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Emerging technologies in the Peruvian tourism sector: a bibliometric analysis and perspectives on digital innovation

Tecnologías emergentes en el sector turístico peruano: un análisis bibliométrico y perspectivas para la innovación digital

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ABSTRACT

Tourism, as one of Peru's most dynamic economic sectors, faces the challenge of adapting to technological transformations that are redefining the way we travel, manage destinations, and generate value. In this context, emerging technologies such as artificial intelligence, augmented reality, big data, and the Internet of Things are positioned as tools to drive digital innovation in the sector. The objective of this study was to analyze scientific production on emerging technologies applied to Peruvian tourism using a bibliometric approach. The methodology was based on the analysis of 68 scientific articles extracted from the Scopus database, using a search string in English and filtering by affiliation with Peruvian institutions. Bibliometric indicators such as annual production, most productive sources, leading institutions, keywords, collaborative networks, and thematic analysis were applied. The results showed sustained growth in research, with a greater presence of regional universities and a strong connection with technological areas. The conclusion is that there is an expanding academic ecosystem, with practical implications for public policymaking, digital capacity building, and the design of smart tourism destinations in Peru.

Keywords: artificial intelligence; digital transformation; digital tourism; user experience; virtual reality

RESUMEN

El turismo, como uno de los sectores económicos más dinámicos del Perú, enfrenta el reto de adaptarse a las transformaciones tecnológicas que están redefiniendo la forma de viajar, gestionar destinos y generar valor. En este contexto, las tecnologías emergentes como la inteligencia artificial, la realidad aumentada, el big data y el Internet de las cosas se posicionan como herramientas para impulsar la innovación digital en el sector. El objetivo de este estudio fue analizar la producción científica sobre tecnologías emergentes aplicadas al turismo peruano mediante un enfoque bibliométrico. La metodología se basó en el análisis de 68 artículos científicos extraídos de la base de datos Scopus, utilizando una cadena de búsqueda en inglés y filtrando por afiliación con instituciones peruanas. Se aplicaron indicadores bibliométricos como producción anual, fuentes más productivas, instituciones líderes, palabras clave, redes de colaboración y análisis temático. Los resultados evidenciaron un crecimiento sostenido en la investigación, con mayor presencia de universidades regionales y una fuerte vinculación con áreas tecnológicas. Se concluye que existe un ecosistema académico en expansión, con implicancias prácticas para la formulación de políticas públicas, el fortalecimiento de capacidades digitales y el diseño de destinos turísticos inteligentes en el Perú.

Palabras clave: experiencia del usuario; inteligencia artificial; realidad virtual; transformación digital; turismo digital

1. INTRODUCTION

Tourism is one of the most dynamic and globalized sectors of the world economy, representing a key source of employment, foreign exchange, and sociocultural integration (Arroyo-Solórzano & Rojas-Prendas, 2021; Gutierriz et al., 2025). Its sustained growth has been accompanied by a transformation in consumption patterns, driven by technological advances and the digitalization of services (Fernández Cueria et al., 2022; García Aguilar et al., 2022). In this context, technological innovation not only optimizes the management and operation of the sector, but also redefines the way tourists plan, experience, and share their trips (Fernández-Bedoya et al., 2025; Mori-Pezo et al., 2023).

Along these lines, the development of emerging technologies such as artificial intelligence, the Internet of Things, augmented reality, big data, blockchain, among others, is transforming various economic sectors, including tourism (Bekele & Raj, 2025; Khoshroo & Soltani, 2025). These technologies make it possible to optimize the traveler experience, efficiently manage tourist destinations and generate added value in the service chain (Cheng et al., 2023). At the global level, smart tourism has been consolidated as a strategic trend to boost local economies through digital and interconnected solutions (Bekele & Raj, 2025).

In Peru, despite its natural, cultural, and historical wealth, the tourism sector faces challenges in adopting innovative technologies (Fernández-Bedoya et al., 2025). The technological gap between tourist destinations and the low investment in digital transformation limit the sector's competitiveness compared to other countries (Filocamo et al., 2020). Furthermore, the COVID-19 pandemic highlighted the need to modernize processes and promote safe, sustainable, and digitalized tourist experiences, especially in regions with high uncapitalized tourism potential, such as the Amazon, the northern mountains, or alternative cultural circuits (Cayahuallpa-Paquirachi et al., 2024; Kuchinov, 2021).

The causes of this problem include poor coordination between public, private, and academic actors; limited digital training in micro and small tourism businesses; low investment in applied research and technological development in tourism; and a lack of regional strategies geared toward digital innovation (Maquera et al., 2022). This is compounded by the weak implementation of public policies that encourage technological adoption in emerging destinations and limited access to financing for technological projects in the sector (Castillo Botetano & Salcedo, 2022).

The consequences of this situation include a poorly differentiated and uncompetitive tourism offering, lost opportunities to attract digital tourists, fragmented tourism information, and low international visibility of Peruvian destinations (Bravo et al., 2023; Vidaurre-Rojas et al., 2024). Furthermore, low innovation limits the country's ability to consolidate sustainable and smart destinations and to respond to the new demands of post-pandemic tourism, where technology plays a key role in personalized experiences (Cotrina-Trigozo, 2023).

Despite the growing global interest in digital tourism, there is a scientific gap in how academic research on emerging technologies applied to the tourism sector in Peru is developing (Payntar, 2022). The available literature is scattered and lacks systematic analyses that allow identifying trends, key actors, predominant technological approaches, and innovation opportunities. This gap limits evidence-based decision-making and hinders the design of effective public policies (Cotrina-Trigozo et al., 2024).

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Given this scenario, this article aims to conduct a bibliometric analysis of scientific production related to emerging technologies in the Peruvian tourism sector, in order to identify the main trends, actors, recurring themes, and research gaps. It also seeks to provide strategic perspectives to guide digital innovation in the country's tourism sector and foster effective coordination between academia, the government, and the private sector.

2. METHODOLOGY

The bibliometric method was applied, which offers quantitative techniques to analyze the scientific production and the impact of research on a specific topic, allowing a comprehensive view of the dynamics, actors or trends in the academic field (McBurney & Novak, 2002). The following indicators were evaluated: (1) annual scientific production, (2) most productive publication sources, (3) institutions with the highest volume of publications, (4) most frequently occurring keywords, (5) collaboration networks between countries and (6) [complete with the corresponding sixth indicator].

10,974 documents were obtained from the Scopus database (accessed January 31, 2025) from the search string in the title, abstract and keyword fields: ("tourism" OR "tourism sector" OR "smart tourism" OR "tourist destination" OR "digital tourism") AND ("emerging technology" OR "disruptive technology" OR "digital innovation" OR "digital transformation" OR "artificial intelligence" OR "machine learning" OR "deep learning" OR "big data" OR "data analytics" OR "blockchain" OR "Internet of Thing" OR "IoT" OR "augmented reality" OR "virtual reality" OR "cloud computing" OR "5G" OR "metaverse" OR "digital twin" OR "cyber-physical system" OR "robotic" OR "mobile technology" OR "predictive analytics" OR "chatbot" OR "virtual assistant").

A geographic filter was then applied to restrict the results to publications related to the Peruvian context, yielding 68 documents. The records were exported in CSV format and processed using Biblioshiny, a graphical interface developed by Aria & Cuccurullo (2017) and based on the Bibliometrix package of the RStudio statistical environment.

3. RESULTS

Figure 1 shows the evolution of annual scientific production related to emerging technologies in the Peruvian tourism sector. A growing trend is observed starting in 2019, with a notable increase between 2020 and 2023, reaching its peak in 2023 with more than 15 publications. This growth can be associated with the post-pandemic boom in digitalization and the growing interest in technological innovation in tourism. However, in 2024, a significant drop in the number of articles is evident, which could be attributed to a partial closure of the research cycle or a thematic reorientation of the field.

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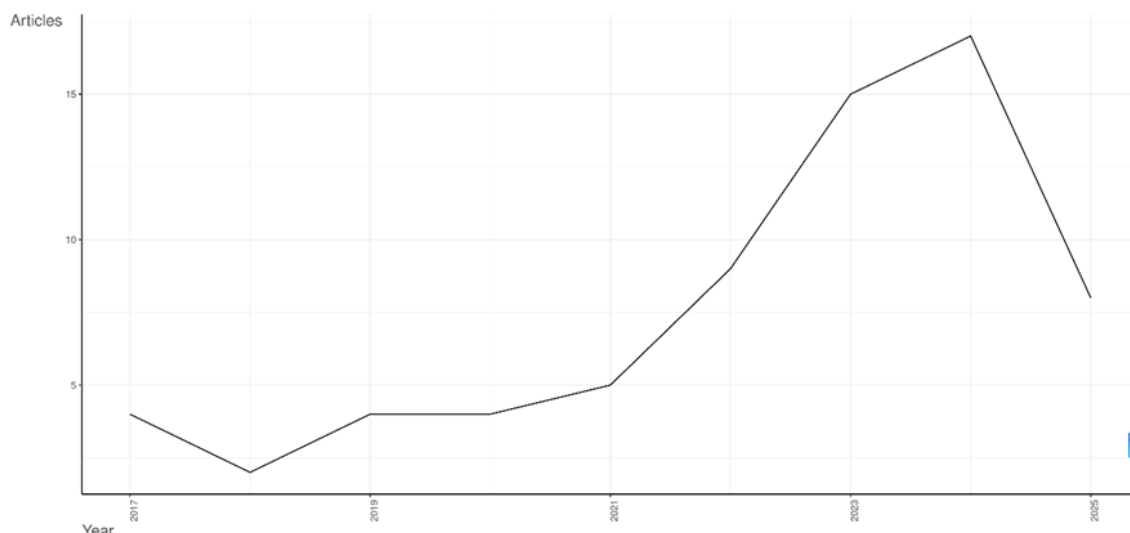
Figure 1. Annual scientific production

On the other hand, Figure 2 shows the main publication sources where research related to emerging technologies in Peruvian tourism has been disseminated. The *Revista Ibérica de Sistemas e Tecnologias de Informação (RISTI) stands out* as the most productive, with a total of 7 articles. It is followed by *CEUR Workshop Proceedings* and *Proceedings of the LACCEI International Multi-Conference*, both with 4 documents. Other relevant sources include *Lecture Notes in Computer Science and Sustainability (Switzerland)*, with 3 publications each. This overview reveals a high presence of technology conferences and journals, which suggests that the scientific approach to the topic is closely linked to digital development, engineering, and applied innovation.
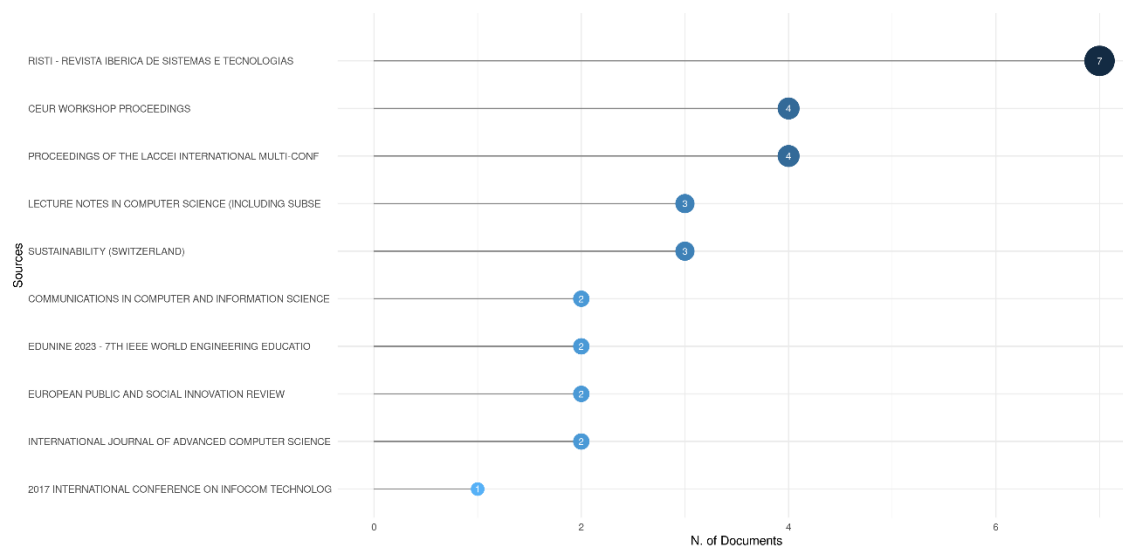
Figure 2. Most productive publication sources

Furthermore, Figure 3 presents the institutions with the greatest scientific output in the field of emerging technologies applied to tourism in Peru. The Pedro Ruiz Gallo National University leads the ranking with 14 publications, followed by the Peruvian University of Applied Sciences with 12 articles, and the National University of San Agustín with 9. Also notable are the Pontifical Catholic University of Peru and the National University of San Agustín de Arequipa (UNSA), both with 6 documents. This overview reflects significant participation by public and private universities, with a notable focus on regions outside of Lima, demonstrating a growing decentralized interest in digital innovation in the tourism sector.

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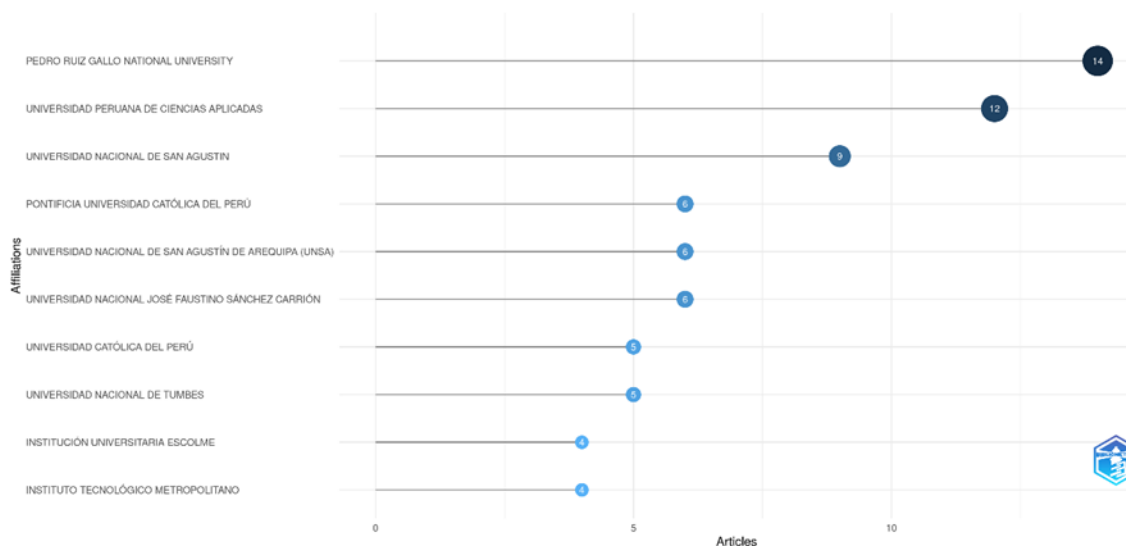
Figure 3. Institutions with the highest volume of publications

In another context, Figure 4 represents a keyword cloud summarizing the concepts most frequently addressed in the scientific literature on emerging technologies in the Peruvian tourism sector. The most prominent word is tourism, reflecting the centrality of the thematic field. Around it, terms linked to digital technologies such as virtual reality and augmented reality stand out. reality, artificial intelligence, big data and machine learning, demonstrating a strong focus on the technological transformation of tourism through immersive tools, automation and data analysis.


Figure 4. Most frequently occurring keywords

Likewise, terms related to user experience are identified (user experience, sentiment analysis), as well as specific applications such as virtual tourism, photogrammetry, cloud computing, and mobile apps. These terms reflect the interest in studying how technology can improve tourist interaction, perception, and satisfaction by integrating personalized and contextual solutions. The approach also includes predictive analytics and advanced visualization techniques such as 360° video.

On the other hand, contextual concepts such as COVID-19, the Amazon jungle, and Latin America appear, indicating a particular focus on the territorial and current implications of the tourism digitalization process. Methodological references such as systematic review, bibliometrics, and prism methodology are also observed, suggesting progress in the scientific rigor of the field. Overall, the figure allows us to visualize not only the most researched technologies but also the growing interest in studying their practical application in real and challenging environments such as tourism in Peru.

Figure 5 now shows the international collaboration networks in scientific publications on emerging technologies applied to tourism, with Peru as the central hub. Strong connections are observed with Latin American countries such as Colombia, Mexico, Ecuador, and Brazil, with collaboration with Colombia being the most notable in terms of frequency and intensity. Significant links are also recorded with Spain and, to a lesser extent, with Switzerland, Finland, France, and Tunisia. Emerging connections are also seen with Asian Countries such as China, India, and Thailand, as well as with Middle Eastern nations such as Saudi Arabia, Jordan, and Pakistan. This map demonstrates a diverse collaborative network that, although centered in Latin America, is beginning to expand to other regions, suggesting a growing internationalization of research in this field.
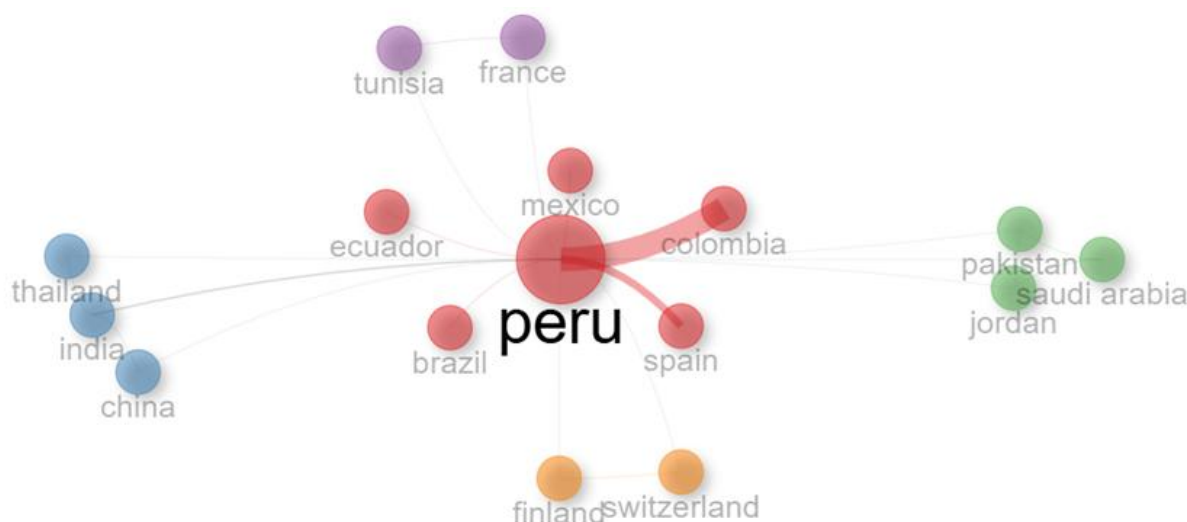
Figure 5. Collaboration networks between countries

Finally, Figure 6 presents a thematic map generated from the analysis of keyword co-occurrence, using the thematic map approach. The graph is divided into four quadrants that represent different levels of development (density) and relevance (centrality) within the field of study. In the upper right quadrant (motor themes), terms such as augmented reality, mobile applications and immersive, which stand out for their high centrality and density, indicating that they are well-developed and fundamental concepts for the study of tourism and digital innovation. Also notable is the cluster formed by tourism, forecasting, and tourism sectors, suggesting that these terms constitute the thematic core of the field.

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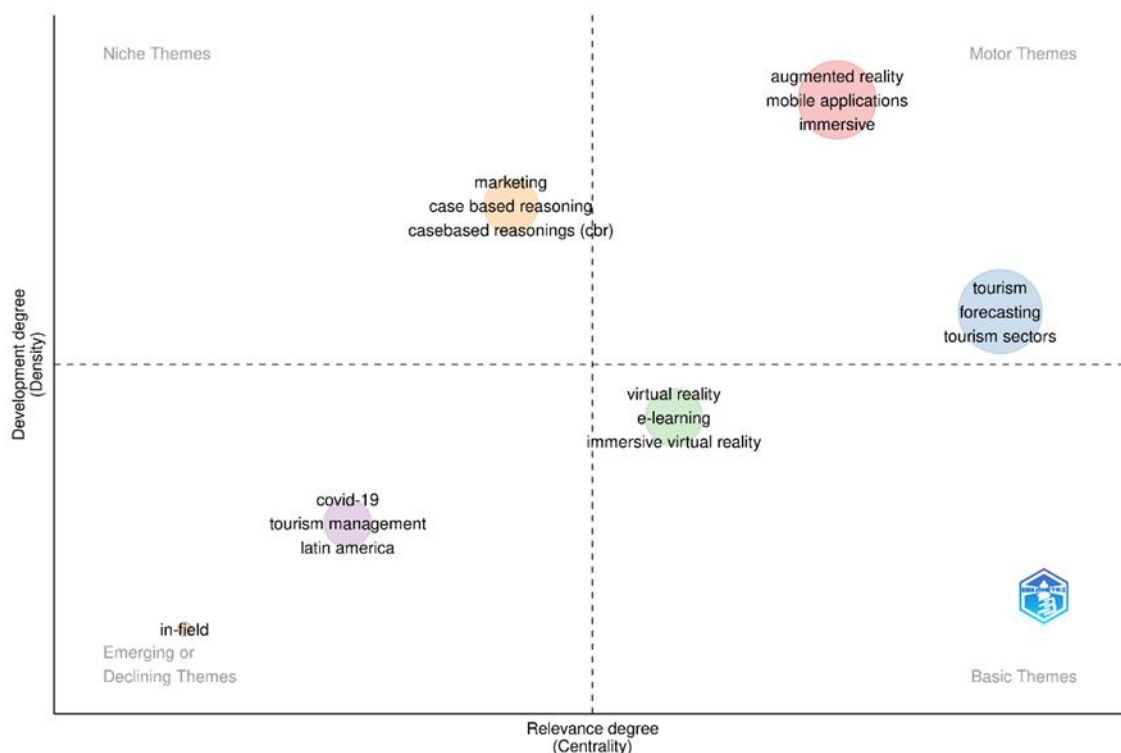
Figure 6. Thematic map of emerging technologies in Peruvian tourism

In the lower right quadrant (basic topics), concepts such as virtual reality, e-learning, and immersive virtual reality appear, which are relevant but less developed, indicating opportunities for further research. In the lower left quadrant (emerging or declining topics), terms such as COVID-19, tourism management, and Latin America reflect topics of contextual interest that may be losing relevance or have not yet established themselves. Finally, the upper left quadrant (specialized or niche topics) shows terms such as marketing and case-based reasoning, which, while technically advanced, have little connection with the rest of the field, suggesting more specific or isolated areas of research.

4. DISCUSSION

The results show a notable increase in scientific production on emerging technologies in Peruvian tourism starting in 2019, peaking in 2023. This trend can be associated with the need for digital transformation driven by the pandemic, which forced a rethinking of tourism management models. Fernández-Bedoya et al. (2025) highlight that the health crisis motivated the adoption of technological tools such as virtual reality and artificial intelligence to respond to the new demands of post-COVID tourists. This scenario coincided with increased academic interest in topics such as immersive experiences, predictive analytics, and service virtualization.

In terms of publications, the prevalence of technology journals and conferences suggests that research on digital tourism is developing from disciplines such as engineering, computer science, and sustainability. Bekele & Raj (2025) argue that the digitalization of tourism demands interdisciplinary approaches that integrate technological development with the social sciences. This trend is reflected in the use of terms such as machine learning, blockchain, and cloud computing in the studies analyzed, as well as in the prominence of academic platforms focused on innovation and ICT.

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Regarding institutional participation, the leadership of regional universities such as the Pedro Ruiz Gallo National University and the National University of San Agustín contrasts with previous studies that indicated a concentration of academic production in Lima (Maquera et al., 2022). This phenomenon suggests a process of knowledge decentralization, in which traditionally lagging regions are beginning to play a more active role in smart tourism research. This progress could also be related to the strengthening of international collaboration networks, especially with countries in Latin America and Europe, as evidenced by the academic cooperation map.

Thematic maps reveal that technologies such as augmented reality, mobile applications, and artificial intelligence are central to the field, which coincides with the proposals of Filocamo et al. (2020) on the use of mobile solutions to boost tourist destinations. On the other hand, concepts such as e-learning and immersive virtual reality appear to be incipient areas of development, which represents an opportunity to diversify research lines. Furthermore, topics such as COVID-19 and Latin America show signs of displacement, reaffirming what Cayahuallpa-Paquirachi et al. (2024) pointed out, who suggest that the future of digital tourism should focus more on customer loyalty through sustainable technological experiences.

This study sheds light on the limited coordination between academic production and public policies aimed at tourism innovation. While efforts such as ViveChachapoyas.com, driven by community and technology initiatives (Castillo Botetano & Salcedo, 2022), exist, a national strategy linking research, development, and implementation is still needed. Therefore, the findings of this bibliometric analysis provide a useful basis for guiding future digital innovation agendas in Peruvian tourism, with a more inclusive, sustainable, and technologically robust vision.

CONCLUSIONS

This bibliometric study identified the main trends, actors, and interrelationships in scientific production on emerging technologies applied to tourism in Peru. Sustained growth in publications was observed in recent years, driven by post-pandemic digitalization and the advancement of solutions such as artificial intelligence, augmented reality, and big data. Technology journals and regional universities have gained prominence, reflecting a decentralization of knowledge and a broadening of the interdisciplinary approach. Furthermore, the analysis of keywords and thematic maps revealed both established areas and emerging trends that require further academic development.

From a practical perspective, the findings offer information to guide public policies, institutional strategies, and business decisions in the tourism sector. Authorities can use this evidence to design territorial innovation programs, promote digitalization in tourism MSMEs, and foster university-business-government partnerships. In turn, educational institutions have the opportunity to consolidate lines of research focused on tourism technology, while startups and tour operators can leverage the identified trends to develop digital solutions that respond to the new demands of post-pandemic travelers. Overall, this study contributes to strengthening the scientific foundation necessary to build a smarter, more competitive, and sustainable tourism ecosystem in Peru.

FINANCING

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CONFLICT OF INTEREST

There is no type of conflict of interest related to the subject of the work.

AUTHORSHIP CONTRIBUTION

Conceptualization, data curation, formal analysis, research, visualization, writing -original draft, writing -proofreading and editing: Ramirez-Flores, L. A.

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