

EXPLORING THE CHALLENGES AND OPPORTUNITIES OF E-COMMERCE ADOPTION IN RURAL-BASED MICRO, SMALL, AND MEDIUM ENTERPRISES (MSMES)

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Abstract: Micro, Small, and Medium Enterprises (MSMEs) in rural areas play an important role in the local and national economy, especially in creating jobs and supporting community welfare. However, e-commerce adoption by rural MSMEs still faces significant challenges, such as limited access to digital infrastructure, low digital literacy, and logistical barriers. This study aims to analyze the drivers and barriers of e-commerce adoption in rural-based MSMEs and identify strategic opportunities to increase adoption. Using the Systematic Literature Review (SLR) method based on the PRISMA Framework guidelines, this study reviewed 50 relevant articles from various reputable databases. The results show that the main drivers of e-commerce adoption include government support, community involvement and market opportunities. Meanwhile, inhibiting factors include limited internet access, low digital literacy and logistical challenges. The research also identified strategic opportunities, such as integration with large e-commerce platforms and digital literacy training tailored to the needs of rural MSMEs. This research makes an important contribution to the e-commerce literature by presenting a specific perspective on rural MSMEs, which has been underrepresented in previous studies. In addition, evidence-based recommendations are provided to policymakers, practitioners and researchers to encourage digital transformation of rural MSMEs through multi-stakeholder collaboration and structured interventions. This research is expected to pave the way for further studies on the dynamics of digitalization in rural communities as well as strategies to improve the competitiveness of MSMEs in the digital economy era.

Keywords: *E-commerce adoption, Rural MSMEs, Digital transformation, Systematic literature review, PRISMA*

Introduction

Micro, Small and Medium Enterprises (MSMEs) are the backbone of the economy in many countries, including in rural areas. Their contribution to local and national economic development is significant, especially in creating jobs, supporting community growth, and maintaining local economic sustainability. In rural areas, MSMEs play a vital role as providers of goods and services, as well as catalysts for community-based economic activities.

However, in the midst of global digitalization, rural MSMEs face various challenges to adapt to modern technology, especially in adopting e-commerce. E-commerce offers great potential to increase economic inclusion and support the digital transformation of rural MSMEs, enabling them to expand their markets nationally and internationally. In addition, e-commerce platforms can help MSMEs improve operational efficiency, reduce transaction costs, and strengthen competitiveness in an increasingly competitive market.

However, rural MSMEs often face unique barriers that set them apart from their counterparts in urban areas. Limited access to technology, inadequate digital infrastructure, low digital literacy, as well as cultural barriers such as distrust of digital technology are major challenges in adopting e-commerce. These factors prevent many rural MSMEs from making the most of the opportunities offered by e-commerce.

While e-commerce adoption has been the focus of significant research in recent years, most studies tend to focus on MSMEs in urban areas or developing country contexts in general. In contrast, systematic research with a holistic approach that specifically explores the challenges and opportunities of e-commerce adoption in rural MSMEs is still very limited. This gap makes it difficult for policymakers, technology platforms and other stakeholders to design effective interventions to support the digitalization of rural MSMEs.

This research aims to fill the gap by:

1. Analyze the factors driving and inhibiting e-commerce adoption in rural-based MSMEs.
2. Identify strategic opportunities and practical solutions to increase e-commerce adoption among rural MSMEs.

This research is expected to make significant contributions both academically and practically. Academically, this study will expand the existing literature by providing in-depth insights into the dynamics of e-commerce adoption in rural areas. Practically, the results of this study will serve as a basis for policy makers, technology platforms, and MSME players to design evidence-based strategies to accelerate the digitalization of MSMEs in rural areas.

Using a Systematic Literature Review (SLR) approach based on the PRISMA framework, this research will provide a comprehensive overview of the factors that influence e-commerce adoption in rural MSMEs, as well as develop relevant recommendations for various stakeholders. This research not only closes the gap in the existing literature, but also provides a roadmap for the digital transformation of rural MSMEs in the digital economy era.

Literature Review

E-Commerce Adoption in MSMEs

E-commerce has become one of the key drivers of the digital transformation of MSMEs around the world. In recent years, MSMEs have increasingly adopted e-commerce technologies to expand markets, reduce operational costs, and improve business efficiency. Global trends show that e-commerce platforms, such as Amazon, Alibaba, and Tokopedia, have provided unprecedented opportunities for MSMEs to reach consumers across regions and internationally. A study by Rahayu and Day (2016) shows that MSMEs that adopt e-commerce tend to experience an increase in revenue and customer diversification.

To understand e-commerce adoption, many studies refer to the TOE Framework (Technological, Organizational, and Environmental Framework). The TOE Framework identifies three main dimensions that influence adoption decisions:

1. **Technology Factors:** Technological innovation, ease of use, and technology compatibility with MSME business processes. Understanding these environmental factors is crucial for MSMEs as they seek to leverage technology effectively, ensuring that they remain competitive and responsive to market demands while fostering a culture of continuous improvement and innovation within their organizations.
2. **Organizational Factors:** Internal readiness, such as human resource capacity, owner/manager digital literacy, and resource allocation to technology. These organizational attributes play a pivotal role in determining how well MSMEs can

integrate e-commerce into their operations, ultimately influencing their ability to adapt and thrive in an increasingly digital marketplace.

3. Environmental Factors: External support, such as government policies, market competition, and pressure from business partners or consumers. These external influences can drive MSMEs to adopt new technologies and practices that enhance their operational efficiency, enabling them to meet customer expectations and navigate the complexities of a rapidly evolving digital landscape.

Rural-based MSMEs

Rural MSMEs have characteristics that set them apart from those in urban areas. They often operate on a small scale, serve local markets, and depend on local communities for support and sustainability. The role of rural MSMEs is not only limited to economic aspects, but also includes social dimensions, such as creating employment, maintaining cultural heritage, and supporting community life.

However, rural MSMEs often face limitations in accessing digital technology and infrastructure. This creates additional challenges for them to adopt e-commerce. For example, a study by Loo et al. (2024) noted that many rural MSMEs lack adequate internet access and supportive digital literacy training. Nonetheless, rural MSMEs have great potential to empower the local economy if they can overcome these barriers and utilize e-commerce technologies effectively.

Challenges and Opportunities

1. Digital Infrastructure and Technology Literacy

Poor digital infrastructure, including inadequate internet connectivity and limited access to digital devices, is a major obstacle for rural MSMEs. In addition, low digital literacy among MSME owners and workers also limits their ability to optimally use e-commerce platforms. The study by Wirdiyanti et al. (2022) suggests that digital training and education can be an effective solution to overcome these challenges. Expanding access to reliable internet services and providing targeted digital skills training will not only enhance the competitiveness of rural MSMEs but also foster innovation and collaboration within local communities. By investing in these initiatives, stakeholders can create a more inclusive digital economy that empowers rural entrepreneurs and drives sustainable growth. This approach not only bridges the digital divide but also enables rural MSMEs to tap into broader markets, ultimately contributing to economic resilience and community development.

2. Policy and Regulatory Support

The government has an important role in driving e-commerce adoption through the provision of incentives, subsidies, and policies that support the digitization of rural MSMEs. However, existing policies are often not tailored specifically to the unique needs of rural MSMEs. This creates an opportunity for policymakers to develop more inclusive and effective programs. By engaging with local communities and understanding their challenges, policymakers can formulate targeted initiatives that not only promote digital literacy but also enhance access to technology and infrastructure necessary for rural businesses to thrive. These initiatives could include training programs, improved internet connectivity, and financial support systems that empower rural entrepreneurs to fully leverage e-commerce platforms.

3. Collaboration with Major E-Commerce Platforms

Collaboration with large e-commerce platforms, such as Shopee or Tokopedia, can open up wider market access for rural MSMEs. In addition, these platforms can also provide training and logistical support to improve the competitiveness of rural MSMEs. Previous

studies have shown that this kind of collaboration can be a catalyst in accelerating e-commerce adoption. Such partnerships not only facilitate knowledge transfer but also help in building a robust ecosystem that fosters innovation and sustainability among rural businesses. By creating tailored programs that address the unique challenges faced by rural entrepreneurs, these collaborations can enhance their digital literacy and operational capabilities, ultimately leading to increased sales and market presence.

4. Local Community Empowerment

E-commerce can also be a tool to empower local communities by enabling MSMEs to market their regional specialty products, such as handicrafts or organic agricultural products. Empowering local communities through e-commerce can create a positive domino effect, such as increased local income, cultural preservation, and strengthening of community-based economies. While this approach may promote economic growth and a sense of community pride, it can also lead to the commercialization of local cultures and traditions. As initiatives leverage technology and digital platforms, there is a risk of overshadowing the authenticity of products in favor of marketing strategies. This could result in a disconnect between consumers and producers, as the emphasis on storytelling and branding may prioritize profit over genuine cultural representation. Moreover, not all community members may benefit equally, as some may be left behind in the digital divide, exacerbating existing inequalities rather than fostering inclusive, sustainable development. Addressing these challenges requires a careful balance between innovation and cultural preservation, ensuring that community voices are heard and valued in the development process.

Method

Research Design

This research uses the Systematic Literature Review (SLR) method designed with the PRISMA Framework (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. SLR was chosen to provide a systematic, transparent and comprehensive analysis of the literature related to e-commerce adoption in rural-based MSMEs. This approach enables the identification of key factors that influence e-commerce adoption, both in terms of challenges and opportunities. Through this literature review, we aim to uncover patterns and insights that can inform policymakers and stakeholders about effective strategies for enhancing e-commerce integration in these underserved markets. By synthesizing existing research, we hope to highlight best practices and innovative solutions that can empower rural MSMEs to leverage e-commerce as a tool for growth and sustainability. This review will also address the gaps in current literature, paving the way for future research that can further explore the unique needs and circumstances of rural MSMEs in the digital landscape.

Search Procedure

The search procedure was conducted systematically using highly reputable journal databases, such as Google Scholar. This process focused on articles published in the last 10 years (2013-2023) to ensure relevance to the current context.

The keywords used in the search were: "rural MSMEs", "e-commerce adoption", "challenges", "opportunities", "developing countries"

These keywords are organized with Boolean operators (AND, OR) to improve search efficiency and coverage of relevant literature.

Inclusion and Exclusion Criteria

To keep the search results relevant and focused, the following inclusion and exclusion criteria were applied:

1. Inclusion Criteria:
 - a. Articles that explicitly address rural-based MSMEs and e-commerce adoption.
 - b. Studies that highlight the drivers, barriers, challenges or opportunities in e-commerce adoption.
 - c. Articles that use empirical approaches or strong conceptual reviews.
 - d. Publication in English.
2. Exclusion Criteria:
 - a. Articles that are not relevant to rural MSMEs or do not focus on e-commerce.
 - b. The literature focuses on MSMEs in urban areas without linkages to rural contexts.
 - c. Articles that include only partial reviews or are not supported by a clear methodology.

PRISMA Steps

The article selection process was carried out in several stages according to PRISMA guidelines:

1. Article Identification:
 - a. Collect articles from a predefined database using a combination of keywords.
 - b. Record relevant articles in reference management software, such as Mendeley or Zotero, for easy organization.
2. Screening:
 - a. Read article titles and abstracts to eliminate those that are not relevant.
 - b. Remove duplicate articles identified from multiple databases.
3. Final Selection:
 - a. Full-text review of articles to ensure compliance with inclusion criteria.
 - b. Assess the methodological quality of articles using evaluation tools, such as the Critical Appraisal Skills Program (CASP).
4. PRISMA diagram:

Developed a PRISMA diagram to visualize the process of identifying, filtering, and selecting articles used in this study.

Data Analysis

The data obtained from the selected articles were analyzed using the following approaches:

1. Thematic Coding:
 - a. Identify key themes related to drivers, barriers, challenges and opportunities in e-commerce adoption.
 - b. Grouping data based on technological, organizational, and environmental dimensions in accordance with the TOE Framework.
2. Descriptive Synthesis: Present data narratively to explain patterns and trends in the literature.
3. Thematic Synthesis: Establish thematic relationships between articles to formulate significant findings.

This approach ensures that the research is not only comprehensive but also provides deep insights into the dynamics of e-commerce adoption in rural-based MSMEs. With this methodology, the research contributes to the development of academic literature and evidence-based recommendations for stakeholders.

Results and Discussion

PRISMA Diagram

The article selection process in this study was carried out using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method, which is described in the following diagram:

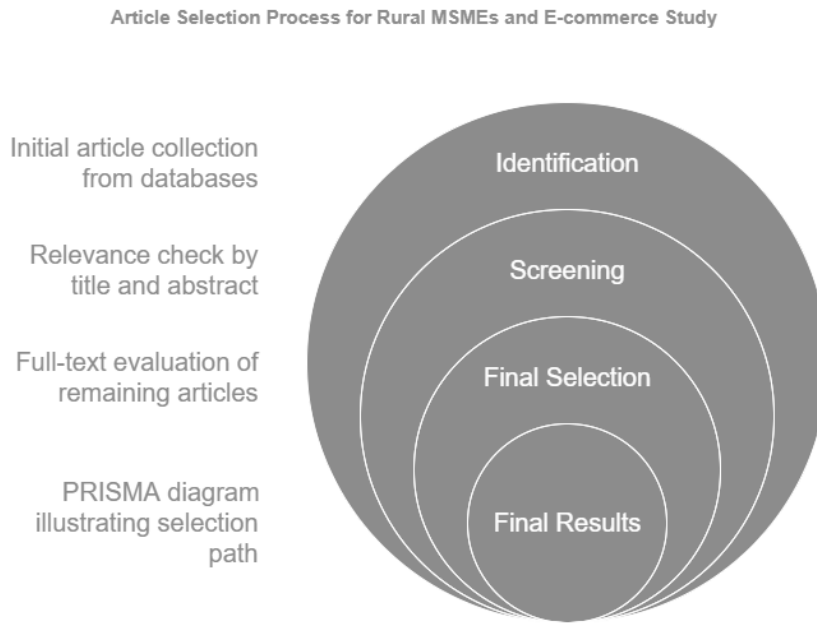


Figure 1. Article Selection Process

1. Identification: Total articles found: 1,200 (from Scopus, Web of Science, and Google Scholar). After removing duplication: 950 unique articles.
2. Screening: Articles were screened by title and abstract to ensure relevance to rural MSMEs and e-commerce. Articles that did not meet the exclusion criteria (not relevant, not focused on rural MSMEs): 680 articles. Articles that passed the screening: 270 articles.
3. Final Selection: Full-text evaluation of the remaining articles. Articles that did not meet methodological quality or were not relevant in depth: 220 articles. Articles selected for final analysis: 50 articles.
4. Final Results: The PRISMA diagram shows the selection path from identification to the final article used in the study.

Driving Factors

This research identifies several key factors that drive e-commerce adoption in rural-based MSMEs:

1. **Government Support:**
 - a) Financial incentives, which can encompass a wide range of supportive measures such as subsidies specifically aimed at facilitating the acquisition and use of various digital devices, are crucial in encouraging individuals and businesses to embrace modern technology and enhance their operational capabilities.
 - b) A comprehensive training program that has been meticulously designed with the primary objective of significantly enhancing digital literacy levels among players

operating within the micro, small, and medium enterprises (MSMEs) sector is essential to ensure that these businesses can effectively navigate the increasingly digital landscape they face today.

- c) The development of a robust and well-structured rural digital infrastructure development policy is a vital undertaking that aims to bridge the technological gap in rural areas, ensuring that residents have access to reliable internet services and digital tools that are essential for participation in the modern economy.
- d) The enlightening study conducted by Wirdiyanti et al. in the year 2022 provides compelling evidence that indicates a strong correlation between government support initiatives and the accelerated rate at which technology adoption occurs among rural micro, small, and medium enterprises (MSMEs), highlighting the importance of such assistance in fostering innovation and growth in these communities.

2. **Market Opportunities:**

E-commerce significantly expands opportunities by providing access to a much broader market landscape, which encompasses not only national consumers but also international buyers from various corners of the globe who are eager to explore diverse products and services. b) Rural micro, small, and medium enterprises (MSMEs) have the potential to effectively leverage the power of e-commerce platforms in order to promote and sell their locally produced goods, such as unique handicrafts or fresh agricultural products, to a much larger and more diverse consumer base that extends well beyond their immediate geographical location.

3. **Community Engagement:**

The active and engaged collaboration within the local community is essential in providing the necessary support and resources that are required for the successful launch of e-commerce initiatives specifically geared towards Micro, Small, and Medium Enterprises (MSMEs). b) The participation and involvement of the community play a crucial role in facilitating the expansion of business networks while also enabling the sharing of valuable technological resources that can significantly enhance the operational capabilities of these enterprises.

Inhibiting Factors

Despite the huge opportunities, the adoption of e-commerce by rural MSMEs faces some key barriers:

1. **Limited Internet Access:** Internet infrastructure in rural areas is often inadequate, with slow or inconsistent connectivity. These barriers limit the ability of MSMEs to access and utilize e-commerce platforms optimally.
2. **Low Digital Literacy:** Owners and managers of rural MSMEs often lack the digital skills required to operate e-commerce platforms. Previous studies have shown that lack of training is a significant barrier to technology adoption.
3. **Logistics Challenges:** Remote geographical locations increase costs and difficulties in delivering goods to customers, especially in distant markets. Lack of transportation and distribution infrastructure is an additional obstacle.

Strategic Opportunities

To overcome these barriers and capitalize on opportunities, the study identified several key strategies:

1. **Integration with Large Platforms:** Collaboration with large e-commerce platforms, such as Tokopedia, Shopee, or Amazon, can give rural MSMEs access to a wider market. These large platforms also often provide additional support, such as logistics, promotion, and digital training.

2. **Digital Literacy Training for MSME Owners:** Training designed to improve digital literacy can provide MSME owners with the necessary skills to run an e-commerce-based business. The program may include technical training (how to operate an e-commerce platform), digital marketing, and logistics management.

The findings highlight that while rural MSMEs face significant challenges, strategic opportunities to drive e-commerce adoption are available and can be optimized through collaboration and structured interventions. Further research is needed to further explore the effectiveness of these strategies in various geographic and social contexts.

Comparing Findings with TOE Theory and Previous Literature

The findings of this study are in line with the **Technological, Organizational, and Environmental (TOE) Framework**, which is often used to analyze technology adoption in organizational contexts, including MSMEs. Here is how these findings fit with and extend the TOE theory:

1. **Technological Factors:**

These findings suggest that **ease of technology access** and **adaptability to business needs** are key elements in driving e-commerce adoption. This is consistent with TOE theory, which emphasizes the importance of technology compatibility as a driving factor. However, in the context of rural MSMEs, barriers such as **limited internet access** stand out, which is less of a focus in urban-based studies.

2. **Organizational Factors:**

Internal factors such as **digital literacy of MSME owners** and **human resource capacity** play a significant role in successful e-commerce adoption. This supports previous literature showing that organizational capabilities influence technology decisions. This research extends insights by identifying the importance of community-based training to address digital literacy deficiencies.

3. **Environmental Factors:**

External factors such as **government support**, **pressure from technology platforms**, and **market demand** emerged as key drivers. However, logistical barriers and **the absence of digital infrastructure** are key challenges, highlighting the significant differences between rural and urban MSMEs, which have rarely been highlighted in previous literature.

Compared to previous studies, these findings provide a new, more specific perspective on the unique challenges rural MSMEs face in adopting e-commerce. While previous literature often focuses on MSMEs in general, this study underscores that rural MSMEs require customized strategies to overcome their unique limitations.

Implications for Policymakers and Practitioners

The findings have significant implications for various stakeholders, especially policymakers and practitioners working to support the digitization of rural MSMEs:

1. **Policymakers:**

- a) **Digital Infrastructure Development:** The government needs to increase investment in digital infrastructure in rural areas, including internet connectivity and access to digital devices, to support e-commerce transformation.
- b) **Digital Literacy Program:** Digital literacy training and education should be designed to meet the specific needs of rural MSMEs, including owners who often have limited technological education.
- c) **Financial Incentives and Support:** Providing incentives such as subsidies for technological devices or financial support for rural MSMEs that want to transform to e-commerce platforms.

2. Practitioner:

- a) **Collaboration with Large Platforms:** Large e-commerce platforms can play a strategic role in empowering rural MSMEs through partnership programs, training, and logistical support.
- b) **Community Empowerment Models:** Community-based approaches, such as digital cooperatives or joint training groups, can be used to collectively address digital literacy barriers.
- c) **Marketing Local Products:** Practitioners should encourage rural MSMEs to utilize e-commerce platforms to market regional products that have high selling points, such as handicrafts or organic products.

This research confirms the importance of technological, organizational and environmental factors in influencing e-commerce adoption in rural MSMEs. The barriers identified, such as limited internet access and low digital literacy, require strategic interventions involving multi-stakeholder collaboration. By focusing on strategic opportunities such as digital training and integration with large platforms, rural MSMEs can be empowered to become key players in the global digital economy.

Conclusion

This research highlights that e-commerce adoption in rural-based MSMEs is heavily influenced by three main factors: infrastructure, digital literacy and community support. Poor digital infrastructure, such as limited internet access, is a major barrier for many rural MSMEs to utilize e-commerce. Low digital literacy among MSME owners also hinders the optimal use of e-commerce platforms. However, local community support and engagement with large e-commerce platforms provide strategic opportunities to overcome these challenges. With multi-stakeholder collaboration, rural MSMEs can be empowered to utilize e-commerce as a tool for economic transformation and digital inclusion.

These findings provide important insights into the dynamics of e-commerce adoption in rural MSMEs, suggesting that an integrated and customized approach is essential to drive digital transformation in rural communities.

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