

Transforming Rural Entrepreneurship Through Digital Innovation: A Review on Opportunities, Barriers and Challenges

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Abstract

This paper delves into the transformative impact of digital innovation on rural entrepreneurship, highlighting the opportunities, barriers and challenges rural entrepreneurs face. Digital technologies, including e-commerce platforms, mobile applications, and social media, enable rural entrepreneurs to reach broader markets, enhance operational efficiencies, and develop innovative business models. Despite these benefits, the digital divide—characterised by inadequate technological infrastructure and low digital literacy—presents substantial barriers to these digital advancements. Further complicating the adoption of digital technologies are challenges such as a lack of technological expertise and financial constraints, which impede the full realisation of digital innovation in rural areas. This paper discusses various strategies to overcome the barriers to digital transformation in rural entrepreneurship. The key point among these strategies is the implementation of supportive policies encouraging digital adoption. Investment in digital infrastructure is crucial to bridge the technological gap and provide rural areas with the necessary tools to compete in the digital economy. Additionally, targeted educational programs are essential to improve digital literacy and provide rural entrepreneurs with the skills to effectively leverage digital technologies. The paper underscores the importance of a holistic approach, combining policy support, infrastructure development and education to empower rural entrepreneurs. By adopting these strategies, rural communities can achieve sustainable economic growth, enhance their competitiveness, and improve the quality of life for their residents. Ultimately, this paper aimed to provide a comprehensive understanding of the role of digital innovation in transforming rural entrepreneurship and offered practical solutions to foster inclusive and sustainable economic development.

Keywords: rural entrepreneurship, digital innovation, technology

1. Introduction

Despite their relatively low economic activity, infrastructure development and limited access to essential services, rural areas possess distinct economic and structural attributes that present opportunities for entrepreneurial endeavours (Barber et al., 2021; Galvao et al., 2020). According to Steiner and Atterton (2015), rural entrepreneurship has both direct and indirect impacts on the local environment. Direct impacts include employment creation and the development of local products and services, while indirect impacts refer to spillover effects or the added value of primary business activities operating within the local area. Developing countries, particularly, can capitalise on rural areas as a basis for regional economic development and transformation. This is made possible by developing entrepreneurial networks and conducive rural ecosystems that allow for important access such as creative capital sources, incubation and retail space, mentorship and social opportunities (Barber et al., 2021).

In essence, entrepreneurship in rural areas is similar to that in urban areas. Rural entrepreneurship involves the strategic use of a unique combination of resources, which may be derived from either agricultural or non-agricultural sectors. To a certain extent, Petrin (1994) noted that the economic goals of an entrepreneur and the social goals of rural development are more strongly connected than those in urban areas. Due to this, entrepreneurship in rural areas is typically centred within the community, has a strong link to extended families, and significantly influences the rural community. Additionally, resilience and adaptability are the two traits that are often demonstrated by rural entrepreneurs who use their strong interpersonal relationships and ingenuity to

overcome challenges specific to rural areas (Olalekan, 2024).

Over the past several years, digital technologies have been instrumental in transforming economies and societies. With the increasing growth and ease of using digital technologies to support entrepreneurial activities, these technologies have opened doors to new and unique opportunities for promoting rural entrepreneurship. Lekhanya (2018) states that digitalisation extends beyond products, services, and manufacturing processes. It also encompasses a wide range of competencies, such as marketing, business networking, promotional mix, product distribution, supply chain management, access to international markets, and growth management to gain a competitive edge. Especially within the rural setting, the digitalisation of business processes can overcome challenges such as outsourcing certain services or lack of available human capital. This enables new start-ups and young entrepreneurs to operate more willingly and conveniently in rural environments. Among the highlighted benefits of adopting digital innovation to rural entrepreneurs include improved productivity, greater operational and administrative efficiency, as well as increased ability to engage with their customers beyond geographical boundaries, with the help of digital platforms such as social media and e-commerce websites (Cen et al., 2022; Abeysinghe & Malik, 2021).

The digitalisation of rural entrepreneurship is crucial for the growth and competitiveness of rural businesses (Samsudin et al., 2024). For small businesses, the benefits of adopting digital innovations are evident. Businesses with strong digital strategies are more diversified and better prepared to weather business and/or economic slumps (World Economic Forum, 2023). In the rural setting, micro and small business ventures are increasingly seen as a means of generating meaningful and sustainable employment opportunities, particularly for those who are economically disadvantaged and marginalised such as rural women (Mugobo & Ukpere, 2012). Thus, leveraging digital tools and platforms among small rural businesses can address traditional barriers and foster sustainable economic development in rural communities. Nevertheless, access to technologies alone (e.g., Internet connection) is insufficient to help rural communities and businesses flourish, if they are not equipped with sufficient knowledge and skills to utilise these digital innovations (Salemink et al., 2017).

The rapid advancement of digital technologies presents a unique opportunity for rural entrepreneurs to overcome traditional challenges and compete in a global marketplace. Although the advantages of digital innovation are evident and well-documented, there is limited discussion on the inherent challenges that rural entrepreneurs face in adopting digital innovation. Thus, this study aims to delve into the opportunities and emerging barriers and obstacles encountered by rural entrepreneurs and emerging barriers and obstacles they encounter as they embrace digital transformation. By reviewing relevant literature, this paper highlighted how rural entrepreneurs can navigate challenges and opportunities presented by digital innovation through actionable strategic recommendations.

This paper is structured as follows. It begins with an introduction that outlines the significance of digital innovation for rural entrepreneurship and the objective of the study. The paper then reviews the relevant literature from three perspectives: (i) potential and opportunities offered by digital innovation, (ii) barriers to digital innovation adoption among rural entrepreneurs, and (iii) obstacles hindering rural entrepreneurs from adopting digital innovation. This is followed by a section highlighting recommendations for policymakers, practitioners and/or industry players to support the digital transformation of rural entrepreneurship. The paper concludes with a summary of findings obtained from the literature review and future research directions focusing on the initiatives toward digitalising rural entrepreneurship.

2. Harnessing Digital Innovation for Rural Entrepreneurship

Digital innovation has made it possible for rural entrepreneurial ventures to not only innovate and become more competitive but also gain new growth opportunities (Lekhanya, 2018; Räisänen & Tuovinen, 2020). Due to the recent advancements in technological tools and capabilities, numerous studies have examined the effects of digitalisation on rural entrepreneurship that largely revolve around topics related to the use of information and communication technology (ICT), e-commerce and digital financial services. A study by Barnett et al. (2019) for instance, showed that mobile phones and Internet use have positive effects on rural entrepreneurship in China, through social networking and information acquisition. They considered the possibility of reverse causality from entrepreneurship to ICT utilisation and additionally found that mobile phone and Internet users are more likely to become entrepreneurs than non-users. Meanwhile, Tang et al. (2022) found that digital innovation promotes tourism entrepreneurial activity in rural areas. They noted that technological developments reduced the cost of innovation, thus further stimulating innovative behaviour and encouraging more entrepreneurial activities beyond conventional industries.

2.1 Market Expansion

Digital innovation offers substantial opportunities for rural entrepreneurship by facilitating market expansion. Through social media and e-commerce platforms, rural artisans and small-scale producers can sell their goods worldwide, effectively expanding their market beyond local confines and increasing their revenue potential (UNCTAD, 2024). Take for example China's e-commerce powerhouse, Alibaba. Alibaba serves as an example of how other e-commerce platforms can strategically utilise digital channels to expand their reach into rural markets. Through its rural expansion program, Alibaba provides service centres in rural areas to assist rural entrepreneurs in learning how to sell their products or services online. These rural service centres are managed by the village's young people, who would also educate the local community who lack awareness and willingness to engage in online purchasing activities (Bhatia-Kalluri, 2021). The subsequent establishment of Taobao village in rural China has also enabled rural residents to start a business and achieve industrial agglomeration and growth by using digital innovation at a minimal cost (Li, 2017). Similarly, Taobao village has enabled rural entrepreneurs in China to convert idle resources into flexible business opportunities, whilst integrating developing markets into global value chains (Leong et al., 2016).

2.2 Access to Finance

Access to finance is crucial for rural entrepreneurs to grow and thrive (Jalil, 2021). The majority of micro-enterprises rely on internally generated funds to finance their operations as it can be challenging to acquire external sources, which might lead to their failures (Fadil & St-Pierre, 2021). These challenges, however, can be addressed by industry practitioners and financial institutions through leveraging emerging digital innovations such as digital finance, to improve rural 'entrepreneurs' access to funds and meet the increasing financial needs of market consumers in a convenient, secure and efficient manner (Owens, 2013). Another significant innovation in digital finance, namely online payment systems, is crucial to ensuring that e-commerce platforms run smoothly and effectively (Li et al., 2020). Digital payment services and mobile banking applications simplify transactions, making it easier for rural businesses to engage with customers from different areas or regions. These systems increase consumer confidence by providing simple and safe payment options, thereby enhancing customer convenience and encouraging more purchases (Oyelami et al., 2020). For instance, the Rural and Regional Development Ministry of Malaysia has implemented the Rural Entrepreneurs Digitalisation program under the Desamall initiative to educate rural entrepreneurs on digital innovation applications and capabilities, including those related to financial digitalisation, digital warehouse and payment gateway management (Bernama, 2024). Through training and practical exposure, rural entrepreneurs would obtain the skills necessary to successfully use digital applications, thereby improving productivity and efficiency, and promoting entrepreneurship growth.

2.3 Business Development and Networking

Social media is often regarded as a convenient and effective channel for networking activities and establishing social connections (Tiwasing, 2021). Utilising social media as an online platform for business networking can enhance access to assistance and provide advice to entrepreneurs, leading to improved business performance, particularly for small and medium enterprises in rural areas (Roberts et al., 2017; Townsend et al., 2016). Bosworth (2012) further underscores the significance of adopting a networking approach in rural entrepreneurial efforts, since rural business owners typically exhibit high commitment to their local community. Additionally, these online business networks may also be used by rural entrepreneurs to connect various enterprises and broaden their customer base (Townsend et al., 2016; Moyes et al., 2012). An analysis of entrepreneurial activities in rural Internet centres in Malaysia has equally shown that social networking applications can help rural entrepreneurs create and strengthen their social capital (Noor et al., 2020). Meanwhile, using popular social media platforms such as Facebook, Instagram and Twitter provide an easy, cost-effective means for customers to directly connect with new products, services and brands (Aswani et al., 2018). Online reviews and feedback help rural entrepreneurs understand consumer preferences, allowing them to tailor their products and marketing strategies to meet the demands of a wider audience. By leveraging these digital tools, rural entrepreneurs can enhance their market reach and improve their competitiveness in the global market.

In Soluk et al.'s (2021) work, it was found that digital innovation plays a crucial role in promoting entrepreneurship among individuals residing and working in rural parts of developing countries like India. Based on observations, microbusiness owners employed various techniques to expand and improve their business models. For example, some entrepreneurs are now using applications to sell their handcrafted sarees abroad, rather than limiting their sales to only their local villages or communities. Another example relates to shrimp farmers who acquired knowledge through a local self-help organisation regarding the important role of pH level in their shrimp basins for enhancing productivity. With the use of digital sensor technology and an Internet-based application, these

farmers can now monitor the pH levels of their shrimp basins, which ultimately facilitates the commercialisation of their shrimp farming endeavours in the long run.

2.4 Education and Skill Development

In remote and underdeveloped places, rural entrepreneurial initiatives may flourish with the support of entrepreneurial education, training and skills (Lekhanya, 2018). Entrepreneurial education is vital in driving the economic development of many countries since it significantly influences the growth and survival of enterprises (Kalyani & Kumar, 2011). Before they can effectively leverage digital innovation applications like web stores, search engine optimisation, or social media for marketing, entrepreneurs first need to be educated about utilising smartphones and the Internet. According to Räsänen and Tuovinen (2020), there were significant differences in the digital proficiency of rural microenterprise owners, with some lacking even the most fundamental knowledge. Rural entrepreneurs may overcome this barrier by utilising digital tools and platforms to access various online educational resources and training programs. Rural entrepreneurs have the opportunity to obtain a vast amount of knowledge on market trends, best practices and strategies for managing their businesses through webinars, online courses and e-books that are widely available online. Access to information and resources is essential for improving entrepreneurs' skills and abilities, allowing them to make informed decisions and adjust to evolving market conditions. Furthermore, digital platforms facilitate networking and collaboration among entrepreneurs, researchers, and industry experts. This interconnectedness allows rural entrepreneurs to share experiences, seek advice, and form partnerships that can lead to innovative business solutions. Connecting with a broader community enhances resourcefulness and fosters collaboration, which is essential for entrepreneurial success in rural settings (Moss et al., 2022).

3. Barriers to Implementing Digital Innovation for Rural Entrepreneurship

Previous researchers examining the adoption of digital innovation by entrepreneurs in rural areas found that rural entrepreneurs often need greater support and facilities than their urban counterparts. Alabdali et al. (2023) and Fanelli (2021) suggest several major barriers and limitations when adopting digital innovation in rural entrepreneurship namely, lack of infrastructure, resistance to change and lack of required knowledge and skills to uptake their digital technologies to a greater level of digital transformation. In Malaysia for instance, rural areas face significant hindrances in adopting digital technologies, with only 32% of rural small businesses utilising digital tools compared to over 60% in urban regions (Economic Planning Unit, 2021). Some of the significant hindrances to digital adoption in rural entrepreneurship that have been highlighted in different literature are (i) limited access to technological infrastructure (Rosnan & Yusof, 2023; Morris et al., 2022), (ii) resistance to change due to low levels of digital literacy (Ismail et al., 2023; Alabdali et al., 2023; Fanelli, 2021) and (iii) limited regulatory and institutional support (e.g., Rosnan & Yusof, 2023).

3.1 Technological Infrastructure Barriers

Infrastructure limitations are a primary factor contributing to the barriers to adopting digital innovation in rural enterprises. Previous studies contended rural entrepreneurs face significant barriers to digital adoption due to inconsistent internet access and unreliable power supplies, which impede their ability to leverage technology effectively (Rani et al., 2022; Ferrari et al., 2022). These infrastructural deficits disrupt daily activities and hinder the effective utilisation of digital technologies essential for modern business practices. Previous studies highlighted that rural regions in developing countries are particularly affected by poor internet connection, limiting their ability to engage in digital entrepreneurship (Rosnan & Yusof, 2023; Morris et al., 2022).

3.2 Social-cultural Barriers

Previous studies on entrepreneurs in rural areas found a significant relationship between 'entrepreneurs' attitudes and digital adoption. Fahmi and Savira (2023) and Jaganathan et al. (2018) suggested that higher levels of owner attitudes were related to higher ICT adoption. The reluctance to embrace digital tools among rural entrepreneurs, driven by limited digital literacy and a lack of trust in technology, exacerbates the obstacles to digital adoption. It has been contended in many previous studies that entrepreneurs lacking knowledge and experience in digital technologies are less likely to be involved in digital innovation. Entrepreneurs in rural areas exhibit a notable reluctance to embrace digital innovations, often rooted in scepticism towards digital technologies, driven by fears of fraud, privacy concerns, and a general mistrust of unfamiliar systems and a lack of digital literacy (Ramdani et al., 2021). This resistance is compounded by insufficient training and support, which are critical for overcoming the barriers of digital literacy and fostering a positive attitude towards technological change. A previous study on rural entrepreneurs' perspectives on digital technology in South Indonesia (Fahmi & Savira, 2023) suggests that small enterprises are more likely to adopt digital innovation if their owner-manager or founder is aware of the potential benefits that could be generated from digital technologies. Räsänen and Tuovinen (2020) in their study

of micro-entrepreneurs in the rural area found that the workshop concept worked well for spreading information, encouraging a positive attitude towards digital innovations, and planning the use of innovations in rural enterprises.

3.3 Regulatory and Institutional Barriers

Rural entrepreneurs with limited support from local policy in terms of financial and technical incentives are less likely to successfully adopt digital innovation in their enterprises (Ferrari et al., 2022). These barriers are intensified by regulatory frameworks that might not be suitable to address the unique needs of rural entrepreneurs, resulting in ineffective policy measures and limited support (Rani et al., 2022). Many previous studies on the digital transformation of SMEs found that government support has significant determinant of digital adoption in SMEs in terms of digital capital incentives and sponsorship (Saruchera & Mpunzi, 2023; Zhao et al., 2023). Despite various government initiatives promoting digital adoption such as subsidies and incentives, rural entrepreneurs often find these measures inaccessible due to complex application processes and the lack of local support for infrastructure (Economic Planning Unit, 2021). The mismatch between policy intentions and the practical needs of rural entrepreneurs highlights the necessity for more targeted and effective policy interventions. According to Fanelli (2021), tailored regulatory frameworks that address the specific needs of rural businesses in adopting digital innovation are essential for bridging the digital gap and fostering inclusive digital growth. A supportive environment from both the government and community forces was found to have a positive effect on the digital transformation which integrates cognitive supports (i.e., training on digital skills and knowledge) and psychological supports (i.e., support from family and other entrepreneurs) (Geng et al., 2023; Thomas, 2023).

Addressing the barriers to digital innovation adoption in rural entrepreneurship is not merely answered by considering only the technological or economic barriers, but also social factors (e.g., knowledge and experience, training and education, motivation), institutional support factors (e.g. management support, financial support) and environment factors (e.g. 'entrepreneurs' network, government support). Bridging this divide has the potential to unlock new opportunities, enhance operational efficiencies, and drive innovation in rural communities. As Malaysia endeavours to position itself as a leader in the regional digital economy, overcoming these challenges is essential to ensure that the benefits of digital transformation are equitably distributed across urban and rural areas (Economic Planning Unit, 2021).

4. Challenges in Scaling Digital Innovation for Rural Entrepreneurship

Rural entrepreneurship can contribute significantly to inclusive development by creating job opportunities across numerous subsectors of the rural economy, and Greenberg et al. (2018) who conducted a study in Moshavim and Kibbutzim stated that this activity entails the development in rural areas, which helps stimulate economic growth and enhance the quality of life in these communities. These businesses, which are situated in rural areas with a lower population density, frequently face inadequate infrastructure. Hence, undertaking digital transformation can be challenging in rural areas with limited technological support and expertise (Vial, 2021).

4.1 Technological Knowledge and Expertise

Integrating digital innovation in rural communities presents several challenges. First and foremost, it is vital to possess the capability for digital solutions to expand and adapt to heightened business needs (Bharadwaj et al., 2013; Ravichandran, 2018). Scaling may be an enormous challenge without an in-depth knowledge of the underlying technology because it requires rigorous planning and execution. For instance, according to Davenport (2005), technology expertise is required to improve infrastructure to handle additional information, introduce new features without disrupting current operations, and ensure that the system performs properly under high pressure. Furthermore, fixing possible bottlenecks, making the best use of resources, and maintaining data integrity while expanding are difficult tasks that require a thorough understanding of the technology system and its constraints. Teece (2018) concluded that without this knowledge, businesses could experience inefficiencies, higher costs, and system disruptions, thereby impairing their capacity for growth and creativity.

4.2 Financial Constraints

The financial considerations in digital transformation, which encompass a range of challenges and decisions crucial to ensuring that the investment yields positive returns, are another critical issue that requires attention. Businesses have to initially invest heavily in new technologies, infrastructure upgrades, and personnel training. These costs can be substantial, particularly for rural entrepreneurs with limited resources (Patel & Chavda, 2013). Additionally, the ongoing maintenance expenses can strain financial resources. Mismanagement or underestimation of these costs can lead to budget overruns and financial instability. Moreover, Ijomah (2024), which focuses on small and medium enterprises located in rural areas, added that projecting the return on investment from digital initiatives is complex, as it involves predicting long-term benefits amidst rapid

technological changes and market dynamics. Hence, engaging in extensive financial planning is crucial for controlling over budgets, furthermore consistently conducting cost-benefit analysis will effectively navigate the intricate financial elements of digital transformation.

4.3 Skill Gaps and Training Needs

Skill gaps and training needs are another significant challenge in digital transformation, particularly in environments with limited technical expertise. Räisänen and Tuovinen (2020) highlighted that the majority of rural entrepreneurs may lack basic digital literacy, making it challenging to adopt and utilise new technologies effectively. Digital system implementation, management, and maintenance occasionally necessitate extensive training programs due to a lack of manpower with the advanced technical skills required to perform these tasks. On top of that, staying up-to-date with the latest innovations in digital tools and procedures requires constant upskilling (Vidas, 2022). This continuous learning curve can strain resources, as businesses must invest in training and development to build a workforce capable of leveraging digital innovations. Unless these skill gaps are filled by extensive training programs, Tosheva (2020) emphasises that rural businesses will not be able to fully benefit from digital transformation, which may lead to less-than-ideal results and a loss of competitive advantage.

4.4 Regulatory Compliance and Government Policies

On a macro level, navigating regulatory compliance, standards, and government policies is another challenging aspect of digital transformation, requiring rural entrepreneurs to ensure that their digital activities adhere to relevant legal and regulatory frameworks. Chukwurah (2024) listed that this framework involves understanding and implementing data privacy laws, cybersecurity requirements, and industry-specific standards, which can vary significantly across regions and sectors. Compliance necessitates continuous monitoring and updating of practices to meet evolving regulations, often demanding specialised legal and technical expertise. Furthermore, government policies can both facilitate and hamper digital transformation, with favourable policies and incentives providing much-needed financial and infrastructure support, while resilient regulations impose additional costs (Bürer et al., 2022; George, 2023). Hence, proactively managing regulatory obligations and aligning digital initiatives with government regulations and industry standards is vital for rural entrepreneurs to avoid legal penalties, reputational harm, and operational disruptions that can arise from infringement.

Adopting digital technologies to improve business performance, provide market access, and promote economic growth is a challenging process that constitutes a digital transformation for rural entrepreneurship. Inadequate infrastructure, a shortage of technical expertise, and slow internet connectivity are just a few of the specific challenges that this process must overcome to effectively utilise digital solutions. Additionally, rural entrepreneurs often struggle with financial constraints, regulatory compliance, and a lack of awareness about the benefits of digital innovation. Given these difficulties, rural entrepreneurs require specific interventions and support, such as financial incentives or subsidies from the government, community training programs, collaborations with tech companies, and better investments and expenditures in rural infrastructure. By addressing these specific requirements, the government could empower rural businesses to capitalise on digital innovation effectively, thereby promoting sustainable growth and competitive advantage in rural areas and their communities.

5. Overcoming Barriers and Challenges to Digital Innovation for Rural Entrepreneurship

Rural entrepreneurs face a variety of barriers and challenges when using digital technologies. To comprehensively address these issues, a strategic approach is required. The strategies include investing in technology and infrastructure, enhancing digital literacy, providing financial support, and a supportive policy and regulatory framework for digital innovation. By focusing on these strategies, rural communities can effectively bridge the digital divide, fully embrace the digital economy, and drive sustainable economic growth.

5.1 Improving Digital Infrastructure

Improving digital infrastructure is crucial for rural entrepreneurs to compete in the digital economy and close the digital divide. By focusing on connectivity, service quality, and the ability to use digital technologies efficiently, these strategies aim to reduce both obstacles and challenges. Enhancing digital infrastructure addresses not only connectivity issues but also economic disparities. Improved digital infrastructure enables rural business owners to participate more effectively in the digital economy. Their participation in the digital economy can increase economic opportunities, job creation, and community development.

Improving digital infrastructure starts with expanding internet access coverage, which is also the most crucial step (García-Mora & Mora-Rivera, 2023). Governments and telecommunications providers must work together to ensure rural areas do not fall behind. Finding places with poor internet connectivity requires careful assessment of rural areas. Policymakers and service providers can prioritise these areas for prioritised attention. For instance, one

initiative in India called “BharatNet” seeks to close the digital divide and promote economic growth by bringing high-speed Internet to rural communities (Sindakis & Showkat, 2024).

Moreover, for rural communities to fully benefit from digital technologies, internet speed and reliability must also be improved apart from the coverage (Ford et al., 2023). High-speed Internet is necessary for many uses, including online learning, telehealth services, and effective business operations. Installing fibre optic cables, for example, can upgrade infrastructure and offer faster and more dependable connections than traditional connections like conventional copper lines (Briglauer et al., 2024). Governments can set aside funds to construct broadband infrastructure in rural areas. Increasing rivalry among internet service providers (ISPs) can also result in lower prices and higher-calibre services. As an example, the government of South Korea has promoted competition among ISPs, enabling rural residents to access high-speed Internet at reasonable costs (Lee et al., 2023).

For rural entrepreneurs to access larger markets and grow their customer base and revenue streams, it is important to establish digital marketplaces and platforms (Heeks et al., 2021). Governments can work with private companies to establish and run digital marketplaces suited to rural businesses’ requirements. For example, the government of Thailand has introduced a “Smart Digital Hub to assist rural farmers and artisans in selling their goods online expanding their customer base and firms” (Iwasaki, 2023).

5.2 Building Digital Literacy and Skills

Even with high coverage and high-speed internet access, rural communities still require the ability to use digital tools and technologies efficiently. Access to digital infrastructure alone is insufficient for rural entrepreneurs to thrive in the digital economy. Digital literacy, or the ability to effectively use digital tools and technologies, is essential for maximising the benefits of digital innovations (Freeman et al., 2020; Liu et al., 2020). Digital literacy includes knowing how to set up and manage online stores, utilise social media for marketing, and implement digital payment systems. Digital literacy enhances productivity by streamlining business operations, improving communication, and automating tasks. It allows entrepreneurs to efficiently manage their businesses, reducing time spent on manual processes whilst increasing overall efficiency. With digital tools, entrepreneurs can optimise their supply chains, track real-time inventory, and manage customer relationships more effectively.

Therefore, rural entrepreneurs must be able to use digital tools and technologies effectively, even with widespread coverage and high-speed internet access. Access to digital infrastructure alone is insufficient for rural entrepreneurs to succeed in the digital economy. Maximising the advantages of technological advancements requires digital literacy, or the capacity to use digital tools and technologies efficiently (Nikou & Aavakare, 2021). The digital literacies include managing customer markets, business relationships, marketing strategies, managing cybersecurity and accessing financial support and programs online. Digital literacy facilitates better access to resources and information, which aids in keeping business owners up to date on consumer preferences, market trends, and emerging business opportunities. Digital literacy empowers entrepreneurs to perform competitive analysis, acquire market research, and make informed decisions based on data (Liu et al., 2020). The ability to obtain information is essential for formulating plans that meet the constantly shifting needs of the market. Digitally savvy business owners can try new ideas like digital marketing campaigns, smartphone apps, and e-commerce platforms to expand their customer base and gain a competitive advantage. Besides, using digital tools effectively also makes networking and collaboration more accessible, which helps business owners form important alliances and business relationships.

Moreover, understanding digital security is essential for safeguarding company information and transactions against online attacks (Thakur, 2024). Business owners should be aware of the best practices for protecting their online presence, which include encrypting data, creating strong passwords, and updating software often to prevent vulnerabilities. In addition, digital literacy also makes it possible to access online financial services and government programs (Chohan & Hu, 2022). Digitally savvy business owners, for example, can apply online for grants, loans, and other financial aid programs, which expedites the application process and raises the applicant’s chances of getting funding. Therefore, by utilising digital literacy, rural business owners can better navigate the digital environment and ensure their companies stay resilient and competitive in the rapidly changing digital economy.

To improve digital literacy, governments and academic institutions can work together to offer training through community centres, schools, and non-governmental organisations. The Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA), for instance, is part of India’s Digital India initiative and aims to digitally literate rural households (Sivakumar, 2018; Tudu, 2024). Another example is Malaysia’s eUsahawan program, which provides online training in social media management, digital marketing, and e-commerce to assist rural entrepreneurs in expanding their digital footprint and market reach (Holroyd, 2019).

Programs for specialised training, coaching, and mentoring can offer individualised support, and online learning environments enable ongoing skill development. Some Asian countries have initiated programs to help digital literacy in rural areas. The “Digital 4.0” program in Vietnam provides free training on digital marketing and online business strategies to small and medium-sized enterprises (SMEs) in collaboration with Google. Rural businesses can receive digital marketing, e-commerce, and data analytics training from Thailand’s Digital Economy Promotion Agency (DEPA) (Wongwuttivat & Lawanna, 2018). Digital Centres are used by Bangladesh’s a2i (Access to Information) program to provide practical training for rural entrepreneurs (Dolar Kar et al., 2020). By implementing these strategies, stakeholders can assist rural entrepreneurs in surmounting obstacles and proficiently utilising digital technologies.

5.3 Financial Support and Access to Capital

While improving digital infrastructure and enhancing digital literacy is critical, financial support is also essential to ensure that rural entrepreneurs can fully utilise these digital innovations. Financial limitations may hinder rural entrepreneurs from obtaining the digital tools and infrastructure they require (Freeman et al., 2020). Insufficient funding could make it difficult for rural businesses to cover the upfront expenses of digital technology, like buying computers, software, and high-speed internet access (Räsänen & Tuovinen, 2020). Rural business owners may have to pay hefty ongoing costs for digital marketing, maintenance, and upgrades even if they can purchase some digital tools. These ongoing costs can strain companies’ already tight budgets and make it difficult to sustain their digital innovations in the long term.

Therefore, financial support is essential to remove these barriers and challenges. Financial assistance can partially cover the upfront costs of implementing digital technologies. Government grants and subsidies can lower these cost barriers, to invest in essential digital tools (Chen et al., 2021). Grants can be used for e-commerce platform development, internet infrastructure upgrades, or the purchase of digital devices. For example, government initiatives like the SME Digitalisation Grant have aided the digital transformation of rural businesses in Malaysia (Khai et al., 2020). Funding is necessary for digital projects to be sustained after the initial investment. To enable rural business owners to sustain and grow their online presence, internet access and digital marketing services subsidies can lower ongoing operating costs.

Financial funds such as microfinance for rural enterprises’ requirements are also essential (Jalil, 2021; Rasheed et al., 2019). These initiatives allow business owners to invest in infrastructure and digital technologies by providing small loans with beneficial terms. As an example, microfinance institutions such as Grameen Bank have effectively lent money to rural entrepreneurs in Bangladesh, enabling them to embrace digital technology and expand their businesses (Kandie & Islam, 2022).

5.4 Simplifying Digital Regulations

While financial support, digital literacy, and infrastructure improvements are critical, restructuring digital regulations is just as crucial. Governments can encourage digital entrepreneurship and innovation in rural areas by lowering bureaucratic burdens (Ajayi-Nifise et al., 2024). A conducive business climate in rural areas can only be achieved by streamlining regulations for digital businesses. Due to bureaucratic obstacles, enterprises in remote areas with restricted access to regulatory advice may be discouraged from launching and running digital businesses.

With the simplifying of digital regulation, more time is spent on their business activities rather than navigating complex regulatory systems, which is what simplified regulations do for entrepreneurs: they make it easier to start and run their businesses. Eventually, this strategy drives economic growth and development in rural areas by guaranteeing the full efficacy of other advancements in digital infrastructure, literacy, and funding support. For example, Indonesia passed the “Omnibus Law” to encourage investment and entrepreneurship by rationalising a number of laws, including those that apply to digital businesses (Novadina, 2024).

6. Conclusion and Future Research Directions

6.1 Conclusion

Numerous opportunities presented by digital innovation have the potential to transform rural entrepreneurship by bridging the gap between rural and urban economic activities. Rural business owners can expand their market reach and improve operational efficiency by utilising digital innovations. Nevertheless, some barriers and challenges remain, such as a lack of digital infrastructure, lack of digital skills, financial limitations, and regulatory barriers. A comprehensive strategy is required to fully utilise digital innovation in rural areas.

Governments and stakeholders can establish a conducive environment that supports digital entrepreneurship in rural areas and promotes sustainable and inclusive development by enhancing digital infrastructure, fostering the development of digital skill literacy and competencies, offering financial support and capital access, and

simplifying digital regulations. This favourable environment may then fuel economic growth. To put these plans into action, cooperation between businesses, governments, and communities is necessary. A favourable business environment encourages rural entrepreneurs to work together, leading to economic growth.

6.2 Future Research

Future studies on digital innovation to transform rural entrepreneurship should focus on a few important areas to offer a more thorough understanding and useful solutions. Future research may include studies on financial assistance effectiveness, key successful factors in digital innovation adoption, emerging new technologies, and the effectiveness of training and development on digital innovation.

Financial support is widely recognised as a crucial catalyst for entrepreneurial ventures. However, its effectiveness in promoting digital innovation among rural entrepreneurs is not yet sufficiently researched. A comprehensive assessment of the types of amounts and delivery mechanisms of financial assistance is required to determine their optimal design to maximise the acceptance of digital innovations in rural contexts.

Another important research approach is identifying the key success factors for introducing digital innovations in rural areas. Understanding the unique challenges and opportunities rural entrepreneurs face when adopting digital technologies is important. Factors such as digital literacy, access to digital infrastructure, entrepreneurial skills and supporting ecosystems should be examined in depth to identify the fundamental drivers of success.

Rapid technological advancement requires continuous research into new technologies and their potential applications in rural entrepreneurship. While interest in technologies such as artificial intelligence, blockchain and the Internet of Things is growing, their practical implementation in rural areas remains largely unexplored. Research should focus on discovering specific use cases for these technologies that can solve rural entrepreneurs' unique needs and challenges.

Investments in training and development are critical to equip rural entrepreneurs with the digital skills they need to compete in today's economy. Although numerous training programs have been implemented, their effectiveness in driving digital innovation and long-term business growth is often unclear. Rigorous evaluations of training programs are needed to assess their impact on entrepreneurs' digital skills, business performance and innovation outcomes. In addition, research should examine the optimal design and delivery of training programs to maximise their effectiveness in different rural contexts.

By addressing these research areas, future studies can significantly contribute to developing evidence-based policies and strategies to support digital innovation in rural entrepreneurship. A deeper understanding of the factors influencing digital adoption, the effectiveness of various interventions and the potential of new technologies will enable policymakers, practitioners and entrepreneurs to work together to create a thriving rural economy in the digital age.

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References

- Abeysinghe, D. U., & Malik, M. (2021). The role of digital technology in rural entrepreneurship and innovations. In *Rural Entrepreneurship and Innovation in the Digital Era* (pp. 20–38). IGI Global. <https://doi.org/10.4018/978-1-7998-4942-1.ch002>
- Ajayi-Nifise, A. O., Tula, S. T., Asuzu, O. F., Mhlongo, N. Z., Olatoye, F. O., & Ibeh, C. V. (2024). The Role of Government Policy in Fostering Entrepreneurship: a Usa and Africa Review. *International Journal of Management & Entrepreneurship Research*, 6(2), 352–367. <https://doi.org/10.51594/ijmer.v6i2.775>
- Alabdali, S. A., Pileggi, S. F., & Cetindamar, D. (2023). Influential factors, enablers, and barriers to adopting Smart Technology in rural regions: A literature review, *Sustainability*, 15(10), 7908. <https://doi.org/10.3390/su15107908>
- Aswani, R., Kar, A. K., Ilavarasan, P. V., & Dwivedi, Y. K. (2018). Search engine marketing is not all gold: Insights from Twitter and SEOclerks. *International Journal of Information Management*, 38(1), 107–116. <https://doi.org/10.1016/j.ijinfomgt.2017.07.005>
- Barber III, D., Harris, M. L., & Jones, J. (2021). An Overview of Rural Entrepreneurship and Future Directions. *Journal of Small Business Strategy*, 31(4), 1–4. <https://doi.org/10.53703/001c.29468>
- Barnett, W. A., Hu, M., & Wang, X. (2019). Does the utilisation of information communication technology

- promote entrepreneurship: Evidence from rural China. *Technological Forecasting and Social Change*, 141, 12–21. <https://doi.org/10.1016/j.techfore.2019.01.007>
- Bernama. (2024, February 26). *KKDW Allocates RM1.7 Million To Help Rural Entrepreneurs To Master Digitalisation*. Bernama. Retrieved from <https://www.bernama.com/en/news.php?id=2273615>
- Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. V. (2013). Digital business strategy: toward a next generation of insights. *MIS Quarterly*, 471–482. <https://doi.org/10.25300/MISQ/2013/37:2.3>
- Bhatia-Kalluri, A. (2021). *E-commerce for Rural Micro-Entrepreneurs: Mapping Restrictions, Ecologies of Use and Trends for Development*. Proceedings of the 1st Virtual Conference on Implications of Information and Digital Technologies for Development. <https://doi.org/10.48550/arXiv.2108.09759>
- Bosworth, G. (2012). Characterising rural businesses – Tales from the paperman. *Journal of Rural Studies*, 28(4), 499–506. <https://doi.org/10.1016/j.jrurstud.2012.07.002>
- Briglauer, W., Krämer, J., & Palan, N. (2024). Socioeconomic benefits of high-speed broadband availability and service adoption: A survey. *Telecommunications Policy*, 48(7), 102808. <https://doi.org/10.1016/j.telpol.2024.102808>
- Bürer, M. J., de Lapparent, M., Capezzali, M., & Carpita, M. (2022). Governance drivers and barriers for business model transformation in the energy sector. In *Swiss Energy Governance: Political, Economic and Legal Challenges and Opportunities in the Energy Transition* (pp. 195–243). https://doi.org/10.1007/978-3-030-80787-0_10
- Cen, T., Lin, S., & Wu, Q. (2022). How does digital economy affect rural revitalisation? The mediating effect of industrial upgrading. *Sustainability*, 14(24), 16987. <https://doi.org/10.3390/su142416987>
- Chen, C. L., Lin, Y. C., Chen, W. H., Chao, C. F., & Pandia, H. (2021). Role of government to enhance digital transformation in small service business. *Sustainability*, 13(3), 1–26. <https://doi.org/10.3390/su13031028>
- Chitura, T., Mupemhi, S., Dube, T., & Bolongkikit, J. (2008). Barriers to electronic commerce adoption in small and medium enterprises: A critical literature review. *Journal of Internet Banking and Commerce*, 13(2), 1.
- Chohan, S. R., & Hu, G. (2022). Strengthening digital inclusion through e-government: cohesive ICT training programs to intensify digital competency. *Information Technology for Development*, 28(1), 16–38. <https://doi.org/10.1080/02681102.2020.1841713>
- Chukwurah, N., Ige, A. B., Adebayo, V. I., & Eyieyien, O. G. (2024). Frameworks for effective data governance: best practices, challenges, and implementation strategies across industries. *Computer Science & IT Research Journal*, 5(7), 1666–1679. <https://doi.org/10.51594/csitrj.v5i7.1351>
- Davenport, T. H. (2005). *Thinking for a living: how to get better performances and results from knowledge workers*. Harvard Business Press.
- Dolar Kar, T. M. R., Islam, N., & Gani, M. O. (2020). Leveraging the Youth to A Sustainable Development: A Case Study on A2i Innovation Lab. *Thu Dau Mot University Journal of Science*, 2(4), 373–388. <https://doi.org/10.37550/tdmu.EJS/2020.04.082>
- Economic Planning Unit. (2021). *Malaysia Digital Economy Blueprint*. Perpustakaan Negara Malaysia.
- Fadil, N., & St-Pierre, J. (2021). Growing SMEs and internal financing: the role of business practices. *Journal of Small Business and Enterprise Development*, 28(7), 973–994. <https://doi.org/10.1108/JSBED-11-2019-0375>
- Fahmi, F. Z., & Savira, M. (2023). Digitalisation and rural entrepreneurial attitude in Indonesia: a capability approach. *Journal of Enterprising Communities: People and Places in the Global Economy*, 17(2), 454–478. <https://doi.org/10.1108/JEC-06-2021-0082>
- Fanelli, R. M. (2021). Barriers to adopting new technologies within rural Small and Medium Enterprises (SMEs). *Social Sciences*, 10(11), 430. <https://doi.org/10.3390/socsci10110430>
- Ferrari, A., Bacco, M., Gaber, K., Jedlitschka, A., Hess, S., Kaipainen, J., Koltsida, P., ... Brunori, G. (2022). Drivers, barriers and impacts of digitalisation in rural areas from the viewpoint of experts. *Information and Software Technology*, 145. <https://doi.org/10.1016/j.infsof.2021.106816>
- Ford, S., Buscemi, J., Hirko, K., Laitner, M., Newton, R. L., Jonassaint, C., ... Klesges, L. M. (2023). Withdrawn as duplicate: Society of Behavioral Medicine (SBM) urges Congress to ensure efforts to increase and enhance broadband internet access in rural areas. *Translational Behavioral Medicine*, 13(6), 420–422. <https://doi.org/10.1093/tbm/ibz035>

- Freeman, J., Park, S., & Middleton, C. (2020). Technological literacy and interrupted internet access. *Information, Communication & Society*, 23(13), 1947–1964. <https://doi.org/10.1080/1369118X.2019.1623901>
- Galvao, A. R., Mascarenhas, C., Marques, C. S., Braga, V., & Ferreira, M. (2020). Mentoring entrepreneurship in a rural territory—A qualitative exploration of an entrepreneurship program for rural areas. *Journal of Rural Studies*, 78, 314–324. <https://doi.org/10.1016/j.jrurstud.2020.06.038>
- García-Mora, F., & Mora-Rivera, J. (2023). Exploring the impacts of Internet access on poverty: A regional analysis of rural Mexico. *New Media & Society*, 25(1), 26–49. <https://doi.org/10.1177/14614448211000650>
- Geng, L., Hui, H., Liang, X., Yan, S., & Xue, Y. (2023). Factors affecting intention toward ICT adoption in rural entrepreneurship: Understanding the differences between business types of organisations and previous experience of entrepreneurs. *Sage Open*, 13(3). <https://doi.org/10.1177/21582440231197112>
- George, A. S. (2023). Evaluating India’s economic growth: challenges and opportunities on the path to 5 trillion dollars. *Partners Universal International Innovation Journal*, 1(6), 85–109. <https://doi.org/10.5281/zenodo.10307006>
- Greenberg, Z., Farja, Y., & Gimmon, E. (2018). Embeddedness and growth of small businesses in rural regions. *Journal of Rural Studies*, 62, 174–182. <https://doi.org/10.1016/j.jrurstud.2018.07.016>
- Heeks, R., Gomez-Morantes, J. E., Graham, M., Howson, K., Mungai, P., Nicholson, B., & Van Belle, J.-P. (2021). Digital platforms and institutional voids in developing countries: The case of ride-hailing markets. *World Development*, 145, 105528. <https://doi.org/10.1016/j.worlddev.2021.105528>
- Holroyd, C. (2019). Digital content promotion in South East Asia: government strategies for a new economic sector. *Journal of Asian Public Policy*, 12(1), 15–33. <https://doi.org/10.1080/17516234.2018.1477029>
- Ijomah, T. I., Idemudia, C., Eyo-Udo, N. L. & Anjorin, K. F. (2024). Innovative digital marketing strategies for SMEs: Driving competitive advantage and sustainable growth. *International Journal of Management & Entrepreneurship Research*, 6(7), 2173–2188. <https://doi.org/10.51594/ijmer.v6i7.1265>
- Ismail, N. A., Bakar, M. A., & Hilmi, M. I. (2023). Encouraging factor for ICT usage in agriculture from supplier view: A case study in Southern Region, Malaysia. *ESTEEM Journal of Social Sciences and Humanities*, 7(2), 240–253.
- Iwasaki, K. (2023). Chinese Firms Driving Digitalisation in the ASEAN Region. *Pacific Business and Industries*, 23(90), 2–31. Retrieved from <https://www.jri.co.jp/en/MediaLibrary/file/english/periodical/rim/2023/90.pdf>
- Jaganathan, M., Ahmad, S., Ishak, K. A., Nafi, S. N. M., & Uthamaputhran, L. (2018). Determinants for ICT adoption and problems: Evidence from rural based Small and Medium Enterprises in Malaysia. *International Journal of Entrepreneurship*, 22(4), 1–13. Retrieved from <http://dspace.uum.edu.my/jspui/handle/123456789/4265>
- Jalil, M. F. (2021). Microfinance towards micro-enterprises development in rural Malaysia through digital finance. *Discover Sustainability*, 2(1), 55. <https://doi.org/10.1007/s43621-021-00066-3>
- Kalyani, B., & Kumar, D. (2011). Motivational factors, entrepreneurship and education: Study with reference to women in SMEs. *Far East Journal Of Psychology And Business*, 3(2), 14–35.
- Kandie, D., & Islam, K. J. (2022). A new era of microfinance: The digital microcredit and its impact on poverty. *Journal of International Development*, 34(3), 469–492. <https://doi.org/10.1002/jid.3607>
- Khai, K. G., Onn, Y. W., Zulkifli, R. B., Kandasamy, S., & Ahmad, A. B. (2020). The necessity to digitalise SMEs business model during the COVID-19 pandemic period to remain sustainable in Malaysia. *Journal of Education and Social Sciences*, 16(1), 73–81.
- Lee, H., Jeong, S., & Lee, K. (2023). The South Korean case of deploying rural broadband via fiber networks by implementing universal service obligation and public-private partnership based project. *Telecommunications Policy*, 47(3), 102506. <https://doi.org/10.1016/j.telpol.2023.102506>
- Lekhanya, L. M. (2018). The digitalisation of rural entrepreneurship. In *Entrepreneurship-Trends and Challenges*. IntechOpen. <https://doi.org/10.5772/intechopen.75925>
- Leong, C., Pan, S. L., Newell, S., & Cui, L. (2016). The Emergence of Self-Organizing E-Commerce Ecosystems in Remote Villages of China: A Tale of Digital Empowerment for Rural Development. *MIS Quarterly*, 40(2), 475–484. <https://doi.org/10.25300/MISQ/2016/40.2.11>
- Li, A. H. (2017). E-commerce and Taobao Villages. A Promise for China’s Rural Development? *China*

- Perspectives*, 2017(3), 57–62. <https://doi.org/10.4000/chinaperspectives.7423>
- Li, J., Wu, Y., & Xiao, J. J. (2020). The impact of digital finance on household consumption: Evidence from China. *Economic Modelling*, 86, 317–326. <https://doi.org/10.1016/j.econmod.2019.09.027>
- Liu, Z. J., Tretyakova, N., Fedorov, V., & Kharakhordina, M. (2020). Digital literacy and digital didactics as the basis for new learning models development. *International Journal of Emerging Technologies in Learning*, 15(14), 4–18. <https://doi.org/10.3991/ijet.v15i14.14669>
- Morris, M., Morris, W., & Bowen, R. (2022). Implications of the digital divide on rural SME resilience. *Journal of Rural Studies*, 89, 369–377. <https://doi.org/10.1016/j.jrurstud.2022.01.005>
- Moss, T. W., Loor, A. D., & Parada, F. D. (2022). Partnerships as an enabler of resourcefulness in generating sustainable outcomes. *Journal of Business Venturing*, 37(1), 106089. <https://doi.org/10.1016/j.jbusvent.2020.106089>
- Moyes, D., Whittam, G., & Ferri, P. (2012). A conceptualisation of the relationship capital of rural small service firms. *Local Economy*, 27(2), 136–151. <https://doi.org/10.1177/0269094211428867>
- Mugobo, V. V., & Ukpere, W. I. (2012). Rural entrepreneurship in the Western Cape: Challenges and opportunities. *African Journal of Business Management*, 6(3), 827. <https://doi.org/10.5897/AJBM11.895>
- Nikou, S., & Aavakare, M. (2021). An assessment of the interplay between literacy and digital Technology in Higher Education. *Education and Information Technologies*, 26(4), 3893–3915. <https://doi.org/10.1007/s10639-021-10451-0>
- Noor, M. M., Hashim, N., & Jamin, R. M. (2020). Implications of ICT for Development on Enhancing Rural Entrepreneur Program (REP) at Telecentres in Malaysia. *International Journal of Business and Society*, 21(2), 629–642. <https://doi.org/10.33736/ijbs.3275.2020>
- Novadina, F. (2024). Fundamentals of Omnibus Law in Legal Studies. *Enigma in Law*, 1(2), 45–50. <https://doi.org/10.61996/law.v1i2.37>
- Olalekan, O. O. (2024). Rural Entrepreneurship in the Digital Age: A Systematic Review. *International Journal of Sustainable Rural Development*, 1(1), 1–5. <https://doi.org/10.54536/ijrsd.v1i1.2586>
- Owens, J. (2013). Offering Digital Financial Services to Promote Financial Inclusion: Lessons We've Learned. *Innovations: Technology, Governance, Globalization*, 8(1–2), 271–282. https://doi.org/10.1162/INOV_a_00179
- Oyelami, L. O., Adebisi, S. O., & Adekunle, B. S. (2020). Electronic payment adoption and 'consumers' spending growth: empirical evidence from Nigeria. *Future Business Journal*, 6, 1–14. <https://doi.org/10.1186/s43093-020-00022-z>
- Patel, B., & Chavda, K. (2013). Rural entrepreneurship in India: Challenge and problems. *International Journal of Advance Research in Computer Science and Management Studies*, 1(2).
- Petrin, T. (1994, September 8–14). *Entrepreneurship and supporting institutions: An analytical approach* [Keynote Paper]. Seventh FAO/REU International Rural Development Summer School, Herrsching, Germany. Food and Agriculture Organization (FAO). Retrieved from <https://www.fao.org/4/w6882e/w6882e02.htm>
- Räsänen, J., & Tuovinen, T. (2020). Digital innovations in rural micro-enterprises. *Journal of Rural Studies*, 73, 56–67. <https://doi.org/10.1016/j.jrurstud.2019.09.010>
- Ramdani, B., Raja, S., & Kayumova, M. (2021). Digital innovation in SMEs: a systematic review, synthesis and research agenda. *Information Technology for Development*, 28(1), 1–25. <https://doi.org/10.1080/02681102.2021.1893148>
- Rani, N. Z. A. A., Ismail, M. K., Kumaran, V. V., Muhamad, M. Z., & Shaupi, N. S. A. (2022). Analysing the challenges in adopting digitalisation among SMEs: A case study in Malaysia. *Res Militaris*, 12(4), 500–509.
- Rasheed, R., Siddiqui, S. H., Mahmood, I., & Khan, S. N. (2019). Financial Inclusion for SMEs: Role of Digital Micro-financial Services. *Review of Economics and Development Studies*, 5(3), 429–439. <https://doi.org/10.26710/reads.v5i3.686>
- Ravichandran, T. (2018). Exploring the relationships between IT competence, innovation capacity and organisational agility. *The Journal of Strategic Information Systems*, 27(1), 22–42. <https://doi.org/10.1016/j.jsis.2017.07.002>
- Roberts, E., Beel, D., Philip, L., & Townsend, L. (2017). Rural resilience in a digital society: Editorial. *Journal of*

- Rural Studies*, 54, 355–359. <https://doi.org/10.1016/j.jrurstud.2017.06.010>
- Rosnan, H., & Yusof, N. (2023). Digital Technologies and Small-Scale Rural Farmers in Malaysia. In B. Alareeni, A. Hamdan, R. Khamis & R. E. Khoury (Eds.), *Digitalisation: Opportunities and Challenges for Business* (p. 620). ICBT 2022. Lecture Notes in Networks and Systems. Springer, Cham. https://doi.org/10.1007/978-3-031-26953-0_72
- Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies*, 54, 360–371. <https://doi.org/10.1016/j.jrurstud.2015.09.001>
- Samsudin, N., Zakaria, T., Osman, J., Ramdan, M. R., Khalid, I. K. M., Mohamad, N., ... Sastraredja, S. (2024). The Digitalization Technology for Sustainable Rural Entrepreneurship: A Structured Review. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 42(1), 14–30. <https://doi.org/10.37934/araset.42.1.1430>
- Saruchera, F., & Mpunzi, S. (2023). Digital capital and food agricultural SMEs: Examining the effects on SME performance, inequalities and government role. *Cogent Business & Management*, 10, 1–22. <https://doi.org/10.1080/23311975.2023.2191304>
- Sindakis, S., & Showkat, G. (2024). The digital revolution in India: bridging the gap in rural technology adoption. *Journal of Innovation and Entrepreneurship*, 13(1), 29. <https://doi.org/10.1186/s13731-024-00380-w>
- Sivakumar, B. (2018). Digital India – A Key to Transform India. *International Journal of Creative Research Thoughts*, 6(2), 1368–1375. <https://doi.org/10.36106/paripex/3707557>
- Soluk, J., Kammerlander, N., & Darwin, S. (2021). Digital entrepreneurship in developing countries: The role of institutional voids. *Technological Forecasting and Social Change*, 170, 120876. <https://doi.org/10.1016/j.techfore.2021.120876>
- Steiner, A., & Atterton, J. (2015). Exploring the contribution of rural enterprises to local resilience. *Journal of Rural Studies*, 40, 30–45. <https://doi.org/10.1016/j.jrurstud.2015.05.004>
- Tang, G. N., Ren, F., & Zhou, J. (2022). Does the digital economy promote innovation and entrepreneurship in rural tourism in China? *Frontiers in Psychology*, 13, 979027. <https://doi.org/10.3389/fpsyg.2022.979027>
- Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, 47(8), 1367–1387. <https://doi.org/10.1016/j.respol.2017.01.015>
- Thakur, M. (2024). Cyber Security Threats and Counter Measures in Digital Age. *Journal of Applied Science and Education*, 04(042), 1–20. <https://doi.org/10.54060/a2zjournals.jase.42>
- Thomas, B. (2023). Exploring the facilitators of e-commerce adoption among rural entrepreneurs in Sabah. *Journal of BIMP-EAGA Regional Development*, 9(1), 1–11. <https://doi.org/10.51200/jbimpeagard.v9i1.4365>
- Tiwasing, P. (2021). Social media business networks and SME performance: A rural–urban comparative analysis. *Growth and Change*, 52(3), 1892–1913. <https://doi.org/10.1111/grow.12501>
- Tosheva, E. (2020). Economic and social benefits of digital economy and digital transformation in The Republic of North Macedonia. *Izmir Sosyal Bilimler Dergisi*, 2(2), 42–51.
- Townsend, L., Wallace, C., Smart, A., & Norman, T. (2016). Building virtual bridges: How rural micro-enterprises develop social capital in online and face-to-face settings. *Sociologia Ruralis*, 56(1), 29–47. <https://doi.org/10.1111/soru.12068>
- Tudu, I. (2024). Make in India Digital: A Review. *Management Journal for Advanced Research*, 4(1), 73–77. <https://doi.org/10.5281/zenodo.10698140>
- United Nations Conference on Trade and Development (UNCTAD). (2024). *Digital Economy Report 2024: Shaping an environmentally sustainable and inclusive digital future*. United Nations. Retrieved from https://unctad.org/system/files/official-document/der2024_en.pdf
- Vial, G. (2021). Understanding digital transformation: A review and a research agenda. In *Managing digital transformation* (pp. 13–66). <https://doi.org/10.4324/9781003008637-4>
- Vidas, B. M., Bogetić, S., Bešić, C., Kalinić, Z., & Bubanja, I. (2023). Managing the reskilling revolution for the digital age: Case study: Western Balkan countries. *Journal of Engineering Management and Competitiveness*, 13(1), 37–52. <https://doi.org/10.5937/JEMC2301037V>

- Wongwuttawat, J., & Lawanna, A. (2018). The digital Thailand strategy and the ASEAN community. *Electronic Journal of Information Systems in Developing Countries*, 84(3), 1–15. <https://doi.org/10.1002/isd2.12024>
- World Economic Forum. (2023, January 16). *How digitalisation will drive the global recovery for small businesses*. World Economic Forum. Retrieved from <https://www.weforum.org/agenda/2023/01/how-digitalization-lead-recovery-small-businesses-davos2023/>
- Zhao, X., Zhao, L., Sun, X., & Xing, Y. (2023). The incentive effect of government subsidies on the digital transformation of manufacturing enterprises. *International Journal of Emerging Markets*. <https://doi.org/10.1108/IJOEM-05-2022-0766>

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