization goals.

2. Literature Review

2.1 The Role of Digitalization in Business

Digitalization has emerged as a transformative force in the modern business landscape, enabling organizations to enhance operational efficiency, improve customer engagement, and achieve competitive advantages. Scholars highlight those digital technologies, such as cloud computing, big data analytics, artificial intelligence (AI), and the Internet of Things (IoT), offer businesses unprecedented opportunities to streamline processes and make data-driven decisions (Gong & Ribiere, 2021). These technologies help organizations respond to changing market demands with agility, innovate their product and service offerings, and expand their reach to new customer segments (Vrana & Singh, 2024). For small and medium-sized enterprises (SMEs), digitalization can be a game-changer, leveling the playing field with larger corporations. Research shows that adopting digital tools allows SMEs to enhance productivity, improve supply chain efficiency, and access global markets through e-commerce platforms (Amankwah-Amoah et al., 2021). However, the benefits of digital transformation go beyond operational improvements, as it also fosters innovation, builds organizational resilience, and strengthens customer relationships. Despite these advantages, the adoption of digital technologies is not uniform across sectors and regions, with many SMEs struggling to transition due to a range of barriers.

2.2 SMEs and Digital Transformation

Globally, SMEs face unique challenges in adopting digital technologies, even as digital transformation becomes increasingly vital for survival in competitive markets. Studies reveal that SMEs, particularly in developing regions, often lack the financial resources, technical expertise, and strategic vision needed to embrace digitalization effectively (Bhuiyan et al., 2024). Unlike large corporations, SMEs operate on limited budgets and often prioritize short- term survival over

long-term investments in technology. Furthermore, they may lack access to skilled personnel who can implement and manage digital solutions, a factor compounded by limited training opportunities (Baethge-Kinsky, 2020). The COVID-19 pandemic accelerated digital adoption globally, forcing SMEs to adapt to new realities such as remote work, online retail, and digital payments (Amankwah-Amoah et al., 2021). However, this rapid shift also exposed significant gaps in digital readiness. While SMEs in developed economies benefited from supportive ecosystems, including access to funding, advanced infrastructure, and digital literacy programs, those in emerging markets faced persistent barriers. For instance, studies highlight that SMEs in regions with underdeveloped technological infrastructure struggle with connectivity issues, limiting their ability to adopt cloud-based solutions and participate in digital commerce (Maghfirah & Eni, 2024).

2.3 Factors Influencing Digitalization in SMEs

Numerous factors influence the digitalization efforts of SMEs, with barriers often categorized as financial, technological, organizational, and cultural. Financial Barriers: Limited financial resources are among the most cited challenges for SMEs undertaking digital transformation. The costs associated with acquiring, implementing, and maintaining digital technologies can be prohibitive for small businesses, especially in developing regions (Su et al., 2022). Moreover, the lack of access to affordable financing options further restricts their ability to invest in technology. While grants and low-interest loans have proven effective in some contexts, their availability and accessibility vary widely across regions (Pandya, 2012). Technological Barriers: The availability of reliable infrastructure plays a critical role in determining the digital readiness of SMEs. In many developing regions, inadequate internet connectivity and limited access to modern equipment hinder the adoption of digital tools (Maghfirah & Eni, 2024). Furthermore, the complexity of certain technologies can be a deterrent for SMEs lacking in-house expertise or access to technical support. Studies also point out that the absence of localized digital solutions tailored to the needs of SMEs further complicates their digitalization journey (Ullah, 2019). Organizational Barriers: Internal factors such as resistance to change and limited digital literacy among employees and managers significantly impact the adoption of digital technologies. Resistance to change often stems from a fear of failure, lack of understanding of digital tools, or concerns about disrupting existing processes (Dibrov, 2015). Additionally, SME owners and managers may lack the strategic vision required to evaluate the return on investment (ROI) of digital initiatives, leading to hesitancy in committing to digital transformation (Bhuiyan et al., 2024). Cultural and External Barriers: Cultural attitudes towards technology, as well as external factors such as policy support, also play a crucial role in shaping digital adoption. In some regions, traditional business practices and a lack of awareness about the benefits of digital tools create resistance among SME owners (Ullah, 2019). Externally, insufficient policy incentives, such as subsidies or tax relief for digital investments, limit the ability of SMEs to overcome financial and technical barriers (Veugelers, 2008).
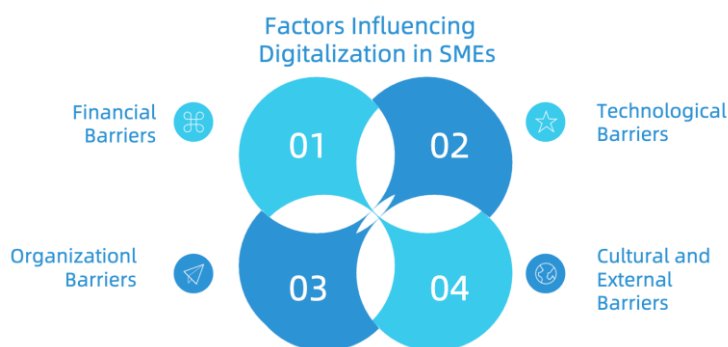

Figure 2. Factors Influencing Digitalization in SMEs

2.4 Digitalization in China

China has emerged as a global leader in digital innovation, with initiatives like "Internet Plus" and "Digital China" driving rapid adoption of digital technologies across industries (Dao & Dong, 2022). These policies have encouraged businesses to integrate digital tools into their operations, fostering innovation and competitiveness. SMEs have benefited from the proliferation of e-commerce platforms such as Taobao and JD.com, which have created opportunities for small businesses to reach wider markets. However, the benefits of digital transformation have been unevenly distributed across China's regions. Coastal provinces such as Guangdong, Zhejiang, and Jiangsu, which are economically advanced and have well-developed digital ecosystems, have seen greater success in SME digitalization compared to inland provinces like Guangxi (Liang & Li, 2020). Guangxi, characterized by its predominantly rural economy and lower levels of technological infrastructure, faces unique challenges in adopting digital technologies.

3. Research Methodology

This study employs a systematic approach to explore why small and medium-sized enterprises (SMEs) in Guangxi, China, face challenges in adopting digital technologies. The methodology has been carefully designed to ensure the research objectives are met, providing a robust foundation for understanding the unique barriers to digital transformation in this region.

3.1 Research Design

This research adopts a qualitative approach, focusing on in-depth case studies of SMEs in Guangxi Province. A qualitative methodology was selected due to its ability to provide a detailed and nuanced understanding of complex issues such as organizational behavior, cultural attitudes, and regional challenges. By exploring the perspectives and experiences of SME owners, managers, and employees, this approach enables a deeper insight into the multifaceted nature of digitalization barriers. The case study method was chosen as the primary research design because it allows for an in-depth examination of specific instances within their real-world context. This is particularly important for exploring the contextual factors unique to Guangxi, such as its socioeconomic conditions, technological landscape, and regional policy environment.

3.2 Data Collection

Primary Data Collection

Data for this study was collected through a combination of semi-structured interviews and field observations. Semi-structured interviews were conducted with key stakeholders, including SME owners, managers, IT personnel, and government officials involved in digitalization initiatives. This method was chosen for its flexibility, allowing participants to share their experiences and insights while enabling the researcher to probe deeper into specific areas of interest.

The interview guide covered topics such as:

- Current levels of digital technology adoption.
- Perceived barriers to digital transformation.
- Experiences with government initiatives and external support.
- Cultural and organizational attitudes toward digitalization.

Secondary data was gathered from government reports, industry analyses, and academic studies on digital transformation in SMEs, both in China and globally. This data provided a broader context for understanding how Guangxi's SMEs compare to those in other regions and the effectiveness of national and local policies.

3.3 Research Samples

The study focuses on five SMEs in Guangxi Province, selected to ensure diversity across industries, business sizes, and geographic locations within the region. The sample includes:

Figure 3. SMEs in Guangxi Province Samples

3.4 Motor Vehicle Inspection Company (Automotive Sector)

This company operates in the automotive sector, offering inspection and maintenance services for motor vehicles. It plays a critical role in ensuring vehicle safety and compliance with regulatory standards. Located in a semi-urban area, the company faces challenges typical of its industry, such as limited access to advanced diagnostic tools and digital management systems. Despite the potential benefits of adopting digital platforms for booking services, tracking inspections, and managing customer records, the company has been slow to embrace these technologies due to financial and operational constraints.

3.5 Small Catering Business (Hospitality and Food Services)

Operating in the vibrant yet competitive hospitality and food services sector, this small catering business specializes in serving local cuisine. It caters primarily to a regional clientele and relies heavily on word-of-mouth marketing. While digital tools could enhance its operations, such as online ordering, reservation systems, and digital payment solutions,

the business struggles with limited awareness of these technologies and a lack of technical expertise. Furthermore, its traditional operating model and cultural emphasis on face-to-face interactions create resistance to digital adoption.

3.6 Hotel on Weizhou Island (Tourism and Accommodation)

Situated on Weizhou Island, a popular tourist destination, this hotel serves domestic and international travelers. The tourism and accommodation sector relies heavily on digital platforms for marketing, bookings, and customer engagement, but this hotel faces unique challenges due to its remote location. Limited infrastructure, such as inconsistent internet connectivity, hinders the adoption of advanced digital tools. Additionally, while the hotel recognizes the potential of social media and online travel agencies to expand its customer base, it lacks the expertise and resources to leverage these platforms effectively.

3.7 Real Estate Company (Urban Development)

This company is involved in real estate development and urban planning, focusing on residential and commercial properties in Guangxi's urban centers. Operating in a sector where digital transformation has the potential to streamline project management, customer relations, and property sales, the company encounters barriers such as high initial costs for adopting advanced software and a lack of skilled personnel to manage digital platforms. Its reliance on traditional marketing methods and manual processes further delays digital integration.

3.8 Retail Trading Company (Consumer Goods)

Specializing in the distribution of consumer goods, this retail trading company operates in both urban and rural markets. It faces significant logistical challenges, such as managing inventory and ensuring timely delivery to remote areas. Digital tools could help optimize supply chain management, enhance customer engagement, and expand its market reach through e-commerce platforms. However, the company struggles with infrastructural limitations and a lack of tailored policy support to encourage digital adoption. These enterprises were chosen to represent a cross-section of Guangxi's economic landscape, highlighting the varied challenges faced by SMEs across different industries. Access to senior management and their willingness to participate in detailed interviews were key criteria for sample selection. The purposive sampling technique ensured that participants had the relevant knowledge and experience to provide meaningful insights into the study's research questions.

3.9 Data Analysis

The data collected from interviews and field observations was analyzed using thematic analysis. This method involves identifying, analyzing, and reporting patterns or themes within the data, making it particularly well-suited for qualitative research.

Thematic analysis followed these steps:

1. Familiarization: Transcribing interviews and reviewing field notes to gain an initial understanding of the data.
2. Coding: Assigning labels to key pieces of information related to barriers, challenges, and enablers of digital transformation.
3. Theme Development: Grouping codes into broader themes, such as financial constraints, technological limitations, organizational resistance, and policy gaps.
4. Interpretation: Relating the themes to the research questions and the broader literature on digital transformation.

Data triangulation was employed by comparing findings from interviews, field observations, and secondary data to enhance the credibility and reliability of the results.

4. Findings and Discussions

This section presents the key findings on the challenges faced by SMEs in Guangxi in adopting digital technologies, analyzes the results within the context of existing literature, and compares the situation in Guangxi with other regions in China and developing economies.

Figure 4. Challenges in Digitalization Adoption

4.1 Financial Constraints

One of the most significant barriers identified across the sampled SMEs is limited financial resources. Businesses expressed difficulty in allocating funds for advanced digital tools, such as cloud computing, enterprise resource planning (ERP) systems, or e-commerce platforms. Most SMEs cited competing financial priorities, such as day-to-day operational costs and debt servicing, as reasons for not investing in digital infrastructure. This finding aligns with studies such as Su et al. (2022), which highlight that financial constraints are a critical obstacle for SMEs globally. In Guangxi, the issue is exacerbated by the region's relatively lower GDP compared to coastal provinces like Guangdong and Zhejiang. Smaller profit margins further limit these businesses' ability to experiment with or scale digital initiatives. Moreover, financial institutions in Guangxi are perceived as reluctant to offer loans for technological upgrades due to the higher risk associated with SME operations. Without access to affordable credit or subsidies, many SMEs remain in a technological stasis, unable to keep pace with competitors in more developed regions.

4.2 Lack of Awareness and Knowledge

A lack of understanding of the benefits and applications of digital technologies was another frequently cited challenge. Many SMEs expressed uncertainty about how digital tools could improve their business operations or enhance customer engagement. This gap in awareness can be attributed to limited exposure to digitalization success stories within Guangxi. Unlike SMEs in coastal cities, which often have access to best practices and innovation hubs, businesses in Guangxi lack similar networks and mentorship opportunities. This aligns with findings by Baethge-Kinsky (2020), who noted that knowledge deficits among SMEs prevent them from recognizing the strategic value of digital transformation. Additionally, the shortage of skilled IT personnel within SMEs compounds this issue. Many enterprises rely on outdated, manual processes simply because they do not have the in-house expertise to identify and implement digital solutions.

4.3 Cultural Resistance

Cultural attitudes within SMEs also play a significant role in the slow adoption of digital technologies. Owners and senior managers, particularly those from older generations, often exhibit a resistance to change. They perceive digital transformation as risky, expensive, or unnecessary for their traditional business models. For example, several interviewees admitted to preferring to maintain the status quo, fearing disruption to existing workflows or the risk of investing in technology that might not deliver immediate returns. Dibrov (2015) highlights similar trends, noting that resistance to change is a universal challenge for organizations embarking on digital transformation. In Guangxi, cultural norms emphasizing stability and incremental change further entrench these attitudes. This conservative mindset is particularly prevalent in family-owned SMEs, where decision-making is heavily influenced by traditional values.

4.4 Infrastructure Gaps

Guangxi's technological infrastructure remains underdeveloped compared to China's coastal provinces, creating a significant barrier to digital adoption. SMEs in rural and semi- urban areas cited unreliable internet connectivity, limited access to advanced hardware, and insufficient support services as key challenges. According to Maghfirah and Eni (2024), inadequate infrastructure is a common barrier in less developed regions. In Guangxi, poor broadband coverage in rural areas hinders the use of cloud-based tools, while high costs associated with upgrading infrastructure deter smaller businesses. Furthermore, a lack of regional tech ecosystems means that SMEs cannot easily access technical support or partner with digital service providers. This isolation forces them to rely on ad hoc solutions, often leading to fragmented or ineffective digitalization efforts.

4.5 Government Policy and Support

While the Chinese government has launched initiatives like "Digital China" and "Internet Plus" to promote digitalization, the benefits of these programs have been unevenly distributed. SMEs in Guangxi reported limited awareness of and access to government subsidies, training programs, and other forms of support. Several participants expressed frustration with bureaucratic processes and the lack of targeted assistance for smaller businesses. This finding aligns with Veugelers (2008), who noted that insufficient policy frameworks often fail to address the specific needs of SMEs. In Guangxi, policies are perceived as heavily focused on large enterprises or industries with significant export potential, leaving SMEs at a disadvantage. The lack of coordination between local governments and businesses further limits the effectiveness of these initiatives.

5. Conclusions

This study has provided an in-depth exploration of the barriers preventing SMEs in Guangxi, China, from embracing digital transformation to enhance their business capabilities and competitiveness. The findings reveal that despite the recognized importance of digitalization, SMEs in the region face significant challenges, including financial constraints,

limited awareness and knowledge, cultural resistance, inadequate infrastructure, and insufficient government support. These factors, compounded by Guangxi's unique socioeconomic context, highlight the complexity of digital adoption in less developed regions. The findings of this study highlight significant challenges faced by SMEs in Guangxi in adopting digital technologies. Addressing these barriers requires coordinated efforts by SMEs, policymakers, and other stakeholders. This section provides practical recommendations for SMEs to overcome these challenges and offers policy recommendations to foster a supportive digitalization ecosystem.

Prioritize Digital Literacy and Training

SMEs should invest in building the digital skills of their employees and management teams. Workshops, online courses, and partnerships with local universities or training centers can equip staff with the necessary skills to leverage digital tools effectively. Business owners and managers must also focus on developing their understanding of how technology can enhance business processes, customer engagement, and competitiveness.

Adopt Incremental Digitalization Strategies

Instead of undertaking large-scale digital transformation projects, SMEs can start with smaller, cost-effective solutions that deliver immediate value. For instance: SMEs can adopt a phased approach to digitalization by starting with smaller, more manageable solutions that provide immediate value without requiring significant upfront investments. For instance, SMEs can begin by implementing low-cost digital marketing tools, which can help improve their online visibility, attract new customers, and build brand awareness. Additionally, adopting affordable cloud-based accounting software can streamline financial management processes, ensuring better accuracy and efficiency in tracking expenses, revenues, and tax compliance. Furthermore, exploring e-commerce platforms can allow SMEs to reach new markets, increase sales, and enhance customer engagement, all while maintaining a flexible and scalable digital presence. This incremental approach enables SMEs to ease into the digital transformation process and gradually build their digital capabilities over time.

Leverage Local Networks and Collaboration

SMEs can form industry clusters or partnerships to share resources and expertise. Collaborating with other businesses in the region allows for collective problem-solving, reducing costs associated with digitalization, such as hiring IT experts or acquiring software licenses. Local chambers of commerce or trade associations can facilitate such collaborations.

Explore Alternative Financing Options

SMEs struggling with financial constraints should explore alternative funding sources, including government grants, microloans, or partnerships with venture capitalists. Engaging with fintech companies that specialize in SME financing could also provide flexible solutions for funding digital initiatives.

Engage with Digital Service Providers

SMEs can partner with technology vendors to access tailored solutions. Many tech companies offer SME-focused packages, including training and ongoing support. Such partnerships can help businesses implement technology effectively and address gaps in expertise or resources.

Implications

This study makes notable academic contributions by enriching the existing body of literature on SME digital transformation through a concentrated analysis of Guangxi, an under- researched region in China. While much of the current research tends to focus on national or global trends, this study narrows its lens to explore the distinct challenges and opportunities faced by SMEs in Guangxi's specific socio-economic and cultural context. By addressing this gap, the study provides a deeper and more nuanced understanding of how regional factors influence the progress and effectiveness of digital transformation efforts.

Furthermore, the research underscores the complex interplay between regional socioeconomic contexts and the barriers to digitalization. It examines how economic disparities, insufficient infrastructure, and cultural dynamics collectively shape the ability and readiness of SMEs to adopt digital technologies. These findings are not only significant for understanding the situation in Guangxi but also hold broader relevance for other developing regions that face comparable obstacles. Consequently, the study adds to the growing discourse on regional approaches to digital transformation, highlighting the importance of developing tailored, context-sensitive strategies to enhance SME digitalization worldwide.

This study provides practical value by offering actionable recommendations for SMEs to overcome barriers to digital transformation. It suggests a phased approach for SMEs in Guangxi to incrementally adopt digital tools, allowing them to build capacity for long-term transformation while mitigating the risks associated with abrupt changes. The focus on incremental implementation helps SMEs align digital initiatives with their financial and operational capabilities, fostering sustainable growth and competitiveness.

Additionally, the research proposes targeted policy interventions to address the structural barriers faced by SMEs, such as limited access to funding, inadequate infrastructure, and low levels of digital literacy. These recommendations

emphasize the importance of tailored strategies that consider the unique challenges of less developed regions like Guangxi. By aligning policy measures with the specific needs of SMEs, the study advocates for a more inclusive and supportive digital ecosystem, facilitating a smoother transition toward digitalization for businesses in underdeveloped areas. This study offers evidence-based guidance for policymakers to develop inclusive and effective digitalization strategies tailored to the specific needs of SMEs in Guangxi. By identifying the financial, infrastructural, and cultural gaps that hinder digital transformation, the research emphasizes the need for targeted interventions to address these barriers.

Policymakers are encouraged to establish funding mechanisms and subsidies to alleviate the financial constraints faced by SMEs, enabling them to invest in digital tools and infrastructure. Additionally, improving technological infrastructure, such as expanding internet connectivity and access to digital platforms, is critical to bridging the digital divide in less developed areas. Furthermore, the study highlights the importance of addressing cultural resistance and lack of awareness through training programs and awareness campaigns that demonstrate the tangible benefits of digital transformation. By fostering a supportive environment that accounts for regional socioeconomic characteristics, policymakers can drive more equitable and effective digital adoption across SMEs, ultimately enhancing their competitiveness and contributing to the broader economic development of Guangxi.

Suggestions For Future Research

While this study sheds light on the digitalization challenges faced by SMEs in Guangxi, further research is needed to deepen understanding and extend findings to other contexts. Potential areas for future research include: Future research should focus on comparative studies that examine the digital transformation efforts of SMEs in other regions of China. By analyzing the strategies and practices adopted by SMEs in more digitally advanced provinces, researchers can identify best practices and assess the role of regional disparities in shaping the outcomes of digitalization. Such comparisons would provide valuable insights into how Guangxi's SMEs might adapt successful strategies to their unique context. Additionally, comparisons with SMEs in developing countries that face similar economic and infrastructural challenges could offer broader lessons. Understanding how SMEs in other developing regions overcome barriers such as limited funding, inadequate infrastructure, and cultural resistance could inform both practical recommendations and policy interventions for Guangxi. These comparative studies would contribute to the global discourse on SME digitalization, emphasizing the importance of context-specific solutions for fostering growth and competitiveness in less developed regions.

Future research should delve into sector-specific analysis to better understand the digitalization barriers and opportunities faced by SMEs in particular industries, such as tourism, agriculture, or manufacturing. Each sector has distinct characteristics, operational requirements, and digitalization potential, which necessitate tailored approaches. For example, the tourism industry in Guangxi, with its rich cultural and natural attractions, could benefit significantly from digital marketing, online booking platforms, and data-driven customer insights. Exploring the barriers unique to this sector, such as the lack of digital literacy among small business owners or the absence of integrated online platforms, would help provide actionable solutions.

Similarly, the agriculture sector, which forms a vital part of Guangxi's economy, faces challenges like fragmented supply chains and limited access to digital tools for precision farming. Research into how digital technologies can enhance productivity and supply chain efficiency would be invaluable. The manufacturing industry, often characterized by resource-intensive operations, could explore opportunities for automation and smart manufacturing. Identifying barriers like the high cost of technology adoption and resistance to change among factory owners could lead to practical, sector-specific recommendations for digital transformation. By focusing on the unique needs and challenges of individual sectors, future studies can offer targeted insights that drive effective digitalization strategies and foster sectoral growth in Guangxi.

Future research should prioritize longitudinal studies to assess the long-term impacts of digital transformation initiatives on the growth and competitiveness of SMEs, particularly in less developed regions like Guangxi. While cross-sectional studies provide valuable snapshots of the current state of digitalization, they often fail to capture the dynamic and evolving nature of digital transformation processes.

Longitudinal research can offer a comprehensive understanding of how digitalization influences SMEs over time, tracking progress, setbacks, and shifts in organizational practices. For instance, such studies could evaluate how incremental adoption of digital tools impacts revenue growth, market reach, and operational efficiency over several years.

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Conflict of Interest

The authors declare no conflicts of interest.

References

Amankwah-Amoah, J., Khan, Z., & Wood, G. (2021). COVID-19 and business failures: The paradoxes of experience, scale, and scope for SMEs. *European Management Journal*, 122, 283 289. https://doi.org/10.1016/j.emj.2020.09.002

Baethge-Kinsky, V. (2020). The role of human capital in fostering SMEs' digital transformation. *Small Business Economics*, 54(2), 345-360.

Bhuiyan, S., Sharma, A., & Talukder, M. (2024). A strategic approach to SME digital transformation: Bridging the gap between adoption and implementation. *Asia Pacific Journal of Innovation and Entrepreneurship*, 18(1), 29-45.

Dao, Y., & Dong, L. (2022). Internet Plus and the Digital China Initiative: Policy implications for SMEs. *China Economic Journal*, 15(3), 238-255.

Dibrov, A. (2015). Organizational resistance to change: A critical barrier to innovation. *Journal of Organizational Change Management*, 28(4), 672-684.

Gong, Y., & Ribiere, V. (2021). Driving business success through digital transformation: A process framework. *Journal ofDigital Innovation*, 13(2), 105-124.

Liang, Z., & Li, F. (2020). Regional disparities in China's digital economy: Evidence from SMEs. *Regional Studies*, 54(8), 1097-1110.

Maghfirah, R., & Eni, H. (2024). The impact of digital infrastructure gaps on SME competitiveness in developing regions. Journal of Emerging Economies, 16(2), 56-68.

Pandya, V. (2012). Comparative analysis of development of SMEs in developed and developing countries. *International Conference on Business and Management*, 7, 23-32.

Su, Z., Ahlstrom, D., & Li, Y. (2022). Financial challenges for SMEs in digital transformation: An emerging market perspective. *Journal of Business Venturing Insights*, 18, e00354.

Ullah, F. (2019). Barriers to SME growth in developing economies: The role of digital literacy. *Economic Research*, 12(3), 45-67.

Veugelers, R. (2008). Policy support for SME innovation: Balancing the benefits and costs. *Research Policy*, 37(2), 249-263.

Vrana, G., & Singh, R. (2024). Strategic approaches to digital transformation in SMEs: Emerging trends and future directions. *Digital Business Review*, 10(1), 1-1