Digital transformation in the tourism sector: A literature review

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Abstract

Digitalization in the tourism sector has experienced significant growth over the last decade. However, it has been driven by the covid-19 pandemic. Although technological adoption in tourism has been slow due to the nature of the industry, its importance in enhancing tourism activities and services is recognized. Digital transformation has become a relevant phenomenon, and an increase in research on topics such as technological adoption, the digital economy, and artificial intelligence in the sector is expected. In this regard, this document presents a literature review based on bibliometrics conducted within the framework of a digital transformation project in the tourism sector. The results reveal that there is academic and sectoral interest in understanding the impact of digital technology on this sector. The analyzed documents show an average annual growth of 23,77% in publications on the subject and a significant influence of the pandemic on the thematic focus of the research. Similarly, the importance of digitalization in the planning of smart tourist destinations and the adoption of new technologies to generate value for customers is highlighted. Digitalization also emerges as an opportunity for tourism organizations to be strategically agile and adapt to a constantly changing environment. Although the tourism industry still faces challenges due to the pandemic, it is recognized that digitalization will continue to be fundamental for its recovery and future development.

Keywords: Tourism; digitalization; bibliometrics; tree of science; Bibliometrix; tourism industry; smart tourism; digital adoption.

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Transformación digital en el sector turismo: una revisión de literatura

Resumen

La digitalización del sector turístico ha experimentado un crecimiento significativo en la última década. Sin embargo, ha sido impulsado por la pandemia de covid-19. Aunque la adopción tecnológica en el turismo ha sido lenta debido a la naturaleza de la industria, se reconoce su importancia en la mejora de las actividades y servicios turísticos. La transformación digital se ha convertido en un fenómeno relevante, y se espera un aumento de la investigación en temas como la adopción tecnológica, la economía digital y la inteligencia artificial en el sector. En este sentido, el presente documento presenta una revisión bibliográfica basada en bibliometría realizada en el marco de un proyecto de transformación digital en el sector turístico. Los resultados revelan que existe interés académico y sectorial en comprender el impacto de la tecnología digital en este sector. Los documentos analizados muestran un crecimiento anual promedio del 23,77% en las publicaciones sobre el tema y una influencia significativa de la pandemia en el enfoque temático de la investigación. Del mismo modo, se destaca la importancia de la digitalización en la planificación de destinos turísticos inteligentes y la adopción de nuevas tecnologías para generar valor para los clientes. La digitalización también surge como una oportunidad para que las organizaciones turísticas sean estratégicamente ágiles y se adapten a un entorno en constante cambio. Aunque la industria del turismo todavía se enfrenta a desafíos debido a la pandemia, se reconoce que la digitalización seguirá siendo fundamental para su recuperación y desarrollo futuro.

Palabras clave: turismo; digitalización; bibliometría; árbol de la ciencia; Bibliometrix; industria del turismo; turismo inteligente; adopción digital.

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Transformação digital no setor do turismo: uma revisão da literatura

Resumo

A digitalização no setor do turismo registrou um crescimento significativo ao longo da última década. No entanto, foi impulsionado pela pandemia de covid-19. Embora a adoção tecnológica no setor do turismo tenha sido lenta devido à natureza da indústria, a sua importância no reforço das atividades e serviços turísticos é reconhecida. A transformação digital tornou-se um fenômeno relevante, prevendo-se um aumento da investigação sobre temas como a adoção tecnológica, a economia digital e a inteligência artificial no setor. A este respeito, o presente documento apresenta uma revisão bibliográfica baseada em dados bibliométricos conduzidos no âmbito de um projeto de transformação digital no setor do turismo. Os resultados revelam que há interesse acadêmico e setorial em compreender o impacto da tecnologia digital nesse setor. Os documentos analisados mostram um crescimento médio anual de 23,77% nas publicações sobre o tema e uma influência significativa da pandemia no foco temático da pesquisa. Do mesmo modo, destaca-se a importância da digitalização no planeamento de destinos turísticos inteligentes e na adoção de novas tecnologias para gerar valor para os clientes. A digitalização também surge como uma oportunidade para as organizações de turismo serem estrategicamente ágeis e se adaptarem a um ambiente em constante mudança. Embora a indústria do turismo continue a enfrentar desafios devido à pandemia, é reconhecido que a digitalização continuará a ser fundamental para a sua recuperação e desenvolvimento futuro.

Palavras-chave: turismo; digitalização; bibliometria; árvore da ciência; Bibliometrix; indústria do turismo; turismo inteligente; adoção digital.

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Transformation numérique dans le secteur du tourisme: une revue de la littérature

Résumé

La numérisation dans le secteur du tourisme a connu une croissance significative au cours de la dernière décennie. Cependant, cette dynamique a été accélérée par la pandémie de COVID-19. Bien que l'adoption technologique dans le tourisme ait été lente en raison de la nature même de l'industrie, son importance pour l'amélioration des activités et des services touristiques est désormais reconnue. La transformation numérique est devenue un phénomène pertinent, et une augmentation des recherches sur des sujets tels que l'adoption technologique, l'économie numérique et l'intelligence artificielle dans ce secteur est attendue. Dans cette optique, ce document présente une revue de la littérature fondée sur des analyses bibliométriques, réalisée dans le cadre d'un projet sur la transformation numérique du secteur touristique. Les résultats révèlent un intérêt académique et sectoriel pour la compréhension de l'impact des technologies numériques sur ce domaine. Les documents analysés montrent une croissance annuelle moyenne de 23,77 % des publications sur le sujet, ainsi qu'une influence marquée de la pandémie sur l'orientation thématique des recherches. De même, l'importance de la numérisation dans la planification des destinations touristiques intelligentes et dans l'adoption de nouvelles technologies pour créer de la valeur pour les clients est soulignée. La numérisation apparaît également comme une opportunité pour les organisations touristiques d'adopter une agilité stratégique et de s'adapter à un environnement en constante évolution. Bien que l'industrie touristique continue de faire face à des défis liés à la pandémie, il est reconnu que la numérisation restera un élément fondamental de sa reprise et de son développement futur.

Mots-clés : tourisme; numérisation; bibliométrie; arbre de la science; Bibliometrix; industrie touristique; tourisme intelligent; adoption numérique.

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1. Introduction

Technology serves as an evolutionary compensator for humans (Pérez de Paz, 2016) and permeates all human activities. Organizations, as human creations (Tello-Castrillón, 2018), incorporate technology as it becomes widespread and enhances or optimizes their activities(Lawrence & Lorsch, 1967; Pérez de Paz & Londoño-Cardozo, 2021; Simón, 1973a). In this regard, technology influences all sectors and fields of human activity. However, certain activities, due to their nature, face delays or challenges in implementing technological advancements or in regulating them (Londoño-Cardozo & Restrepo-Sarmiento, 2022). In the tourism sector, defined as the activity of traveling and visiting places outside one's usual environment for recreation, cultural discovery, or business (Morley, 1990), the adoption of technology, especially digital technology, has encountered difficulties (Ozdemir *et al.*, 2023; Vinod, 2023) related to the traditional mindset in the tourism industry that fails to meet current demands (Yu, 2023), the lack

of comprehensive information that covers various aspects of destinations, journeys, and tourism offerings (Gamidullaeva *et al.*, 2023), among others.

This slow technological adoption is partly due to the sector's nature. In this case, digital technology acts as a communication and marketing channel utilized by various stakeholders, but it does not specifically correspond to the tourism service itself (Kong *et al.*, 2023; Ozdemir *et al.*, 2023). Until the SarsCov-2 pandemic, hereafter referred to as covid-19, tourists generally did not perceive digitalization in the provision of tourism services (Mathias & Mäkiluoma, 2023; Sousa *et al.*, 2023). This does not imply that tourism operators did not use digital technology previously.

The digital transformation of the tourism sector is a phenomenon that had been emerging even before the pandemic. Researchers had been exploring the adoption of digital technologies by tourism sector organizations since 2016 and 2017 (Giraldo-Patiño, 2019). In this context, Gamidullaeva *et al.* noted that "the tourism industry has undergone dramatic changes since various forms of Information and Communications Technologies (ICT) began to penetrate the society, industry, and markets" (2023, p. 2). However, it was the new normal, a term coined after the pandemic crisis (Johnson *et al.*, 2020), that has popularized the use of digital technology in tourism sector organizations worldwide. Investigating how digital technology has made inroads into the organizations of the tourism sector is a topic of academic and sectoral interest, given that the digitalization of the tourism industry is believed to increase the efficiency of sector operations and provide customers with faster access to information and protection of their interests (Filipiak *et al.*, In press).

In this sense, a bibliometric analysis was conducted based on the methodological proposal presented in Londoño-Cardozo (2022) and Londoño-Cardozo & Tello-Castrillón (In press). This methodological exercise proposes combining two types of bibliometric methods. One is the use of the Bibliometrix application, which generates quantitative information from the data collected in bibliometric databases. The other method is the Three of Science, which, using graph theory, delivers the documents that serve as theoretical support on the topic. According to the authors, combining these two methods allows for a broader scope for literature reviews (Londoño-Cardozo, 2022) by offering

different perspectives and aspects on the researched topic (Londoño-Cardozo, 2022; Londoño-Cardozo & Tello-Castrillón, In press).

This document presents the results of this methodology applied to the topic under discussion. For this purpose, only the Web of Science database, hereafter referred to as WoS, was used for its practicality in delivering information in a free format, unlike Scopus. The search equation *tourism and digitalization* yielded 268 documents. No further adjustments were made to the search criteria as these were deemed to yield pertinent documents. The search results were loaded into the corresponding applications.

As a result of the analysis using Bibliometrix, it was identified that the documents found in the search span from 2010 to 2023, with an annual average growth of 23,77% in publications. The journal Sustainability stands out as the most relevant source, with 25 documents published and a high number of citations. Among the most cited documents, works by Eller *et al.* (2020), Türkeş *et al.* (2019) and Gyódi (2019) are notable, addressing digitalization both in the tourism sector and in small and medium enterprises. The influence of covid-19 on thematic development is confirmed, as from 2020 the academic literature focused on this topic and the transformation it caused in the operational ways of organizations in the tourism sector.

The analysis using the three of science, on the other hand, revealed that research on digital transformation in the tourism sector has undergone a significant change due to the covid-19 pandemic. The results were examined from three perspectives considering the review: before, during, and after the pandemic. The documents analyzed were divided into three categories: roots, trunk, and leaves, according to the three of science model. Root documents focused on the early advancements in digitalization in the tourism and hospitality sector, while trunk documents addressed the impact of the pandemic as a catalyst for digital transformation. Lastly, leaf documents concentrated on the importance of digitalization for the recovery of the tourism sector after the pandemic.

During the pandemic, the tourism industry experienced a drastic change due to travel restrictions and the need to adapt to new operational ways. However, it was recognized that digital transformation could be an opportunity for the sector. The importance of digitalization in planning smart tourism destinations and adopting new technologies to

create value for customers was widely discussed. Moreover, the need for tourism organizations to be strategically agile and leverage digital tools to compete in an ever-changing environment was emphasized. Although the tourism industry continues to face challenges due to the pandemic, digitalization is recognized as continuing to play a significant role in its recovery and future development.

The document concludes that, despite the limited existing literature, research on digitalization in the tourism sector is expected to increase in the coming years, with a growing focus on digital transformation, the digital economy, and artificial intelligence. These advances reflect the impact of the pandemic on academic production and the interest in understanding the effects of digitalization on the tourism industry. The intersection between tourism and digitalization presents an interesting gap for academia and tourism stakeholders.

Additionally, the importance of enhancing the digitalization of the industry and developing strategies in line with the evolution of the environment is recognized. Similarly, government support is required to promote tourism through policies and regulations that foster the sector's recovery. Furthermore, for academia, it is interesting to explore the relationship between smart cities and tourism development, as this could improve the tourist experience, efficient tourism management, sustainability, collaboration, and tourism marketing.

2. Methodology

In this study, the methodology proposed by Londoño-Cardozo (2022) and Londoño-Cardozo & Tello-Castrillón (In press) was applied, combining two types of bibliometric methods: quantitative analysis using Bibliometrix (Aria & Cuccurullo, 2017) and qualitative analysis based on the three of science (ToS) (Valencia-Hernández *et al*., 2020; Zuluaga *et al*., 2016). Bibliometrics is inherently a qualitative method, allowing for an "understanding of a social situation as a whole, taking into account its properties and dynamics" (Bernal-Torres, 2010, p. 60). However, it is important to note that bibliometrics employs techniques from quantitative methodologies for data analysis. Additionally, all information sources used to construct this document were secondary.

The search for sources exclusively used the Web of Science (WoS) database, given its practicality in providing bibliometric information and categorization by common key terms, unlike the Scopus database. Initially, the search equation *tourism and digitalization* was employed. This exercise yielded 268 documents across the entire WoS data universe as of february 2023, leading to the decision to study all documents under those criteria without further adjustments. Consequently, the plain text file containing all information from the WoS database was downloaded.

For the analysis of the information, two different tools were used at distinct stages. Firstly, the original file downloaded from WoS was loaded into ToS (Robledo-Giraldo *et al.*, 2014; Valencia-Hernández *et al.*, 2020; Zuluaga *et al.*, 2016). This tool enabled the identification of the thematic roots of digitalization in the tourism sector using graph theory in three categories of analysis: roots, trunk, and leaves. The roots correspond to the most cited documents and are considered the foundation of the discussed topic. It should be noted that due to the nature of the analysis in ToS, the roots of the topic may correspond to a universe of documents not part of the original 268 documents found in WoS. This is because graph theory positions documents based on their citations, and the source documents do not necessarily discuss the search theme. However, they are theoretical references for the studied topic. The trunk corresponds to the conceptual development of digitalization in the tourism sector. The leaves or branches correspond to the current trends or themes now being developed on the study object.

Secondly, the plain text file generated from WoS was analyzed using Bibliometrix. This tool, functioning as a package in the R programming environment version 4.2.2 (Aria & Cuccurullo, 2017) through the R Studio interface version 2023.03.1 Build 446, is an open-source bibliometric analysis and reference mapping application. This application facilitated the identification of countries that research the topic most extensively, trending topics, the most relevant journals, and thematic evolution over time, among other possibilities offered by the interface. Additionally, with Bibliometrix, graphs were generated that complemented the analysis conducted using ToS.

3. Results

This section presents the results of the methodological application. Firstly, quantitative information derived from the Bibliometrix analysis is presented, followed by a detailed analysis of the results obtained through the Three of Science (ToS). This analysis specifies the three categories and the diverse contents they encompass.

3.1. Bibliometrix analysis

In the quantitative analysis of the data downloaded from WoS, several aspects are evident. As mentioned in the methodology section, using *tourism and digitalization* as search criteria yielded 268 documents spanning from 2010 to 2023. The annual growth rate of publications on digitalization in the tourism sector is 23,77%. A total of 913 authors contributed to these documents, with only 32 being the sole authors of a document, averaging 3.56 authors per document.

Regarding the most relevant sources, it was identified that 25% of all documents were published across 10 journals. The journal *Sustainability* published the most on this theme with 25 documents, and it also received the most citations during the Timespan, followed by *Tourism Management* with 340 and 326 citations, respectively (Figure 1). Analysis by author is not significant as the author with the highest number of published articles on the topic has only three articles within the Timespan. However, it is possible to analyze the country of origin of the scientific production based on the authors' locations.

Figure 1. Most relevant and cited sources

**Articles**

Citations
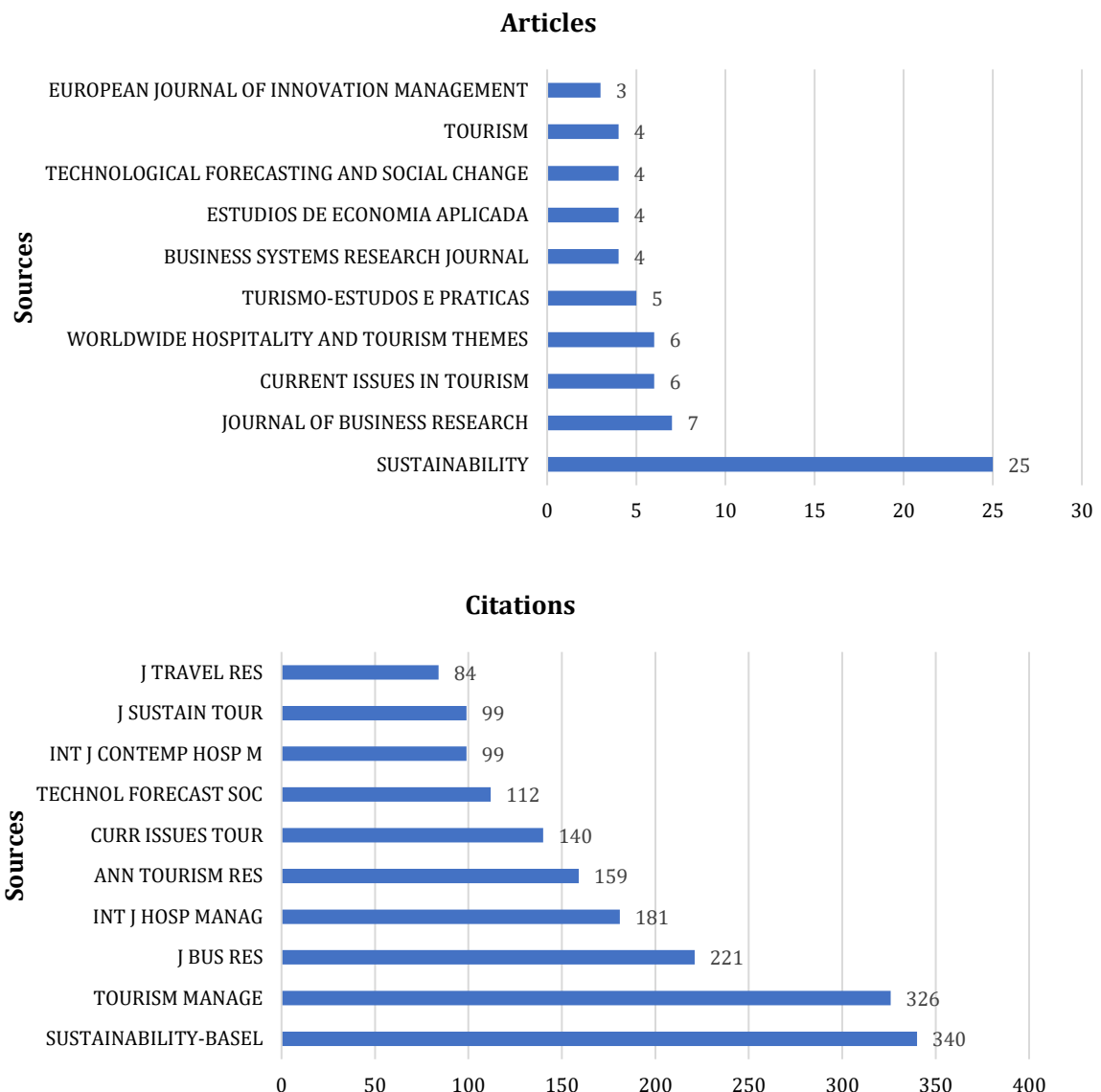
Source. Own elaboration.

The analysis of countries with the highest number of authors publishing on tourism and digitalization reveals that the five most relevant are China, Russia, Ukraine, Portugal, and Spain, see Figure 2. These countries stand out for their considerable contributions to research and knowledge generation in this area. China leads with a total of 94 authors having published on the topic. This result is unsurprising given China's rapid economic growth and development in recent decades, making it a significant tourist destination and a leader in technology. Russia, known for its rich history and tourist attractions, has

shown significant commitment to understanding the impact of digitalization on the tourism sector.

Figure 2. Countries' scientific production
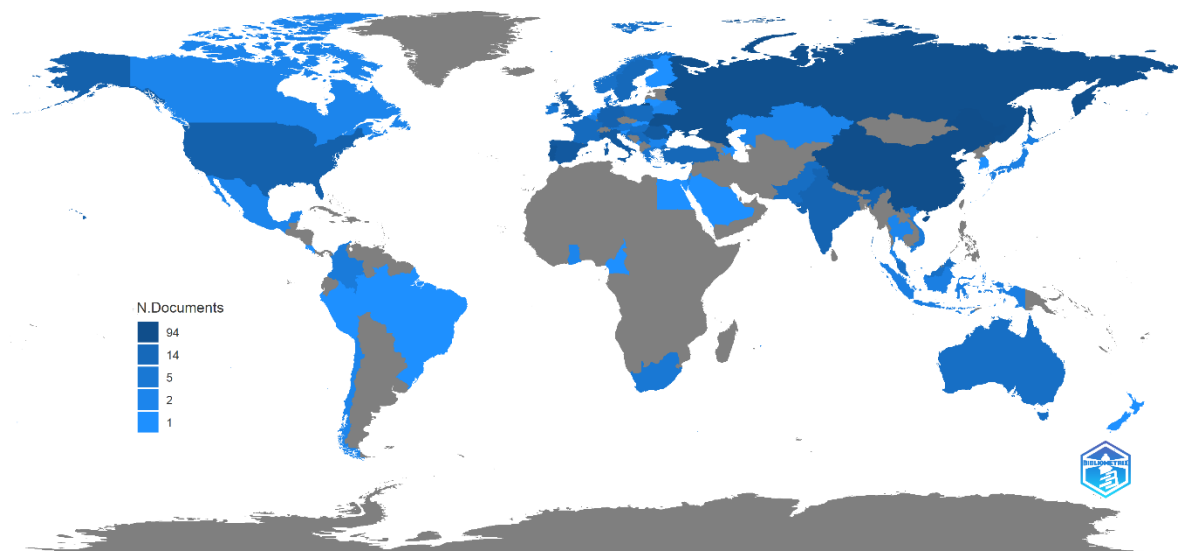
Source. Own elaboration.

Ukraine ranks third with 82 authors, reflecting an increase in research and interest in tourism and digitalization, highlighting its growing importance in the academic community. Portugal is fourth with 60 authors focused on this field of study, internationally recognized for its innovative approach in the tourism sector, leveraging digitalization opportunities to enhance visitor experiences. Spain rounds out the top five, with 42 authors dedicated to researching the relationship between tourism and digitalization. Known for its globally leading tourism industry, Spain has been at the forefront of adopting digital technologies to enhance tourism management and traveler experiences.

In addition to these countries, Colombia also appears with 4 authors who have made significant contributions to the field of study, denoting a growing interest and classifying this topic as an interesting gap for the academic context and the country. This allows it to stand out as an emerging player at the intersection of tourism and digitalization.

Regarding an analysis of the most relevant documents according to their citations (Table 1), the document by Eller *et al.* (2020) appears first with 105 citations recorded in WoS, followed by the document by Türkeş *et al.* (2019) with 70 citations. However, it should be mentioned that these documents are not directed exclusively at the tourism sector. Instead, they address the digitalization of SMEs including those dedicated to tourism. The first document directed exclusively at tourism is by Gyódi (2019), followed by Akhtar *et al.* (2021) with 61 and 38 citations respectively. These documents are analyzed in more depth below.

Gyódi (2019), examines the characteristics of Airbnb networks and their impact on local residents and the traditional hotel industry, using a dataset that includes information on Airbnb listings and hotel offers in Paris, Barcelona, Berlin, and Warsaw. The study revealed that while Airbnb promotes tourism in areas without hotel coverage, it also concentrates in neighborhoods with long tourist attraction, increasing tourist pressure. Airbnb and traditional hotels compete in various market segments, but their substitutability is limited by complementary relationships in specific urban areas. Spatial analysis shows a center-periphery pattern in most cities, contributing to increased tourist pressure in urban centers.

Table 1. Most global cited documents

| Paper	Total citations
Eller *et al.* (2020)	105
Türkeş *et al.* (2019)	70
Gyódi (2019)	61
Akhtar *et al.* (2021)	38
Škare & Soriano (2021)	31
Gössling (2021)	29
Wei & Ullah (2022)	28
Toubes *et al.* (2021)	24

Source. Own elaboration.

On the other hand, Akhtar *et al.* (2021) argue that digital tourism has the potential to replace conventional mass tourism, especially during and after the covid-19 pandemic, by offering a practical and valuable alternative for tourists. Highlighting the importance of digital technologies such as virtual and augmented reality to provide information and entertainment to tourists, particularly older adults who cannot travel due to restrictions.

Based on a systematic literature review, the study concludes that virtual tourism can attract tourist attention, although it may not fully reproduce the experience of a real visit, so virtual spaces must develop more features and added value to satisfy tourists in the future. It also underscores the importance of collaborative research among nations to develop digital tourism post-pandemic crisis. The document provides information on the thematic and chronological distribution of the published literature, as well as the most prolific journals in the field of digital tourism through content and bibliometric analysis.

Bibliometrix allows for an analysis of thematic evolution. In Figure 3, it is evident that in the decade 2010-2020, the thematic focus of the authors was the digitalization of the tourism sector. However, by 2021, the influence of the pandemic on academic production and a dynamization of themes such as digital transformation, digital economy, and relation to hospitality was evident. In 2022, the topic of artificial intelligence emerges in the literature, adding to the themes of the previous year. Also, the topic of bibliometric analyses on tourism and digitalization appears, showing the beginning of interest in knowing more about what has been said regarding this. It is expected that in the coming years, writing will be further dynamized and results of empirical applications will be presented. As of the date of information retrieval from the databases, the literature on digitalization in the tourism sector is not yet relevant, and the scarce literature in the first two months of 2023 relates to covid-19 and digitalization.

Figure 3. Thematic evolution
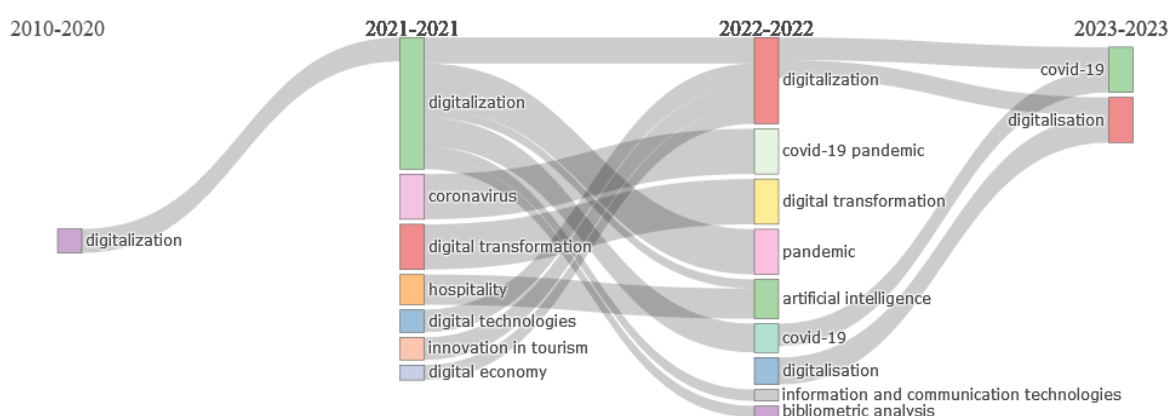
Source. Own elaboration.

Finally, in Figure 4, the most relevant topics found in the search are highlighted. Innovation, management, experience, and information technologies are the main themes in the study of digitalization in the tourism sector.

Figure 4. Word cloud with the most relevant topics

Source. Own elaboration.

3.2. Analysis based on three of science

The qualitative analysis corresponds to this section of the results. Initially, it is important to note that the literature review indicated that in recent years, the research trend relating to digital transformation in the tourism sector identifies the covid-19 pandemic as a significant milestone viewed as an opportunity for change in the industry. Therefore, it is relevant to analyze the results from three perspectives: PRE, DURING, and POST the pandemic. This approach recognizes that digital transformation in tourism, like all human activities, has been ongoing since the emergence of this technology (Pérez de Paz *et al*., 2019; Pérez de Paz & Londoño-Cardozo, 2021). Accordingly, for the analysis, the PRE category includes what in ToS is called Roots. Similarly, the DURING and POST categories correspond to the Trunk and Leaves of ToS, respectively.

This tool's analysis yields a maximum of 90 documents, where 20 correspond to the Roots, 20 to the Trunk, and 50 to the Branches. Some searches may vary, meaning some categories might contain fewer documents as determined by the graph theory analysis (Valencia-Hernández *et al*., 2020); such is the case with this document. Below, each category of the ToS for the topic of tourism and digital transformation is described.

3.2.1. Roots of the science tree or pre-pandemic state of the art

The documents grouped in the roots of ToS originate from various European and North American countries. The publication dates of these documents span a 40-year timespan from 1981 to 2021. A total of 75% of these documents were published prior to the global pandemic crisis, and 40% are affiliated with the academic publisher Elsevier. Notable authors include Dimitrios Buhalis, a British academic cited in three documents related to the application of technologies in the tourism and hospitality sector, and Satish Nambisan, an American academic of Indian origin, whose work relates to the adoption of digital technologies in organizations in general.

In the Root documents, topics related to the earliest advancements in digitalization that had been developed up to that point in the tourism, hospitality, and organizational innovation sectors are addressed (Buhalis *et al*., 2019; Buhalis & Law, 2008; Kraus *et al*., 2019; Nambisan, 2017), see Table 2. Initially, Buhalis *et al*. (2019) highlighted the role of the Internet of Things (IoT) and autonomous devices, along with enhanced analytic capabilities and enriched media such as virtual and augmented reality, in restructuring industry practices. These advancements facilitated the emergence of extrasensory and hyper-personalized experiences, as well as the creation of smart ecosystems that allow travelers to customize their experiences through connected devices.

Table 2. Pre-pandemic technological advancements and considerations in tourism

Technological Advancements	Description
Internet of Things (IoT) and Autonomous Devices	Enable the personalization of experiences and the creation of smart ecosystems.
Virtual and Augmented Reality (VRAR)	Revolutionize service management and offer immersive experiences.
Information and Communications Technologies (ICT)	Redesign business functions and processes.
Reservation and Distribution Systems (CRS/GDS)	Transform operational and strategic practices.
Customer Relationship Management (CRM) Systems	Enable personalization and customer satisfaction.
Digital Business Models	Provide new opportunities and markets.
Collaborative Economy	Encourages entrepreneurship and value creation.
Digital Platforms	Allow the reprogramming and recombination of technologies.
Extrasensory, Hyper-personalized, and Automated Experiences	Possible future disruptions in service experiences.

Source. Elaboration based on Buhalis et al. (2019), Buhalis & Law (2008), Kraus et al. (2019), and Nambisan (2017).

Subsequently, Buhalis & Law (2008) emphasized the impact of the Internet on tourist consumer behavior, providing access to a broad range of information and encouraging the adoption of Internet technologies in the marketing and communication strategies of tourism organizations. For these authors, the use of advanced customer relationship management systems and information gathering at all service stages are fundamental practices for providing instant responses and personalized services (Buhalis & Law, 2008).

The remaining documents from the Roots of ToS make up 25% of the publications in this category. A common factor among them is that they were written during the pandemic, and in them, with authors discussing the opportunity for change that this crisis generated for the tourism sector. Furthermore, they argue that this global event was the catalyst for accelerating digital transformation in organizations within this sector.

Years before the pandemic, the concept of digital transformation emerged as a significant phenomenon for research and professionals. At that time, more than half of the organizations operated on a traditional model with minimal digital tools. Nambisan (2017) considered that technologies would mark a new era in entrepreneurship where traditional forms were already being questioned and modified. He also asserted that with the new digital infrastructure, organizations would benefit from smoother and more limited processes, where a predefined agenda for activities was not necessarily due to better distribution of these activities.

Kraus *et al.* (2019), affirmed that there was a shift in organizational strategies due to the incursion of digital technology. Businesses created from this phenomenon, branches, and existing businesses transitioned from analog to online businesses. This established digital entrepreneurship as a novel form of business activity. From here, the positive impact of digitalization began to be perceived as an important process in the way entrepreneurs conducted their businesses. Indeed, many of these new business forms did not exist until the arrival of digital technological advancements.

According to Teece (2010), experts recognize that technological innovation without a business strategy does not succeed. This is because when thinking about innovation, the analysis and development of a model that leads to commercial success is often

overlooked. Therefore, it is important to apply technological innovation to processes, aligned with strategic analysis through the streamlining of internal operations and the creation of opportunities for process innovation (Nylén & Holmström, 2015). However, companies dedicated to digital innovation face uncertainties, such as factors governing the adoption of digital products and services, generating revenue through the balance between free and paid services, and the ability to keep up with new digital technologies and identifying new innovation opportunities (Nylén & Holmström, 2015).

In the tourism sector, technological revolutions were already present before the pandemic. This incursion of technology into the sector resulted in the growth of tourism and the availability of infrastructure that allows access to services where people could immediately connect and interact with the environment (Buhalis & Law, 2008). Here, concepts such as virtual tourist guides, online travel agencies, new business models like Uber or Airbnb, accessible tourism adapted for people with disabilities, among others, emerged. More recently, smart tourism has also emerged.

The concept of smart tourism is broader than believed. Gretzel *et al.* (2015) stated that the concept of smart tourism is a different dimension, going beyond the involvement of Information and Communications technologies (ICTs), and progressing from traditional to electronic. With this approach, a reality emerges in which tourism enters the field of digital play, allowing for new levels of interaction and access to new experiences in smart cities. This enables planning that can address problems inherent to tourism activity, improve the sustainability and competitiveness of tourist destinations (Ivars-Baidal & Vera-Rebollo, 2019).

3.2.2. Trunk of the science tree or state of the art during the pandemic

The trunk of the ToS is made up of documents published between 2019-2022, with six of these documents published during the pandemic period and three prior to it. The countries of publication included Austria, the United Kingdom, Turkey, Croatia, Norway, Portugal, Spain, Canada, and the USA. These publications were featured in journals from the academic publisher Elsevier, as well as in *Tourism: An International Interdisciplinary Journal*, *Tourism & Management Studies*, *Sustainability Journal*, *Bulletin of the Spanish*

Association of Geography, *Technology Innovation Management Review*, and *Tourism Economics*. Each document belongs to different authors. The documents published in 2019 refer to the emergence of a transformation towards electronic tourism and the need for adopting new technologies in tourism activities (Hongdao *et al.*, 2019; Ivars-Baidal & Vera-Rebollo, 2019; Kazandzhieva & Santana, 2019). Those published during the pandemic discuss topics of covid-19 as a catalyst for digital transformation in the hotel industry and ICTs during the pandemic as an opportunity for new digital business models (António & Rita, 2021).

Amid covid-19, the industry shifted from an excess of tourists in various destinations worldwide to almost a complete halt due to travel restrictions imposed to prevent the virus's spread (Gössling *et al.*, 2021; Higgins-Desbiolles, 2020). Despite the scenario, there was significant evidence that covid-19 would be different from previous epidemics, as the effects of global change would help accelerate the transformation towards sustainable tourism (Gössling *et al.*, 2021).

Sigala (2020), asserted in his research that covid-19 was not only a different crisis but would contribute to generating profound, long-term changes in tourism. The lockdown compelled the emergence of new strategies alongside technological advances as a source of transformative innovation, thus ensuring the continuity of economic activities in the sector. In this vein, Škare *et al.* (2021) conducted an analysis of the results on measuring the impact of covid-19 in over 185 countries in the travel and tourism industry. As a result, the authors asserted that the industry's recovery would take much longer than expected and recommended developing public policies with foresight for future pandemic crises where digitalization plays a significant role (Škare *et al.*, 2021).

3.2.3. *Leaves of the science tree or state of the art post-pandemic*

The documents that make up the Leaves of the Science Tree contain updated information covering a timespan from 2020 to 2023. A total of 95% of these documents were published during the post-pandemic period or the new normal. Elsevier published three articles from this list, and the rest were published by various journals from China, Croatia, Spain, Ghana, Hungary, India, Lithuania, USA, the Netherlands, Poland, Portugal, the

United Kingdom, Romania, Russia, Singapore, and Sweden. In general, the documents discuss topics such as the concept of smart cities and their importance as tourist destinations for the development of digitalization (Fontanari & Traskevich, 2023; Kostadinova-Popova & Malinova-Malcheva, 2020; Popescu *et al.*, 2022). Most of the documents speak about digital transformation as an opportunity for the recovery of the tourism sector after the pandemic and the current period (Ahmed & Sur, 2021; Marino *et al.*, 2022; Mensah & Boakye, 2023; Perelygina *et al.*, 2022; Sedera *et al.*, 2022; Sorooshian, 2021; Zhu *et al.*, 2022).

During this period, some authors proposed strategic agility as a measure for the recovery of the tourism industry. This encourages organizations to leverage new technologies to create and deliver value to the digital tourist who, as a result of the pandemic, has increasingly adopted social and digital tools (Hadjielias *et al.*, 2022). According to António & Rita (2021), covid-19 was undoubtedly a fundamental driver for the adoption of digital transformation in the hotel sector. Likewise, the authors consider that digitalization continues and will not retreat. Old habits will be left behind, making way for the new. Organizations must overcome the challenges brought by digital transformation, which constantly imposes the need to compete and survive in an ever-changing economic environment.

Currently, the tourism industry remains one of the most affected by the covid-19 pandemic. According to Mensah & Boakye (2023), who analyzed lessons learned by tourism organization professionals in Ghana, they proposed a recovery model for tourism summarized as follows: i) review which action plan to implement in the country's tourism sector to maintain visibility as an attractive and sustainable destination; ii) include digitalization for SMEs in tourism as a fundamental tool for transforming businesses, leveraging the use of social networks to interact with customers, designing mobile apps that allow tourists to book and check space availability on specific days and times, taking advantage of the benefits of ICTs by creating an online presence, organizing virtual events, and showcasing various activities related to the sector; iii) collaboration and support from different experts such as public bodies, private entities, and regulatory agencies, especially having policies and legislations that benefit and promote the sector's revival; and iv) reimagining education and training in hospitality and tourism, with a

focus on sustainability and the digitalization of the sector. Globally, these have been some of the strategies that countries and organizations have implemented to ensure their sustainability during and after the crisis in the sector.

4. The challenge of digital adoption as a change in tourism organizations

Organizations, historically considered as predominantly human entities, are creations of people (Tello-Castrillón, 2018). Technology has played a crucial role in transforming and facilitating human work (Hernández Cotón & -Gutiérrez, 2003; Melnyk *et al.*, 2019; Pérez de Paz *et al.*, 2019; Pérez de Paz & Londoño-Cardozo, 2021). These technological changes have permeated all organizational aspects, starting from production modes (Bilbao & Lanza, 2009) and subsequently influencing the structure of organizations (Simón, 1973b, 1973a).

The incorporation of technology has turned organizations into more complex systems (Thompson & Bates, 1957), necessitating processes of differentiation and integration to achieve established goals (Lawrence & Lorsch, 1967). It is crucial to understand the importance of technological integration in organizations across all sectors.

According to Lawrence & Lorsch (1967), integrating technology into organizations involves both the differentiation and integration of processes. Technology allows for the subdivision of organizational systems into smaller subsystems, each adapted to its specific environment. At the same time, it promotes the collaborative integration of all subsystems to achieve organizational objectives.

These rapid technological developments will contribute to the increasing complexity of organizations. According to Simón (1973a), human knowledge, as expressed in technological development, motivates the adaptation of organizations and challenges the traditional conception of what we understand as an organization. The presence of technology in organizations requires rethinking concepts and ways of conducting activities.

However, despite the potential benefits, current technological advances can outpace the race of technological adoption in organizations. As new technologies such as artificial intelligence emerge, they present both organizational and personal challenges.

Before the pandemic, tourist sites experienced growth in visitor numbers, which was interrupted by the total closure of commercial activities. However, this disruptive period has compelled organizations in the sector to adapt to market demands in the post-covid-19 era and seize digital opportunities. Assistance has been observed in recovering visits through websites, digital content, social media interaction, and communication with followers (Silva & Carvalho, 2023), generating changes in consumption patterns in the sector.

The covid-19 pandemic caused not only significant changes in the functioning of organizations but also changed people's lifestyles and the global economy. This impact allowed breaking paradigms and moving towards the future. During this period, tourism sector organizations had the opportunity to adapt and evolve, defining policies and transforming their processes.
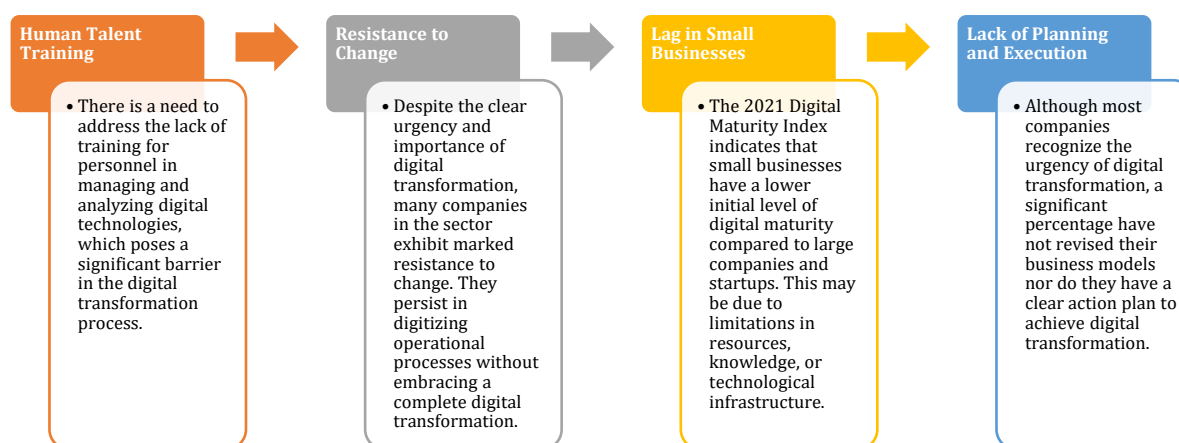
In the context of the new normal, tourism sector organizations must adapt and integrate digital technology to achieve effective digital transformation and optimize their processes. This involves overcoming the challenges posed by new technologies and leveraging their potential to improve the efficiency and effectiveness of operations.

Morozov & Morozova (2022) argue that, in this context, hospitality and tourism services experienced significant changes, and the answer to improving the tourism industry lies in the use of innovative digital tools. Digitalization has a positive impact on the sector, as tourists show a preference for digital communications, which can be leveraged for various activities. Organizations in the sector can find innovative solutions by developing special safety protocols for travel and continuing to offer tourism services.

Overall, the pandemic accelerated digitalization in the hotel industry and the tourism sector, becoming a pillar of sustainability for tourism organizations and other sectors globally. To achieve true digital transformation, the challenge lies in the evolution of business models, leveraging data, technology, and a deeper understanding of customers.

In this sense, digital technological advances give rise to numerous business models and opportunities for entrepreneurs (Kraus *et al.*, 2019); the tourism sector is an example of this (Más-Ferrando *et al.*, 2020). Although some organizations recognize the importance of digital transformation, there are still barriers that hinder its full implementation (Revista Semana, 2022), see Figure 5. Public policies can minimize some of these barriers, exemplified by the case in Colombia.

Figure 5. Barriers hindering digital transformation in tourism

Human Talent Training	Resistance to Change	Lag in Small Businesses	Lack of Planning and Execution
• There is a need to address the lack of training for personnel in managing and analyzing digital technologies, which poses a significant barrier in the digital transformation process.	• Despite the clear urgency and importance of digital transformation, many companies in the sector exhibit marked resistance to change. They persist in digitizing operational processes without embracing a complete digital transformation.	• The 2021 Digital Maturity Index indicates that small businesses have a lower initial level of digital maturity compared to large companies and startups. This may be due to limitations in resources, knowledge, or technological infrastructure.	• Although most companies recognize the urgency of digital transformation, a significant percentage have not revised their business models nor do they have a clear action plan to achieve digital transformation.

Source. Based on Revista Semana (2022).

The Ministry of Commerce, Industry, and Tourism of Colombia (2022) developed a sectoral plan for tourism development extending to 2026. This plan emphasizes the importance of digital adoption to address the current challenges facing the sector. Additionally, it aims to enhance the availability and systematization of information at both national and regional levels, implementing measures for digital transformation. This initiative seeks to capitalize on the opportunities provided by such transformations for the economic reactivation of the tourism sector.

This strategic emphasis on digitalization is intended to ensure that the tourism industry can effectively utilize advanced technologies to not only recover from the setbacks experienced during the pandemic but also to thrive in a rapidly evolving digital landscape. This approach includes leveraging digital tools to improve service delivery, customer engagement, and operational efficiencies, which are crucial for maintaining competitiveness in the global tourism market.

5. Conclusions

Despite the limited literature available to date, research into digitalization in the tourism sector is expected to intensify in the coming years. There is a noticeable shift in interest towards digital transformation, the digital economy, and artificial intelligence. These advancements reflect the impact of the pandemic on academic output and a growing interest in understanding the effects of digitalization on the tourism industry. Future growth in writing on this topic is anticipated, with a more empirical focus and the presentation of results from practical applications.

The intersection between tourism and digitalization presents an interesting gap for the academic context and for the countries involved, as it may help them stand out as emerging players in this constantly evolving research area. Recognizing the fundamental importance of digital technologies in the innovation of organizations within the tourism sector, the increasingly relevant application of Artificial Intelligence, the internet of things, mobile applications, and digital networks becomes evident. These tools have played a crucial role in the context of the pandemic, where their adoption experienced an acceleration phenomenon. However, there is not yet full digital adoption in the tourism sector. Academia must continue to explore improvements in sector activities through technology that can provide better opportunities for all stakeholders through service innovation.

Similarly, government support is essential to promote tourism through policies and regulations that facilitate the sector's recovery. Compared to other industries, tourism organizations have shown little change in adopting platform applications and virtual applications. Nevertheless, it is necessary to improve the digitalization of the industry overall and develop a strategy that aligns with the organization's evolution, as demanded by tourists due to changes in their environment. SMEs in the sector, especially in developing countries, require technological support, the creation of state capacities, and business dynamics and public policies that further facilitate technological adoption.

In this regard, it would be interesting to examine in future research the relationship between the concept of smart cities and tourism development. New generations enjoy interacting with their surroundings and the constant use of mobile devices. Developing

policies aimed at smart cities could not only improve the quality of life for residents but also aspects related to tourism such as: 1) Enhanced tourist experience, 2) Efficient management of tourism and the data it generates for visitors and cities, 3) Sustainable tourism, 4) Collaborative tourism, 6) Enhanced tourism marketing, among others.

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