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A Bibliometric Analysis of the Nexus between Digitalisation and Sustainability in Rural Small, Micro, and Medium Tourism Enterprises (SMMTEs)

Abstract. Thanks to their size and versatility, small, micro, and medium tourism enterprises (SMMTEs) have been able to use digitalisation to achieve many sustainable development goals. While rural communities are also trying to adopt digital technologies, their effective utilisation remains a challenge that hinders their efforts aimed at achieving sustainability. Improved digital access and support could minimise the digital divide, thereby promoting the effective use of affordable digital platforms. This paper provides a systematic review of papers on digitalisation and sustainability in rural SMMTEs using PRISMA guidelines. A bibliometric and network analysis covering the period from 2014 to 2024 is based on a set of 318 articles from the Scopus database. The study discusses many opportunities to transform rural SMMTEs through affordable digital technologies.

Keywords: small, micro, and medium enterprise; rural; tourism; digitalisation; sustainability

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1. Introduction

The development of small, micro, and medium tourism enterprises (SMMTEs) is regarded as an affordable and easy strategy for addressing local socio-economic challenges (Mxunyelwa & Lloyd, 2019). Once considered an outdoor leisure activity for the middle or affluent class, tourism has become a significant driver of socio-economic development. Since SMMTEs play an important role in any innovation,

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entrepreneurial development agenda, and job creation, their success very much depends on promotion (Wookhyun & Alarcón, 2020). As a major source of income, innovation, and growth, SMMTES have the potential to realise many rural sustainable developmental goals (Endris & Kassegn, 2022). Since involvement in tourism could potentially improve many livelihoods, particularly in developing countries, there has been a steady growth in the number of such businesses globally, which has been facilitated by the relative ease of entrance and affordability. SMMTES have been an important source of employment for all age groups. The idea of a better world based on entrepreneurial fundamentals is consistent with the Sustainable Development Goals (SDG 8.3 & 9.3) (UNWTO, 2011).

Since SMMTES have been seen as a poverty alleviation strategy, many governments have promoted their development as a way to combat unemployment (Woyo & Musavengane, 2023). According to SEDA (2023), there are around 2.68 million SMMES in South Africa, which account for 91% of formalized entities and employ approximately 60% of the nation's labour force, contributing approximately 34% of the country's GDP (Sibiya, Westhuizen & Sibiya, 2023). In the sub-Saharan Africa context, SMMES have cumulatively created over 6.8 million jobs (Mwongoso, 2024). In South Africa, the tourism industry is considered to be instrumental in developmental planning, given the sector's role in employment creation, which surpasses many other major sectors such as the automotive, higher education, and chemical industry (Dimitri, De Coning & Smit, 2016). However, to be sustainable rural SMMTES require global visibility, which can only be achieved through the effective utilisation of digital technologies. This explains the growing interest in research exploring SMMTES' digitalisation efforts as well as challenges and opportunities associated with it.

In addition to serving as a tool for promoting sustainable rural SMMTES (Samudrin et al., 2024), digitalisation can also enable access to information, which is necessary to identify business opportunities (Saputra & Sanjiwani, 2024; Ndlovu, Sifolo & Tshipala, 2025). There are, however, growing concerns that the use of digital technology is often problematic. To overcome these problems, affordance and capabilities approaches have been developed, which are designed to facilitate the way these digital technologies influence users' perceptions and attitudes and encourage them to utilise them for business purposes. This is particularly important given the fact that the tourism sector has become increasingly digitalised, benefiting from the recent advent of AI technologies (Sifolo, Molefe & Mkhize, 2024). Digital technologies are nowadays commonly used to handle many aspects of tourism, such as accommodation, nature and wildlife, game lodging, caravan and camping, shuttling, game driving, adventure ziplining, cultural museums, rural agriculture and forestry landscape, traditional crafts centres, among other things (Shaista, Yeo, & Lo, 2016; Setokoe, Ramukumba & Ferreira, 2019; SEDA, 2023; Zhang et al., 2025).

However, given the diverse industries in which SMMES operate and their inevitable reliance on digital technologies, there is a need for an in-depth examination of context-specific challenges they encounter and opportunities they can benefit from (Sibiya, Westhuizen & Sibiya, 2023).

While digital technologies are used by well-established tourism businesses, much of their potential remains untapped by rural SMMTES, which greatly weakens their potential contribution to socio-economic development (Suneel & Shekhar, 2020). As a matter of fact, rural SMMTES in the Global South remain at the periphery of the digital space and often lack of the knowledge about how to best use these technologies for business purposes (Sifolo, 2023). The main purpose of the following study is therefore to identify challenges faced by rural SMMTES in their digitalisation efforts as well as opportunities they can offer in their quest to achieve sustainability.

2. Literature Review

2.1. Digitalisation and Sustainability of SMMTES in Rural Tourism

Despite the presence of big and established players, the tourism industry is still dominated by SMMTES which deliver very specific, often community-based tourism products or services (Dimitri, De Coning & Smit, 2016). South Africa widely recognises these SMMTES as units for strategic development, which provide self-sufficiency, particularly to the underprivileged segments of society. In addition to offering a source of income to the disadvantaged, they are also vehicles for innovations (Rungani & Potgieter, 2018). Small enterprises often come up with new ideas for products and digital innovations, which stimulate industry revival, socio-economic growth, and ultimately, sustainability (Priatmoko et al., 2023; Ndhlovu, Makuyana & Dube, 2024). However, small businesses are frequently confronted with numerous challenges that pose a threat to their performance and existence, e.g. the non-availability of resources, competitive pressures, capricious market demands, the lack of digital talent, and limited digital space (Abid, Ceci, & Aftab, 2024; Ndlovu, Sifolo & Tshipala, 2025). Rural SMMTES tend to have relatively high failure rates and low performance levels, which reveals an urgent need for training, upskilling, especially as with regard to innovative digital technologies, as well as the provision of the necessary IT infrastructure (Ndlovu & Shambare, 2024). According to Xue (2021), the organisational degree and information exchange in rural tourism is highly insufficient.

Despite their vulnerability in the complex business environment, SMMTES that have adapted and embraced digital technologies, have managed to overcome new challenges, such as supply chain disruptions and adopting AI and digital technologies (Roman & Rusu, 2022; Ndlovu, Sifolo & Tshipala, 2024). The tourism industry has to constantly evolve in order to cater to the needs of clients who are also becoming more and more technically skilled, demanding swift and seamless digital experiences and instantaneous responses to their needs (Melović, Baynazoğlu, & Šerić, 2023). For instance, most tourists nowadays expect to view digital images and a convenient digital guide before choosing their next tourism destination. Despite the wide adoption of digital technologies in sub-Saharan Africa, such as social media platforms (Endris & Kassegn, 2022), business outcomes have been disappointing because of a lack of digital skills to create professional business content that could attractively advertise many natural, exotic tourist destinations (Priatmoko et al., 2023). Ultimately, to what extent digitalisation can help the rural tourism become more sustainable depends on two fundamental issues: 1) the degree to which rural tourism actors believe the system can help improve their processes, and 2) the ability of rural tourism actors to operate the system with ease. The success of digitalisation initiatives requires affordable solutions that are designed for the specific context; in other words, a digitalised environment that enables interactions between SMMTES and clients, improves their visibility in the global market and facilitates their business performance.

2.2. Digitalisation Perspectives in Rural South Africa

The development of the digital infrastructure and the distribution of internet access originally focused on urban areas. However, despite investment costs (Tshamano, 2024), the liberalisation of the telecommunication industry in South Africa has attracted several new players, which has helped to increase the availability of the Internet. However, as Aruleba and Jere (2022) point out, advanced digital technologies are still largely lacking in many rural areas, except for services such as voice calls, SMS, and social media. In fact, given the infrastructure and upskilling of rural SMMTES, the availability of social media platforms is a positive development towards rural digitalisation that can be accessed by ubiquitous and affordable smartphones. According to Tshamano (2024), many South African rural users rely on mobile services to connect to the Internet. This has led to a significant increase in the Internet penetration rate to 74.7% in the population of 60.69 million (Kemp, 2023). The increase in mobile internet usage offers opportunities for enhanced digital interactivity. The use of Internet and smartphones in rural areas has increased from 77.3% to 84.6%, with many connecting to 4G networks (Tshamano, 2024), as a result of the government's decision to support the rolling out of the 4G and the

5G networks (Hadzic, 2024). With affordable mobile connectivity and improved access to newer and better digital technologies, rural SMMTES in South Africa are presented with new opportunities to become more sustainable.

3. Bibliometric Analysis

The following study is based on bibliometric analysis of the literature (Baker et al., 2020) exploring the issues of digitalisation and sustainability in rural SMMTES according to the PRISMA reporting guidelines. The analysis focuses on articles written in English and included in the Scopus database, one of the most widely used databases of peer-reviewed literature, which is owned by Elsevier. The articles were selected through a search with the following parameters: the database=Scopus Science; Topic=TITLE-ABS-KEY (“digitalisation” OR “digitalization” OR “digital” OR “technology” OR “tech” AND “rural tourism” OR “sustainable rural tourism”).

The search yielded 418 articles (Figure 1). After the initial screening of titles, abstracts, and keywords, a hundred articles were eliminated. The remaining 318 articles were exported in plain text format as a csv file for bibliometric analysis. The file was then scanned for duplicates and eligibility. The vosviewer was used to facilitate the analysis.

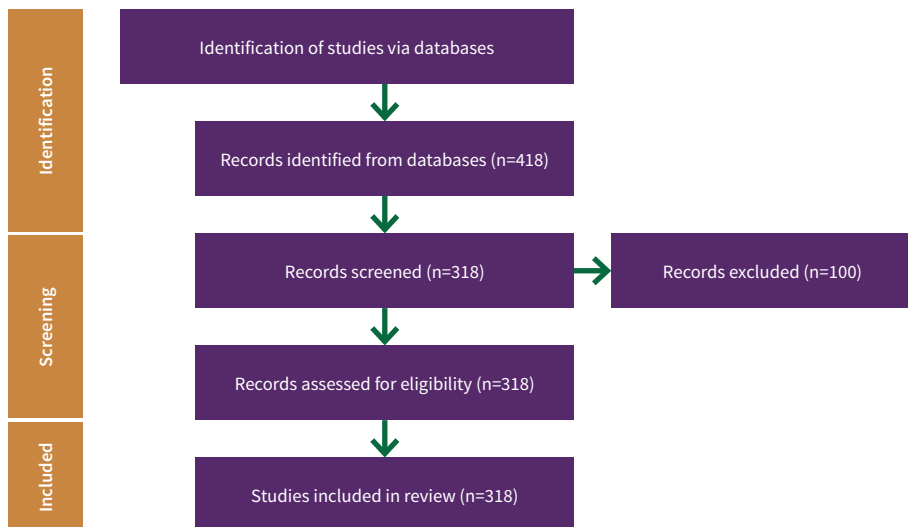


Figure 1. Search results according to the PRISMA guideline

Source: BMJ (2021)

4. Results

The purpose of this bibliometric analysis was to examine research on digitalisation and sustainability in small, micro, and medium-sized tourism enterprises. The collected data include information on document type, year, subject area, country, and significant contributions.

4.1. Literature by Type

Table 1. Publication by type

Articles	Conference papers	Book chapters	Reviews	Books
62.1%	22.0%	8.1%	6.7%	1.1%

Source: Author

4.2. Literature Trends by Year of Publication

Figure 2 depicts the number of scholarly articles regarding the field of interest that were published annually from 2014 to 2024. As can be seen, starting from 2020 the number of articles on this topic kept increasing considerably from year to year.

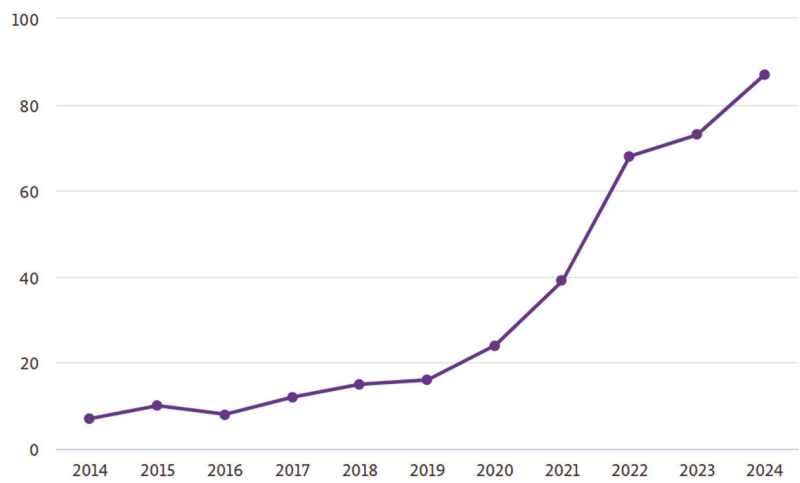


Figure 2. Annual number of articles published from 2014 to 2024

Source: Author

4.3. Articles by Number of Publications, Citations

Table 2. Most impactful authors

Author name	Total Publications	Total Citations	Rank
Lu, J. (2015)	1	155	1
Skinner, H. (2018)	1	139	2
Xi, J. (2015)	2	71	3
Janjua, Z.U.A (2021)	2	61	4
Kumar, S. (2020)	2	59	5
Popp, L. (2014)	1	51	6
Pesonen, J.A (2015)	1	37	7
Tang, H. (2022)	1	37	7
Król, K (2019)	5	31	8
Hussain, S. (2023)	1	31	8
Zhu, W. (2021)	1	31	8
Janjua, Z.A et al. (2023)	1	30	9
Liu, J. (2024)	1	30	9
Qi, J. et al (2022)	1	30	9

Source: Author

4.4. Highly Cited Publications

Table 3 lists the most influential publications on digitalisation and sustainability in SMMTES between 2014 and 2024. Lu, Mao, Wang, and Hu (2015) authored the most cited article with 155 citations, followed by Skinner, Sarpong & White (2018) with 139 citations, and Xi, Wang, Kong, and Zhang (2015) with 71 citations. Digitalisation promoted through the utilisation of smartphones using mobile applications and high-speed internet connectivity has led to accelerated rural tourism (Lu et al., 2015). Given the aforementioned, the phenomenon has enhanced the tourist experience, as tourists have become digitally savvy. These findings affirm that digitalisation has become a significant catalyst in development strategy in many developed countries, hence supporting why rural tourism has gained so much attention in those countries. This indicates the application of nascent technologies in developing the rural environment to become a possible tourist destination, fostering rural socio-economic development (Skinner, Sarpong & White, 2018).

Table 3. Top 11 highly cited publications

Author	Title	Year	Citations	DOI/Link
Lu J., Mao, Z., Wang, M., & Hu, L.	Goodbye maps, hello apps? Exploring the influential determinants of travel app adoption	2015	155	https://doi.org/10.1080/13683500.2015.1043248
Skinner, H., Sarpong, D., & White, G.R.T.	Meeting the needs of the Millennials and Generation Z: gamification in tourism through geocaching	2018	139	https://doi.org/10.1108/JTF-12-2017-0060
Xi, J., Wang, X., Kong, Q., & Zhang N.	Spatial morphology evolution of rural settlements induced by tourism: A comparative study of three villages in Yesanpo tourism area, China	2015	71	https://doi.org/10.1007/s11442-015-1182-y
Janjua, Z.U.A., Krishnapillai, G. & Rahman, M.	A Systematic Literature Review of Rural Homestays and Sustainability in Tourism	2021	60	https://doi.org/10.1177/21582440211007117
Kumar, S. & Shekhar	Technology and innovation: Changing concept of rural tourism-A systematic review	2020	59	https://doi.org/10.1515/geo-2020-0183
Popp, L. & Mc-Cole, D.	Understanding tourists' itineraries in emerging rural tourism regions: the application of paper-based itinerary mapping methodology to a wine tourism region in Michigan	2014	51	https://doi.org/10.1080/13683500.2014.942259
Tang, H., Wang, R., Jin, X. & Zhang, Z.	The Effects of Motivation, Destination Image and Satisfaction on Rural Tourism Tourists' Willingness to Revisit	2022	37	https://doi.org/10.3390/su141911938
Pesonen, J.A.	Targeting rural tourists in the internet: Comparing travel motivation and activity-based segments	2015	37	https://doi.org/10.1080/10548408.2014.895695
Zhu, W. & Shang, F.	Rural smart tourism under the background of internet plus	2021	31	https://doi.org/10.1016/j.ecoinf.2021.101424
Hussain, S., Ahonen, V., Karasu, T., & Leviäkangas, P.	Sustainability of smart rural mobility and tourism: A key performance indicators-based approach	2023	31	https://doi.org/10.1016/j.techsoc.2023.102287
Król, K.	Forgotten agritourism: abandoned websites in the promotion of rural tourism in Poland	2019	31	https://doi.org/10.1108/JHTT-09-2018-0092

Source: Author

4.5. Articles by Journal

Table 4 shows journals where the most articles analysed in the review were published.

Table 4. Journals by the number of articles on digitalisation and sustainability in SMMTEs

Rank	Journal title	Articles
1	Applied Mathematics and Nonlinear Sciences	18
2	Sustainability Switzerland	15
3	Springer Proceedings in Business and Economics	8
4	Mobile Information Systems	6
5	Advances in Intelligent Systems and Computing	5

Rank	Journal title	Articles
6	Iop Conference Series Earth	5
7	Journal of Physics Conference Series	5
8	Lecture Notes in Networks & Systems	5
9	Wireless Communication in Mobile Computing	5
10	Nongye Gongcheng Xuebao Transactions of the Chinese Society of Agricultural Engineering	4
11	Progress in Geography	4
12	Worldwide Hospitality & Tourism Themes	4

Source: Author

4.6. Articles by Country

Table 5 shows the top 15 countries with the largest number of articles regarding the promotion of digitalisation and sustainability in rural small, micro, and medium tourism enterprises.

Table 5. Articles by country

Country	Number of articles
China	186
Malaysia	22
Spain	20
Portugal	19
Russia Federation	14
Indonesia	12
India	7
Italy	7
Poland	7
United Kingdom	7
Australia	6
Japan	5
Philippines	5
Romania	4
United State of America	4

Source: Author

From the top 15 countries, it is indicative that digitalisation initiatives have also been extended to the rural setting, a phenomenon which has for the past confined to the urban environment.

4.7. An overview of country collaboration



Figure 3. Country collaboration (13 out of 65 countries)
Source: Author

Figure 3 shows collaborations by different countries. As can be seen, authors from 13 countries have collaborated in their quest to accelerate digitalisation within the rural tourism settings, most of them are from China. Chinese authors have collaborated with scholars from Malaysia, Japan, Australia, Indonesia, the United Kingdom, Italy, Spain, the Philippines, and Poland.

Table 6 shows a piece of detailed information regarding collaborations from 13 countries, which indicates that digitalisation and sustainability of small, micro, and medium tourism enterprises have become a topic of global interest.

Table 6. Top 11 collaborating countries

Country	Publications	Citations	Total link strength
China	157	865	9
Malaysia	20	193	7
Indonesia	12	51	5
Philippines	5	26	5
Portugal	18	89	3
Spain	16	75	3
Australia	6	31	2
Italy	7	88	2
United Kingdom	6	192	2
Japan	5	40	1
Poland	7	90	1

Source: Author

4.8. Co-citation of Authors Cited

Figure 4 illustrates co-citations of authors who have been cited. A total of 17,173 authors were referenced, of which 46 accumulated a minimum of 20 citations. The co-citation map displays 45 authors arranged into three distinct clusters. It contains a cumulative total strength of 16,892. Cluster 1 (red) consists of 28 items, with

Wang leading with 97 citations and a total link strength of 1,151. Li accumulated 60 citations with a total link strength of 584, while Zhang accumulated 43 citations with a total link strength of 554. Cluster 2 (green) consists of 15 authors, headed by Buhalis as its leader, who accumulated 82 citations with a total link strength of 532, followed by Kastenholz with 54 citations and a total link strength of 487. Gretzel has 49 citations and a total link strength of 444. Cluster 3 (blue) includes Ohey, with 59 citations and a total link strength of 852, and Sharpley, with 36 citations and a total link strength of 584.

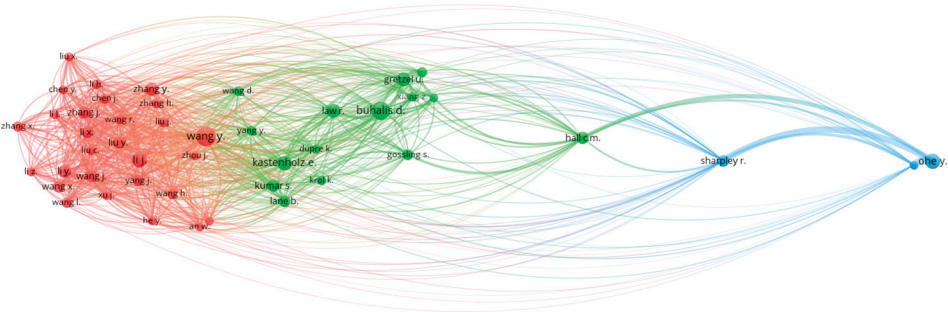


Figure 4. Co-citations and cited authors (46 of 17,173 authors)
Source: Author

4.9. Keyword Co-occurrence

Table 7 presents results of analysing co-occurrences of the most frequently discussed terms or topics related to digitalisation and sustainability in rural SMMTES between 2014 and 2024. Co-occurrences suggest connections existing between publications written by different authors. Of 2020 keywords considered, 80 keywords met the minimum threshold of 5 occurrences.

Table 7. Keyword occurrence analysis

Keyword	Occurrences	Total Link Strength
Rural tourisms	115	540
Tourism	100	458
Rural tourism	123	393
Rural areas	54	283
Big data	32	188
Tourism development	33	180
Sustainable development	35	168

try, data technologies, big data technology, and e-commerce. Cluster 2 (dark blue) contains 18 keywords, including integrated development, rural revitalisation, virtual reality, tourism attractions, artificial intelligence, deep learning, internet of things, and rural economy. Cluster 3 (light blue) contains 7 keywords, namely: information management, information use, information systems, leisure, scenic spot, information services, and regional development. Cluster 4 (purple) consists of 10 keywords: commerce, marketing, tourist destination, social media, digital marketing, tourism market, Portugal, spatiotemporal analysis, social networking, and destination image; Cluster 5 (green) contains 18 keywords: digital storage, rural development, digital economy, digital technologies, internet, innovation, economic & social effects, development model, economics, regional planning, rural, agritourism, planning, development, technology, automatization, data, and agriculture. Cluster 6 (red) contains 17 keywords: ecological environment, tourism development, sustainable development, rural tourism, sustainable tourism, cultural heritage, ecotourism, smart tourism, ecology, rural area, rural areas, environmental protection, stakeholder, COVID-19, sustainability, tourism management, and decision-making.

4.10. Major Themes Related to Digitalisation and Sustainability of Rural SMMTEs

Bibliographic coupling, a situation when two works reference a common third source, suggests that the two publications are likely to concern a related subject (Linnenluecke, Marrone & Singh, 2020). This bibliographic approach was used to classify content related to digitalisation and sustainability in rural SMMTEs into major themes. By organizing articles according to their shared references, the method helps to identify topics recurring in a given journal (Linnenluecke, Marrone & Singh, 2020). Taking into account bibliographic coupling, six clusters were identified along with their primary themes.

Cluster 1: Assessing the relationship between rural tourism and digital technologies

The cluster consists of 10 articles, which largely focus on the application of various digital technologies to market rural tourism destinations (Gan, 2022), the use of big data for the development of rural tourism (Król & Zdonek, 2024), digital artefacts in rural tourism (Król, 2021), and determinants of travel app adoption (Lu et al., 2015). The articles in this cluster provide insights that can give policymakers and SMMTEs actors a comprehensive understanding of matters at play.

Cluster 2: Tourism development, digital technologies, and rural revitalisation

The cluster consists of 18 articles, which explore topics like rural tourism embracing digital technologies with a view to supporting rural revitalisation (Gan, 2024), rural innovation in advancing sustainable developmental goals (Irungu et al., 2023), and sustainable development of leisure and rural tourism (Yang, 2024). The primary objective of rural tourism is to stimulate rural economic growth through the creation of employment opportunities and culture preservation, particularly through the effective use of digital technologies.

Cluster 3: Information management and regional development

The cluster consists of 7 articles, which focus on ways of taking advantage of information management, information systems, and information to support regional development. More specifically, the authors discuss how to rebrand the African continent through agri-tourism (Sabao, Chikwape, & Mugoni, 2024), and sustainable spatial distribution and determinants of key rural tourism villages (Shen, 2024). Cai, Ouyang, & Quayson (2024) examine ways of stimulating regional development of rural areas by promoting agri-tourism. The authors in this group analyse the use of geographic information systems (GIS) to establish spatial patterns of regional development, which requires a collaboration between local authorities, stakeholders, and agricultural experts to roll out plans promoting land redistribution based on spatial arrangements for optimum utilisation and output, with less damage to the environment.

Cluster 4: Examining the interplay between social media platforms, digital marketing, and rural tourism

The cluster consists of 10 articles, which address topics like social media affordances in rural tourism destinations (Liu, Wang & Zhang, 2024), digital marketing as a tool to promote rural tourism (Ribeiro, Esteves & Morais, 2024), impact of social media on tourist behaviour in rural tourism (Hussain, Wang & Li, 2024), digital commerce for rural tourism in the wake of digital technologies (Xu et al., 2024), and brand marketing of rural tourism in the era of mobile computer internet (Feng, 2021). Xu, Yu, Li, and Miao (2024) bemoaned incomplete tourism information and the declining quality of tourism services, which highlights the need for a community-centric e-commerce system. As already observed, despite the proliferation of digital technologies, rural tourism has remained on the periphery of the digital space, leading to a serious socio-economic decline of communities, particularly in developing countries. This is why all stakeholders, especially local authorities, need to collaborate in order to enhance the global visibility of rural tourism through e-commerce.

Cluster 5: Digital technologies and rural development

The cluster consists of 18 articles, which examine the use of digital technologies for promoting the development of rural tourism. Topics include the use of intelligent cloud-based systems (Zhu, 2024), data mining technology and rural tourism development (Jian & Ren, 2024), and design of a rural smart tourism system based on cloud computing (Wan, 2024). As the authors demonstrate, digital technologies can be used to create an online marketplace for products and services offered by local communities, and to access information from the government and its proxies about how technologies can help to improve crop yields and enhance sustainability.

Cluster 6: Rural tourism, smart tourism, and sustainable development

The cluster consists of 17 articles, which address topics such as eco-tourism and rural sustainable development (Veleshnja, 2024), sustainability of smart rural mobility and tourism (Hussain et al., 2023), sustainable development platforms for digital rural tourism (Li & Zhang, 2024), and sustainable rural tourism development in the era of social media (Laxmita, Setyaningsih & Purwani, 2021). Sustainable rural development involves the protection of culture and the environment, and conservation of natural resources with a view to improving community lives. The authors emphasise the need to give local communities a sense of ownership of resources, which can act as a catalyst for sustainable rural development.

5. Discussion

This section reviews the literature on the 6 main themes presented above, which forms the basis for the conceptual framework of stakeholders' collaboration towards effective digitalisation of rural SMMTEs.

5.1. Digitalisation and Sustainability in Rural SMMTEs

The bibliometric analysis has identified a number of limitations regarding digitalisation and sustainability in rural SMMTEs, especially in the sub-Saharan Africa context.

There is no doubt that digitalisation has contributed to the rise in the number of innovative entrepreneurial artifacts and added value to users and actors, enhancing visitor experiences and encouraging repeat visits, thus making rural tourism more sustainable (Kindzule-Millere & Zeverte-Rivza, 2022). There is evidence that thanks to digital technologies rural SMMTEs have become significant contributors to the socio-economic environment of communities, particularly in developed countries,

where these technologies have permeated many spheres in urban and rural settings (Endris and Kassegn, 2022). However, many rural SMMTEs in developing countries are still at the periphery of the digital space owing to the lack of digital infrastructure, digital skills, and limited government support. While social media platforms are commonly used because of their affordability, their potential is still largely underused.

Failure to innovate and create online content through affordable social media business platforms is one of the biggest challenges for rural SMMTEs. This is why it is crucial that policymakers and stakeholders should collaborate in developing appropriate strategies, and promoting the adoption and effective use of digital technologies for regional and international visibility. Figure 6 below presents a conceptual framework of stakeholders' collaboration towards effective digitalisation for sustainability. The bibliographic analysis suggests that what rural SMMTEs need the most is digital connectivity to compensate for their remoteness. In addition, as already mentioned, the staff of rural SMMTEs lack the skills to make effective use of digital technologies. Central governments and local municipalities need to take the leading role in addressing these problems by partnering with the telecom industry in order to develop the digital infrastructure, and draft and implement digital policies. To ensure a high rate of engagement, rural SMMTEs must be assured that digital platforms will ensure the privacy of information and the security of digital transactions.

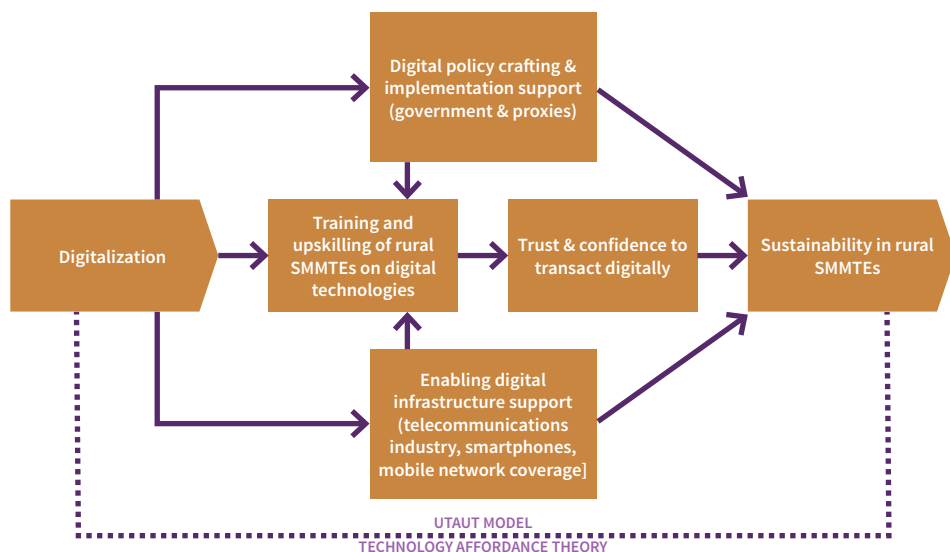


Figure 6. The conceptual framework of stakeholders' collaboration towards effective digitalisation of rural SMMTEs

Source: Author

5.2. The Theoretical Perspective on the Use of Digital Technologies

Efforts to promote digitalisation in rural areas are motivated by the desire to stimulate the socio-economic development and sustainability through interactions between SMMTEs and relevant stakeholders. Many studies analysed in this review show a correlation between the use of digital technologies and the socio-economic sustainability of rural businesses (El Archi et al., 2023; Hussain et al., 2023; Ndhlovu, Makuyana, & Dube, 2024; Muwani et al., 2024). However, there are relatively few studies that investigated digitalisation efforts involving digital affordances towards sustainability in rural SMMTEs in developing countries. There is evidence that human behavioural characteristics influence the adoption and the use of digital technologies (Venkatesh et al., 2003).

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a combination of eight models whose fundamentals are based on four determinants of intention and use (Venkatesh et al., 2003; Cecilia & Shaun, 2022). Venkatesh et al. (2003) list determinants such as performance expectancy, effort expectancy, social influence, and facilitating condition. However, it can also be argued that the adoption and effective utilisation of digital technologies by rural SMMTEs depends on derived benefits and their ease of use. The level of adoption can be increased by promoting positive attitudes towards digital technologies and the availability of the digital infrastructure (Cecilia & Shaun, 2022). The UTAUT model provides a lens for understanding how rural SMMTEs adopt the new ways of using affordable technologies to enhance international visibility and thus improve their sustainability.

The UTAUT model is supported by the theory of technology affordance, which focuses on users' perceptions of functions and utility (Gibson, 1986) as well as their understanding or perceived knowledge regarding possible outcomes that can be achieved by embracing digital technologies (Liu, Ruan, Huang & Zhang, 2024). The theory helps researchers understand the nexus between digital technologies and actors, and how the interaction produces intended results towards achieving a specific goal. In other words, it is necessary to change attitudes and behaviours of rural SMMTEs through training, upskilling, trust building, and improving conditions enabling the use of digital technologies and their associated affordances.

5.3. Implications for Theory, Policymakers, and Rural SMMTEs

The bibliographic analysis highlights the need for more context-specific research to determine the extent to which effective use of digital technologies can make rural SMMTEs in developing countries more sustainable. There are few studies that recognise the need for rural-tourism specific digital platforms or applications and

affordable digital technologies; instead, the majority focus on settings characterised by ubiquitous digital spaces with well-developed digital infrastructure, and the role played by digital technologies in rural tourism (Maquera et al., 2022; El Archi et al., 2023; Hussain et al., 2023; Ndhlovu, Makuyana, & Dube, 2024; Muwani et al., 2024; Ndlovu, Sifolo & Tshipala, 2025).

The themes identified in the bibliographic analysis reflect what has already been achieved and what needs to be done to make rural SMMTEs more sustainable. However, more research is required to develop a rural SMMTE context-specific digital platform that could help to solve many challenges associated with interactivity and visibility.

6. Conclusion

It is believed that the uptake and effective utilisation of digital technologies could help to reduce poverty and make it easier for rural SMMTE actors and communities to launch their socio-economic development initiatives. The results of this review highlight the importance of digitalisation in improving sustainability of rural SMMTEs, in particular by the effective and innovative use of affordable digital platforms to enhance international visibility of less developed countries.

Limitations

The analysis was based on articles included in the Scopus database, which means it did not include other potentially useful findings from publications included in other databases.

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Author Contributions

Conceptualization, **N.N.** and **P.P.S.S.**; methodology, **N.N.**; validation, **N.N.** and **P.P.S.S.**; formal analysis, **N.N.** and **P.P.S.S.**; investigation, **N.N.**; resources, **N.T.**; writing — original draft preparation, **N.N.**; writing — review and editing, **N.T.** and **P.P.S.S.**

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The data presented in this study are available on request from the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.

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Analiza bibliometryczna powiązań między cyfryzacją a zrównoważonym rozwojem sektora MŚP turystycznych na obszarach wiejskich

Streszczenie. Ze względu na swoją specyfikę i elastyczność firmy turystyczne należące do sektora MŚP czerpią korzyści płynące z cyfryzacji i osiągają wiele celów zrównoważonego rozwoju. Choć społeczności wiejskie również próbują wykorzystać możliwości, jakie dają rozwiązania cyfrowe, w wielu przypadkach potencjał tych technologii pozostaje w dużej mierze niewykorzystany, co utrudnia prowadzenie zrównoważonej działalności gospodarczej. Lepszy dostęp i większe wsparcie w tej dziedzinie mogłyby zminimalizować cyfrowe wykluczenie, przyczyniając się do bardziej efektywnego

użytkowania niedrogich platform cyfrowych. Artykuł zawiera systematyczny przegląd publikacji na temat cyfryzacji i zrównoważonego rozwoju mikro-, małych i średnich przedsiębiorstw turystycznych na obszarach wiejskich przeprowadzony zgodnie z wytycznymi PRISMA. Analizie poddano 318 artykułów znajdujących się w bazie Scopus, które ukazały się w okresie od 2014 do 2024 roku. Wyniki analizy zawierają szereg wskazówek na temat możliwości poprawy długofalowej stabilności ekonomicznej małych i średnich firm turystycznych działających na obszarach wiejskich za pomocą niedrogich technologii cyfrowych.

Słowa kluczowe: małe, mikro- i średnie przedsiębiorstwo, wiejski, turystyka, digitalizacja, zrównoważony rozwój



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