

A Systematic Review of Event Technologies in the context of Smart Tourism: Trends and Future Directions

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ABSTRACT

This study presents a systematic review of the integration of emerging digital technologies in smart tourism events, with the purpose of understanding how technological innovation is transforming event design, management and visitor experience. The review examines peer-reviewed journal articles and conference proceedings published between 2014 and 2024 and indexed in the Scopus and Web of Science databases. The analysis was conducted using the Bibliometrix package in the R environment, while descriptive and thematic analyses were performed with the Statistical Package for the Social Sciences. The findings show that several technological domains, including Artificial Intelligence, the Internet of Things, Big Data analytics and immersive technologies, are driving significant advances in the development of smart tourism events. These technologies support improvements in personalisation, behavioural analysis, sustainability, accessibility and real-time decision making. The review also reveals conceptual fragmentation, geographical imbalance, limited theoretical integration and the need for greater attention to ethical, accessibility and sustainability issues. Overall, this study contributes to consolidating the theoretical foundations of smart events and identifies promising directions for future research and innovation within technology-enhanced tourism event ecosystems.

KEYWORDS

Smart Tourism, Emerging Technologies, Artificial Intelligence, Event Management, Smart Technologies, Systematic Review.

ARTICLE HISTORY

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1. Introduction

Over the past decade, the tourism sector has increasingly adopted digital technologies to enhance visitor experiences, improve management processes and support sustainable development (Buhalis & Amarangana, 2013; Gretzel et al., 2015; Backman, 2018; Jovicic, 2019; Pencarelli, 2020; Wael et al., 2023). Within this broader digital transformation, events and festivals represent a particularly relevant context because they are temporary, experience-intensive and data-rich tourism settings (Getz, 2008, 2010; Gursoy & Kendall, 2006; Getz & Andersson, 2009; Tuck & Xinyi, 2023). They bring together visitors, infrastructures, services and multiple stakeholders within limited spatial and temporal boundaries, generating specific challenges related to crowd management, personalisation, safety, accessibility, sustainability and real-time decision-making (Ryan et al., 2020; Revilla et al., 2023). In this context, smart technologies can support visitor management, logistics, environmental monitoring and experience design, while also contributing to destination competitiveness and local value creation (Lee, 2023; Getz & Page, 2024).

Smart Tourism provides a useful framework for understanding this transformation. It explains how advanced technologies and data-driven systems can connect infrastructures, organisations and users to improve tourism experiences, management efficiency and sustainability (Gretzel et al., 2015). Smart Tourism is therefore understood as a data-driven approach that uses emerging technologies, such as the Internet of Things (IoT), Artificial Intelligence (AI) and Big Data Analytics, to improve tourism management and enhance the tourist experience (Kontogianni & Alepis, 2022; Stroumpoulis et al., 2022; Aliyah et al., 2023; Liu & Niu, 2024; Suanpang & Pothipassa, 2024).

In this study, emerging technologies are defined as digital tools, infrastructures and data-driven systems whose application in tourism and event contexts is recent, rapidly evolving or still under consolidation. These technologies support automation, connectivity, personalisation, immersive experiences, real-time monitoring, predictive analytics and digital interaction (Rotolo et al., 2015). The term does not imply that such technologies are necessarily novel at a global level; rather, it reflects the fact that their application within event and festival contexts remains evolving, unevenly adopted and, in many cases, insufficiently consolidated in the academic literature. This conceptualisation provides the basis for the analytical classification developed in this review, which organises the identified technologies into eight domains: AI and Data Analytics, Connectivity and Sensing, Platforms and Digital Engagement, Immersive Technologies, Crowd and Operational Management, Blockchain, Security and Biometrics, and Cloud and Digital Infrastructure Services.

This perspective is relevant across different tourism contexts aimed at enhancing experiences, optimising resource management and promoting sustainability (Ferrás et al., 2020). Within this broader ecosystem, smart cities are especially important because they provide the urban infrastructure, digital connectivity and data-driven management systems that support many tourism practices and large-scale visitor experiences (Khan et al., 2017; Um & Chung, 2021). In this manuscript, smart cities are not considered a subcategory of Smart Tourism, but rather a related urban and infrastructural context in which Smart Tourism practices, including smart events, may be embedded.

Despite the growing relevance of event tourism as a research area, there remains a significant gap in the literature concerning the application of emerging technologies in events and festivals. Celuch (2021) examined the role of Information and Communication Technologies (ICTs) in event management and their potential contribution to sustainability, identifying future research areas such as virtual events, Artificial Intelligence, Big Data Analytics and Augmented or Virtual Reality. Building on Celuch's (2021) review, the present investigation advances and broadens this research trajectory by embedding event technologies specifically within the Smart Tourism ecosystem. Smart events are operationally defined as planned event experiences embedded within tourism or destination ecosystems in which digital technologies, data infrastructures and stakeholder interactions are intentionally used to enhance visitor experience, event management, sustainability, safety, accessibility and destination value creation (Cimbaljević et al., 2021). This definition emphasises that smart events are not defined merely by the presence of technology, but by the integration of technology into the broader socio-technical system of tourism, destination management and visitor experience.

In light of this gap, this paper analyses the concept of Smart Event in the context of Smart Tourism. The aim is to identify and analyse trends, emerging technologies and research directions associated with smart events, including festivals, within the broader context of Smart Tourism. More specifically, this study addresses the following research question: “How have emerging technologies applied to events and festivals evolved within the context of Smart Tourism?” The theoretical contribution of this review lies in consolidating the fragmented notion of smart events within the broader Smart Tourism ecosystem. Rather than treating event technologies as isolated managerial tools, this study conceptualises them as part of a wider socio-technical system involving digital infrastructures, data flows, event organisers, destination stakeholders and visitors. Furthermore, this review provides a practical perspective for event planners, destination managers and marketing professionals by identifying strategies to enhance the impact of events in the context of Smart Tourism. This includes the possibility of incorporating emerging technologies, fostering sustainability and maximising economic and social return while applying current trends in tourism.

To achieve the objective of the study, a systematic literature review methodology was used. The following sections describe the methodology applied in this review. Afterwards, a systematic analysis related to the use of emerging technologies in events within the framework of Smart Tourism is presented. Next, the most commonly used technologies in events are discussed. Then, possible future research directions in terms of theories, sustainability and management strategies are proposed. Finally, the conclusion addresses the theoretical and practical implications for planning and managing smart events. In addition, the review develops an integrative conceptual framework that positions smart events as socio-technical ecosystems embedded within the broader Smart Tourism environment.

2. Methodology

2.1 Review Design and Search Strategy

To conduct a literature review, a systematic methodology is utilized to locate, select, and evaluate pertinent studies on the given topic, with the aim of providing a comprehensive understanding of the current state of knowledge (Bandara et al., 2015; Fisch & Block, 2018; Xiao & Watson, 2019). This review followed a two-stage methodological approach. The first phase entailed the identification, close reading and comprehensive understanding of relevant academic sources. The second phase involved a systematic analysis of the selected articles, conducted using SPSS and Biblioshiny powered by R Studio.

The selected databases were Web of Science (WoS) and Scopus (Birkle et al., 2020; Pranckutė, 2021). The data collection process took place between September 2024 and October 2024. To mitigate potential bias in the study selection, the following inclusion criteria were established: (1) The studies included in this review were from 2014 to September 2024 and had to directly contribute to the stated research objective, excluding those with a primary focus outside it. (2) Only articles and Conference Proceedings indexed in CORE and written in English were selected. (3) The selected studies either focused directly on the application of emerging technologies in events, festivals, event management or event tourism, or provided transferable Smart Tourism technology patterns relevant to visitor experience, event management, sustainability, accessibility, real-time decision-making or data-driven tourism contexts. Studies addressing other characteristics not related to events or aspects unrelated to information technology or digitization were excluded.

All selected studies met all three criteria. Additionally, all studies included in the review were read and evaluated for their alignment with the research objective.

The search strategy was organised into two complementary routes (Table 1). The first route, referred to as the direct event route, was designed to identify the core corpus of studies explicitly addressing events, festivals, and event-related technologies in smart contexts. The truncated term “Event*” was used to capture both singular and plural forms, including “event” and “events”.

The second route, referred to as the contextual Smart Tourism route, was designed as a supplementary robustness check to identify potentially transferable insights that may not have emerged through

event-specific search terms alone. Since smart events are conceptually connected to the broader smart tourism literature, this route initially retrieved a wider body of studies. However, these records were not incorporated automatically into the final sample. Instead, each paper was screened to verify whether it explicitly referred to events or whether its technological mechanisms, managerial implications or conclusions could be meaningfully transferred to smart event contexts. This explains the reduction from a broad contextual pool to a smaller final subset and ensures that the robustness check expanded the sensitivity of the search without diluting the event-specific focus of the review. The construction of the groups involved the use of the 'AND' operator to combine the key concepts.

The search logic was designed to reflect the three conceptual components of the research question: the Smart Tourism context, the event-based object of study and the technological focus of the review. First, "Smart Tourism" and "Smart Cities" were used to situate events within broader smart tourism and digitally enabled destination environments. Second, "Event*", "Festival", "Event Management" and "Crowd Management" were included to capture planned events, festivals and operational event-management issues. Third, technology-related terms such as "Artificial Intelligence", "Blockchain", "Internet of Things", "Virtual Reality", "Platform", "Big Data", "Gamification" and "Augmented Reality" were used as gateway terms to retrieve studies addressing key emerging technologies discussed in the Smart Tourism literature. These search terms were not intended to predetermine the final technology domains. Rather, the eight technology domains presented later in Table 7 were derived from the coding and synthesis of the technologies identified in the selected studies. Records retrieved through broader terms were retained only when they explicitly addressed events or provided transferable technological, managerial or infrastructural insights relevant to smart event contexts.

Table 1. Search Strings

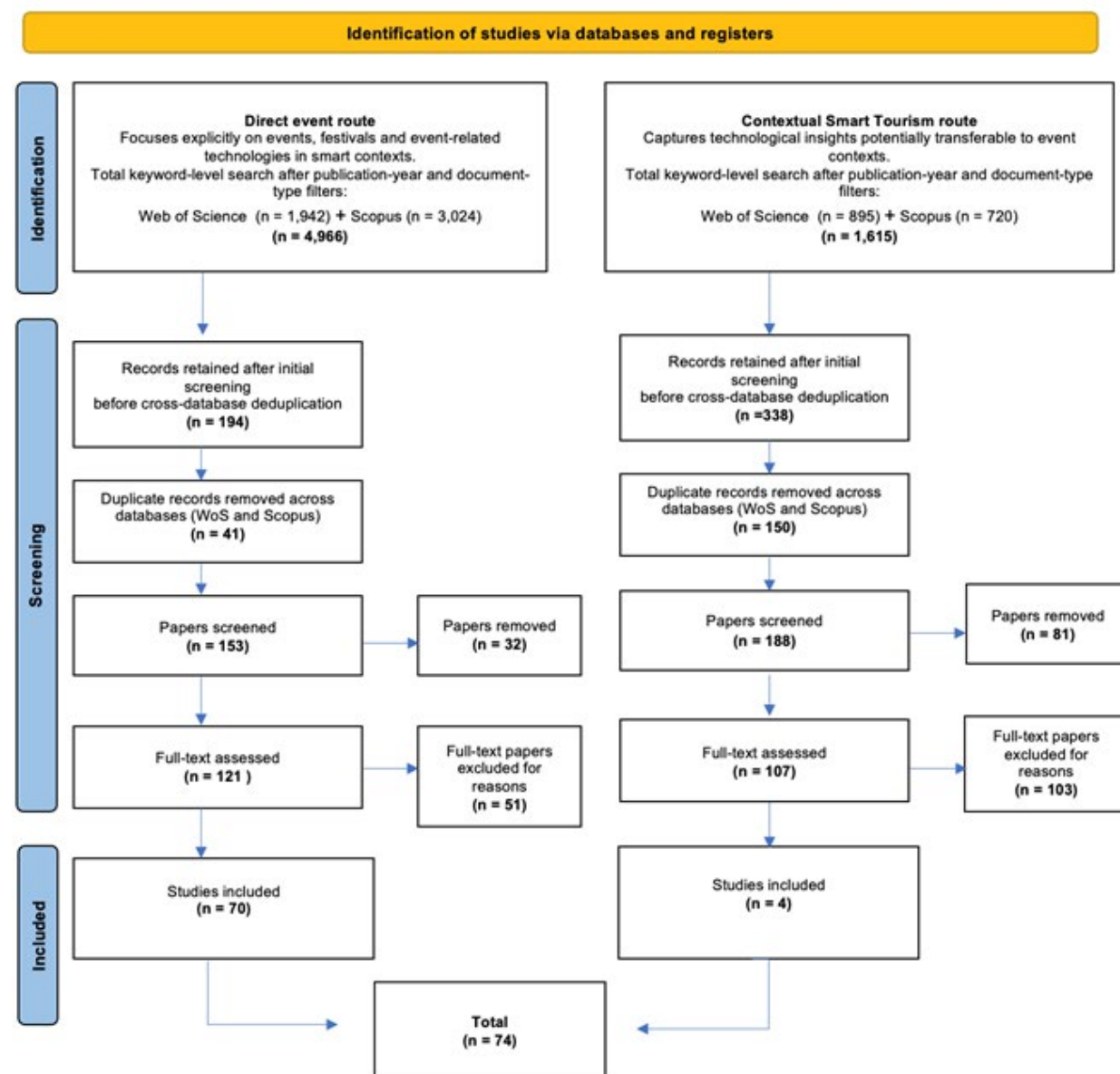
Direct Event Route
"Smart Tourism" AND "Event*"
"Smart Tourism" AND "Festival"
"Smart Cities" AND "Event*"
"Crowd Management"
"Event Management" AND "Artificial Intelligence"
"Event Management" AND "Blockchain"
"Event Management" AND "Internet of Things"
"Event Management" AND "Virtual Reality"
"Event Management" AND "Platform"
"Event Management" AND "Big Data"
"Event Management" AND "Gamification"
"Event Management" AND "Augmented Reality"
Contextual Smart Tourism Route
"Smart Tourism" AND "Artificial Intelligence"
"Smart Tourism" AND "Blockchain"
"Smart Tourism" AND "Internet of Things"
"Smart Tourism" AND "Virtual Reality"
"Smart Tourism" AND "Platform"
"Smart Tourism" AND "Big Data"
"Smart Tourism" AND "Augmented Reality"
"Smart Tourism" AND "Gamification"

Source: Own Elaboration

2.2 Data Extraction, Coding and Analysis

Following this two-route search strategy, and after applying the publication-year and document-type filters in Web of Science and Scopus, the searches produced 6,581 raw keyword-level results: 4,966 from the Direct Event Route and 1,615 from the Contextual Smart Tourism Route (Figure 1). After title, abstract and keyword screening, together with search-string deduplication, 532 records were retained: 194 from the Direct Event Route and 338 from the Contextual Smart Tourism Route. Cross-database deduplication between Web of Science and Scopus removed 191 duplicate records, leaving 341 papers screened: 153 from the Direct Event Route and 188 from the Contextual Smart Tourism Route. Of these, 113 papers were removed during screening, and 228 full-text papers were assessed for eligibility. After full-text assessment, 154 papers were excluded for not meeting the inclusion criteria: 51 from the Direct Event Route and 103 from the Contextual Smart Tourism Route. To strengthen the reliability of the eligibility process, all records proposed for exclusion at the full-text stage were cross-checked by a second reviewer. The final sample consisted of 74 studies: 70 from the Direct Event Route and 4 from the Contextual Smart Tourism Route. The reporting structure follows the PRISMA flow logic (Page et al., 2021), with minor adaptations to reflect the two-route search strategy and the preliminary filtering stage.

Figure 1. Literature Search Overview



The articles were exclusively drawn from journals indexed in reputable bibliometric databases, such as the Journal Citation Report and Scimago Journal Rank, to ensure the quality of the sampled articles.

Quality control was addressed at the source-selection level by including peer-reviewed journal articles indexed in Web of Science and Scopus and conference proceedings indexed in CORE. In addition, each selected study was coded according to its method, theoretical model, hypotheses and main variables. However, no formal critical appraisal tool was applied to score the methodological quality of each individual study, as the objective of the review was to provide a systematic mapping and bibliometric synthesis of the field rather than a risk-of-bias assessment or meta-analysis.

The inclusion of Conference Proceedings in this systematic review is justified by their role in disseminating cutting-edge research on emerging technologies, particularly in the domains of information technology and Smart Tourism. According to CORE (Fekete et al., 2021), conference papers capture key trends, present innovative studies prior to journal publication, and demonstrate rigorous methodologies at relevant academic conferences. Incorporating these sources ensures a comprehensive and current analysis of the technological impact on events and festivals in the context of Smart Tourism.

To ensure consistency in the coding process, studies were classified according to their methodological approach, theoretical basis and technological domain. Methodological approaches were grouped into quantitative, qualitative and mixed-methods studies. For the theoretical dimension, the specific theory, model or conceptual framework used in each article was recorded, together with a brief description of its purpose or contribution. Technologies were grouped into eight domains: AI and Data Analytics, Connectivity and Sensing, Platforms and Digital Engagement, Immersive Technologies, Crowd and Operational Management, Blockchain, Security and Biometrics, and Cloud and Digital Infrastructure Services, specifying their general contribution to smart events. When the methodology, theory or variables were not explicitly stated, classification was based on observable elements such as research design, data collection, analytical technique, technology examined and stated contribution.

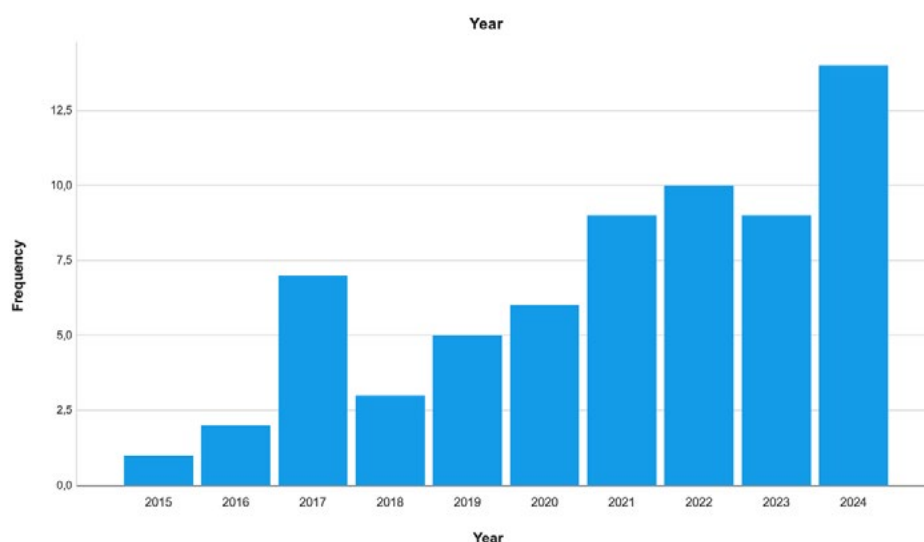
3. Findings

This section presents the results which are organized as follows: (1) Analysis of the temporal evolution of scientific production, (2) Examination of the most influential sources, countries, methodological contributions and main research areas, (3) Identification of key emerging event technologies, (4) Thematic structure analysis, (5) Reconceptualising Smart Events as Socio-Technical Ecosystems: The SESTIM Model, (6) Findings from Contextual Smart Tourism route.

3.1 Analysis of the temporal evolution of scientific production

In order to ensure that this review is grounded in pertinent research, the authors include an overview of the publication timelines encompassed in the study. Studies published over the past ten years were included. This temporal dimension is crucial for understanding the evolution of research in Smart Tourism in events and festivals, revealing trends in research focus, the emergence of new themes, and shifts in methodological approaches that might otherwise remain hidden, thus providing a valuable perspective on the development of the field.

Figure 2 shows the integration of Smart Tourism technologies in events. The increasing academic interest in the field can be attributed to the rising significance of Smart technologies in providing tourism consumers and service providers with relevant information, improved decision-making capabilities, enhanced mobility, real-time awareness, and high-quality and personalized tourism experiences in large-scale events (Gretzel, 2011; Luxford & Dickinson, 2015).

Figure 2. Number of Publications Per Year

Source: Own Elaboration

3.2 Examination of the Most Influential Sources, Countries, Methodological Contributions and Main Research Areas

Table 2 presents the most recurrent publication sources in the final sample. The analysis shows that the literature is distributed across a broad range of journals, although a small group of sources concentrates a higher number of contributions. Event Management is the most represented source, with 6 publications, accounting for 9.09% of the sample. It is followed by the Journal of Hospitality and Tourism Technology with 5 publications (7.58%) and the Journal of Convention & Event Tourism, with 4 publications (6.06% respectively).

A second group of journals contributed 2 publications each (3.03%), including the Asia Pacific Journal of Tourism Research, Information Processing & Management, Journal of Internet Services and Applications, International Journal of Event and Festival Management, Sensors, and the Journal of Sensors. The remaining sources contributed one publication each (1.52%), indicating a highly dispersed publication landscape.

Overall, these results suggest that research on smart technologies in events is not concentrated in a single disciplinary outlet. Instead, it is published across event management, tourism, hospitality, information systems, engineering, sensor technologies and sustainability-related journals. This distribution reinforces the interdisciplinary nature of the field, where smart event research emerges at the intersection of tourism studies, event management and technology-oriented disciplines.

Table 2. Identified Journals

Journal title	Count	Share (%)
Event Management	6	9.09%
Journal of Hospitality and Tourism Technology	5	7.58%
Journal of Convention & Event Tourism	4	6.06%
International Journal of Event and Festival Management	3	4.55%
Asia Pacific Journal of Tourism Research	2	3.03%
Information Processing & Management	2	3.03%
Journal of Internet Services and Applications	2	3.03%
Journal of Sensors	2	3.03%
Sensors	2	3.03%

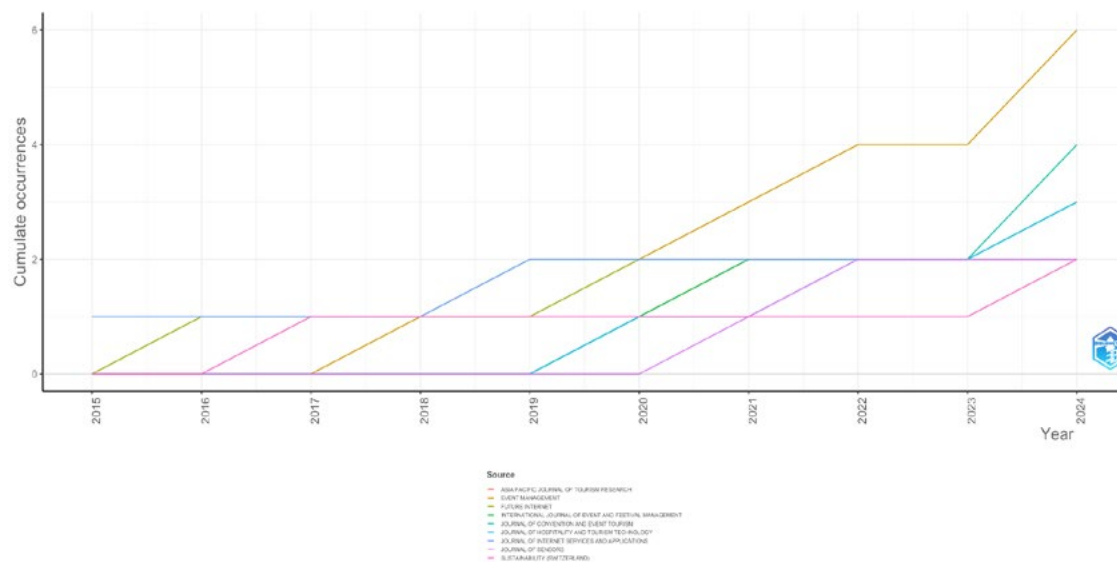
Sustainability	2	3.03%
Asia Transactions on Intelligent Systems and Technologies	1	1.52%
Asian Journal of Pharmaceutical and Clinical Research	1	1.52%
Automatic Control and Computer Sciences	1	1.52%
Case Studies in Fire Safety	1	1.52%
Computer Communications	1	1.52%
Diabetologia	1	1.52%
Digital Image and Video Processing	1	1.52%
Expert Systems with Applications	1	1.52%
Frontiers in Ecology and Evolution	1	1.52%
Frontiers in Psychology	1	1.52%
Future Generation Computer Systems	1	1.52%
Future Internet	1	1.52%
IEEE Access	1	1.52%
IEEE Open Journal of the Communications Society	1	1.52%
IEEE Technical Digest	1	1.52%
International Journal of Consumer Studies	1	1.52%
International Journal of Contemporary Hospitality Management	1	1.52%
International Journal of Healthcare Analysis and Applications	1	1.52%
International Journal of Hospitality Management	1	1.52%
International Journal of Information Technology	1	1.52%
International Journal of Intelligent Systems and Applications in Engineering	1	1.52%
ISPRS International Journal of Geo-Information	1	1.52%
Journal of Ambient Intelligence and Smart Environments	1	1.52%
Journal of Engineering and Applied Sciences	1	1.52%
Journal of Engineering Research	1	1.52%
Journal of Engineering Science and Technology	1	1.52%
Mobile Information Systems	1	1.52%
Multimedia Tools and Applications	1	1.52%
PLOS One	1	1.52%
Polish Journal of Management Studies	1	1.52%
Quality and Quantity	1	1.52%
Sports	1	1.52%
Tourism Management Perspectives	1	1.52%
Tourism Review	1	1.52%
Tsinghua Science and Technology	1	1.52%
Wireless Personal Communications	1	1.52%
Total	66	100.00%

Source: Own Elaboration

The temporal analysis (Figure 3) further supports the significance of Event Management, demonstrating its consistent publication output from 2017 to 2024, thus illustrating its enduring influence in the field. Other journals, such as the Journal of Convention and Event Tourism and the Journal of Hospitality and

Tourism Technology, have focused their publications primarily in the years 2023 and 2024, indicating a more recent focus on the topic.

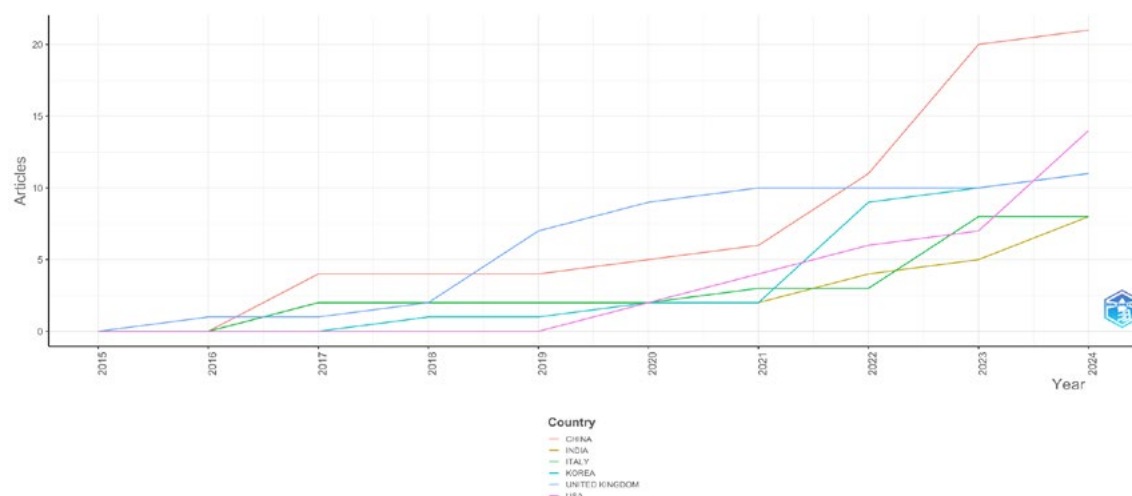
Figure 3. Source's Production Over Time



Source: Own Elaboration

Apart from the temporal analysis of sources, another analysis was carried out to identify which countries lead scientific production in this field of knowledge (Figure 4). The data indicates that China is the foremost contributor to scientific output, exhibiting rapid growth from 2021, and surpassing 20 articles in 2024. The United Kingdom follows, demonstrating consistent progress since 2015, with a consistent output of 11 articles. The United States and South Korea have also shown steady expansion, particularly from 2020, each with over 10 publications. India has gradually increased its output since 2019, though at a lower volume. Italy shows more modest growth, though progress has been evident in recent years. These six countries are the primary contributors to scientific production during the analyzed period.

Figure 4. Country Production Over Time



Source: Own Elaboration

Beyond examining the temporal characteristics of scientific production in terms of countries and sources, it is crucial to examine the methodological characteristics of the reviewed studies. This approach enables the identification of not only the evolution of academic interest, but also the nature of the knowledge generated around the incorporation of smart technologies in events. Table 3 shows the research methodologies used. The trend supports the need for meaningful integration between quantitative and qualitative approaches for a more comprehensive development of the field (Provenzano & Baggio, 2019).

Table 3. Research Methodologies

Method	Count	Share (%)
Quantitative study	51	68.92
Mixed study	14	18.92
Qualitative study	9	12.16
Total	74	100.00

Source: Own Elaboration

Table 4 presents the conference proceedings included in the review and their corresponding CORE/ICORE classification. The proceedings included in the sample are mainly associated with IEEE and international technology-oriented conferences. In terms of CORE/ICORE classification, several venues are ranked B, indicating good and well-regarded conferences within their field, while others are ranked C, indicating recognised conferences that meet academic quality standards. One proceeding is classified as Unranked, meaning that no formal ranking decision has been assigned. Therefore, the inclusion of these proceedings complements the journal-based evidence by capturing recent, applied and technically oriented contributions that are relevant for understanding the technological foundations of smart events within the broader Smart Tourism ecosystem.

Table 4. Identified Conference Proceedings

Source	ICORE Source	ICORE Rank
2018 IEEE international conference on big data (big data)	CORE2023	B
34th Australasian Conference on Information Systems, ACIS 2023	CORE2018	Australasian
ICC 2020 - 2020 IEEE international conference on communications (ICC)	CORE2018	B
16th ACS/IEEE International Conference on Computer Systems and Applications, AICCSA 2019	CORE2023	C
Proceedings of 2016 IEEE 18th international conference on high performance computing and communications; IEEE 14th international conference on smart city; IEEE 2nd international conference on data science and systems (hpcc/smartcity/dss)	CORE2023	C
14th international conference on mobile systems and pervasive computing (mobispc 2017) / 12th international conference on future networks and communications (fnc 2017) / affiliated workshops	CORE2023	Unranked
20th IEEE International Wireless Communications and Mobile Computing Conference, IWCMC 2024	CORE2023	B
IEEE International Conference on Advanced Learning Technologies	CORE2023	B

Source: Own Elaboration

It has also been analysed whether the studies adopt a theoretical or empirical approach in order to understand the orientation and applicability of research in this field. In this regard, 66 articles (89.19%) were found to be empirical and 8 (10.81%) theoretical. The predominance of empirical studies indicates a practical orientation in the research related to the application of Smart technologies in events and festivals.

This analysis also examined the extent to which the reviewed studies have developed theoretical models, as this allows for an evaluation of the level of conceptual development and the contributions to the

theoretical advancement regarding the application of Smart technologies in events. The analysis reveals that 53 articles (71.62%) develop a theoretical model and 21 (28.38%) do not. A strong theoretical framework helps identify the research design and the evaluation of the problem, offering clarity on how the study has been assembled and allowing the theory to be tested, measured, and potentially extended (Grant & Osanloo, 2015).

The proportion of studies that include explicit hypotheses as 20 (27,03%). This examination enables the differentiation between studies focused on validating theoretical relationships through experimental or statistical methods, and those of a more exploratory or descriptive nature.

In addition to identifying whether studies developed theoretical models or hypotheses, the review also examined the theoretical frameworks and conceptual approaches employed in the selected literature (Table 5).

Table 5. Theoretical Frameworks

Theory	Theoretical contribution to event technology research	Source
Agglomeration Theory	Explains how spatial concentration and clustering of event-related activities can generate regional, economic or industry-level effects around events.	Hlee & Lee (2023)
Anthropomorphism Theory	Explains how human-like features attributed to AI agents, robots or digital assistants may influence visitor trust, interaction and experience.	Lu et al. (2024)
Complex Event Processing (CEP) Framework	Supports the real-time detection and processing of large data streams, enabling rapid identification of patterns, incidents or crowd-related situations.	Kousiouris et al. (2018), Roriz Junior et al. (2019)
Consumer Perceived Value Theory	Explains how visitors evaluate the benefits, costs and experiential value of event technologies or digital event services.	Gallarza et al. (2023)
Destination Image Theory	Explains how technologies and event experiences contribute to shaping perceptions of destinations before, during or after an event.	Chang (2022), M & P (2024)
Digital Maturity Framework	Assesses the extent to which users, organisations or destinations are prepared to adopt and use digital technologies.	Marín Díaz et al. (2023)
Experience Co-Creation Theory	Explains how value and experience are jointly created by visitors, organisers, technologies and destination stakeholders.	Bossey, A (2020), Cimbaljevic et al. (2021)
Halo Effect Theory	Explains how positive perceptions of an event or technology can transfer to broader evaluations of the destination or nation image.	Kim et al. (2022)
Information Systems Success Model	Assesses system quality, information quality, service quality, user satisfaction and intention to use digital systems.	Anand et al. (2022), Kim (2024)
IoT/Sensor-Based System Model	Explains how connected devices, sensors and networked infrastructures collect and transmit real-time data for monitoring and management.	Carrino et al. (2016), Elbery & Zorba (2020), Mu (2022), Sabbioni et al. (2022), Silva-Pedroza et al. (2017), Zhang et al. (2021)
Mindfulness Theory	Explains how attentive awareness and mindful experiences may influence visitor wellbeing, engagement and responses to AI-enabled or technology-mediated services.	Wang & Uysal (2024)
Monitor And Acceptance Theory (MAT)	Explains how users monitor and accept new technologies, especially when these technologies affect event attendance, mobility or service use.	Wang et al. (2024)
Open Innovation Theory	Explains how innovation emerges through collaboration among organisations, stakeholders, users and external knowledge sources.	Gusakov et al. (2020), Kubler et al. (2017)
STIRPAT Model	Models the environmental impact of population, affluence and technology, often used for sustainability and carbon-emission analysis.	Zhang (2023)

Satisfaction Transfer Theory	Explains how satisfaction from one experience or technological service can transfer to broader evaluations such as destination or national image.	Kim et al. (2022)
Smart Tourism Technology Experience Framework	Explains how smart tourism technologies shape tourist experience, perceived usefulness, satisfaction and behavioural responses.	Chang (2022), M & P (2024)
Social Technology / Social Media Affordance Framework	Explains how social media and digital communication affordances enable interaction, engagement, information sharing and community formation.	De Maio et al. (2023), Hur et al. (2022), Iványi (2021), Liu et al. (2020), Margolies & Strub (2021), Ozturk et al. (2021)
Stimulus-Organism-Response (S-O-R) Theory	Explains how technological stimuli influence internal visitor responses and subsequent behavioural intentions.	Kim & Jung (2022)
Technology Acceptance Model (TAM)	Explains technology use through perceived usefulness, perceived ease of use, attitude and behavioural intention.	Lei & Ngan (2024), Marín Díaz et al. (2023), Norfolk & Regan (2020), Tsai et al. (2022)
Technology Continuance / Behavioural Intention Framework	Explains why users continue using a technology after initial adoption, often through satisfaction, perceived value and intention.	Nguyen et al. (2019)
Uses And Gratifications Theory	Explains how users actively choose technologies or media to satisfy informational, social, entertainment or experiential needs.	Dieck et al. (2021), Wreford et al. (2019)
Agent-Based Modelling Framework	Models the behaviour and interaction of individual agents to simulate collective dynamics such as crowd movement or evacuation.	Trivedi et al. (2024)
Big-Data Analytics Framework	Uses large-scale data processing to identify patterns, trends, behaviour and managerial insights.	Akbarpour et al. (2020)
Blockchain/Platform Architecture Model	Explains the design of decentralised or platform-based systems that support transparency, security and digital transactions.	Luo & Zhou (2021)
Computational/Predictive Analytics Model	Uses algorithms, predictive models or machine learning to forecast behaviours, flows, sentiment or operational conditions.	Hsieh et al. (2023), Jiang et al. (2022), Song et al. (2024), Sui (2024), Wan et al. (2021)
Interpretative Phenomenological Framework	Explores how individuals make sense of lived experiences in depth and from their own perspective.	Bustard et al. (2019)
Ontology-Based Modelling Framework	Represents concepts, relationships and rules within a domain to support structured system design and knowledge management.	Rajesh Kanna et al. (2017)
Reinforcement-Learning Model	Uses learning agents that optimise decisions through rewards and feedback in dynamic environments.	Tariq et al. (2024)
System Architecture/ Framework	Describes the technical architecture, components and data flows of a digital system, platform or service.	Chen & Zhao (2021), Devine et al. (2024), Franke et al. (2017), Hussein & Mohamed (2023), Koukopoulos & Koukopoulos (2017), Koukopoulos et al. (2018), Pereira et al. (2015), Wang & Binstin (2021), Zhang & Liu (2024)
Technology-Enabled Crowd Management Framework	Explains how digital technologies support monitoring, prediction, regulation and optimisation of crowd movement.	Yamin (2019)

Source: Own Elaboration

The synthesis of theoretical frameworks presented in Table 5 identifies three distinct thematic clusters within the scholarly literature. The first, and most prominent, cluster centers on adoption and behavioral perspectives, incorporating paradigms such as the Technology Acceptance Model, behavioral intention, continuance, perceived value, satisfaction, and stimulus-response theories. While these frameworks are instrumental in elucidating the drivers of user acceptance, adoption, and ongoing interaction with smart technologies, they often concentrate on individual-level perceptions and behavioral outcomes, frequently overlooking wider systematic dynamics.

Second, a significant research stream focuses on experience- and value-oriented paradigms, drawing on constructs such as experience co-creation, destination image, mindfulness, uses and gratifications, and consumer value. These frameworks extend the analytical scope by elucidating the mechanisms through which smart technologies influence visitor engagement, perceived value, and broader destination-related outcomes. Nevertheless, these perspectives often function in isolation, frequently lacking integration with the technological and operational infrastructures essential to facilitating smart event experiences.

Third, studies centered on systemic and operational frameworks, utilizing technologies such as IoT, predictive analytics, and platform architectures, prioritize real-time data capture, monitoring, safety, and mobility. While essential for operational decision-making, these models frequently develop independently of tourism, experience, and governance theories.

Collectively, these patterns suggest that smart event research has evolved through parallel, loosely connected theoretical streams. Although adoption, experience, and infrastructure-oriented approaches explain distinct dimensions of the field, they rarely provide an integrated view of how technologies, organizational capabilities, stakeholder interactions, and visitor experiences function in concert. This fragmentation underscores the necessity for the integrative socio-technical framework proposed in this review.

Additionally, Table 6 examines the articles that utilize or provide open data, enabling an assessment of the transparency, replicability, and potential for reuse of the research findings in future studies. The use of open data promotes greater research transparency, allowing other researchers and practitioners to validate and build upon existing results (Numajiri & Hayashi, 2024).

Table 6. Use of Open Data

Authors	Date	Title
Zhang et al.	2021	Optimization of Sports Event Management System Based on Wireless Sensor Network
Jiang et al	2022	Predicting Citywide Crowd Dynamics at Big Events: A Deep Learning System
Mu	2022	Digitalization and Information Management Mechanism of Sports Events Based on Cooperative Sensing Model of Multisensor Nodes
Peckover et al.	2022	Implementation of Congestion-Related Controls Improves Runner Density, Flow Rate, Perceived Safety, and Satisfaction during an Australian Running Event
Zhang	2023	Artificial intelligence carbon neutrality strategy in sports event management based on STIRPAT-GRU and transfer learning
Sui	2024	AI approach on identifying change in public sentiment for major events: Dubai Expo 2020
Ul Abideen Tariq et al.	2024	Reinforcement Learning for Resilient Aerial-IRS Assisted Wireless Communications Networks in the Presence of Multiple Jammers
Song et al.	2024	Graph Attention Informer for Long-Term Traffic Flow Prediction under the Impact of Sports Events
Roriz Junior et al.	2019	DG2CEP: a near real-time on-line algorithm for detecting spatial clusters large data streams through complex event processing

Source: Own Elaboration

The distribution of research areas across the 74 studies reveals a clearly multidisciplinary and socio-technical profile. The most represented area is Social Sciences – Other Topics, with 22 publications (29.73%), followed by Computer Science; Telecommunications with 5 publications (6.76%). Several areas account for 4 publications each (5.41%): Computer Science, Computer Science; Engineering, and Social Sciences – Other Topics; Business & Economics. Other relevant combined categories include Computer Science; Information Science & Library Science and Social Sciences – Other Topics; Computer Science, each with 3 publications (4.05%). A group of areas accounts for 2 publications each (2.70%), including Computer Science; Education & Educational Research, Computer Science; Engineering; Operations Research & Management Science, Computer Science; Social Sciences – Other Topics, Engineering; Instruments & Instrumentation, Engineering; Telecommunications, and Telecommunications. The remaining areas each contribute 1 publication (1.35%). Overall, these results show that smart event research is not concentrated in a single disciplinary field, but frequently combines social sciences, tourism and event management,

business, computer science, engineering and telecommunications, reflecting the socio-technical nature of the field.

3.3 Identification of Key Emerging Event Technologies

The analysis of the 74 studies identified 231 technology mentions, which were grouped into broader technological domains (Table 7). The most prominent domain is AI, Data Analytics and Computational Intelligence, including artificial intelligence, machine learning, deep learning, neural networks, big data analytics, NLP and predictive analytics. These technologies support prediction, automation, personalisation, decision-making, optimisation, crowd forecasting and content analysis in smart event contexts (Akbarpour et al., 2020; Wan et al., 2021; Zhang et al., 2021; Hur et al., 2022; Sui, 2024; Wang & Uysal, 2024; Wang et al., 2024; Lu et al., 2024).

Other relevant domains include Immersive Technologies, such as virtual reality, augmented reality, mixed reality, 360-degree video and metaverse applications, which enhance visitor experience and digital engagement (Dieck et al., 2021; Hur et al., 2022; Devine et al., 2024); Connectivity and Sensing Technologies, including IoT, wireless sensor networks, GPS, RFID, NFC, wearables and UAVs, which enable real-time monitoring, tracking and safety (Bustard et al., 2019; Sugawara et al., 2022; Mu, 2022); and Mobile Applications and Digital Platforms, which support engagement, information access and service delivery (Kang & Jwa, 2018; Kim et al., 2022). Additional technologies include Location-Based Services (Carrino et al., 2016; Jiang et al., 2022), Cloud Computing and APIs (Li et al., 2017; Kubler et al., 2017), and Crowd and Operational Management Systems (Ronchi et al., 2016; Peckover et al., 2022). Overall, the results suggest a progression from foundational digital technologies to AI-driven, immersive and real-time smart event infrastructures.

Table 7. Identified Technologies

Technological domains	Count	Share (%)	Technologies	Contribution to Smart Events
AI, Data Analytics, Computational Intelligence and Robotics	69	29.87%	Artificial Intelligence (AI); Data and big data analytics; Recommendation, prediction, segmentation and personalisation analytics; Neural networks and advanced AI architectures; Computer vision and image/video processing; Learning and optimisation processes; Machine Learning (ML); Deep Learning models; NLP, text mining and sentiment analysis; Analytical modelling frameworks.	Prediction, automation, recommendation, personalisation, sentiment analysis, decision-making, optimisation and data-driven evaluation.
Connectivity, Sensing and Location Technologies	36	15.58%	Internet of Things (IoT); GPS, geolocation and LBS systems; Wireless and sensor-based networks; RFID, NFC and smart event systems; Sensors and wireless sensor networks; UAVs and intelligent systems infrastructures; Wearables.	Real-time monitoring, mobile tracking, connectivity, mobility management, environmental awareness and attendee/location data capture.
Platforms, Mobile Applications, Digital Engagement, Social Media and Communication Technologies, Streaming, Digital Services	44	19.05%	Mobile applications and smart tourism mobile technologies; E-ticketing and data information and digital management tools; Digital platforms, co-creation and data-sharing tools; Additional mobility platforms.	Digital service delivery, mobile access, attendee interaction, engagement, co-creation, information access and platform-based event experience.

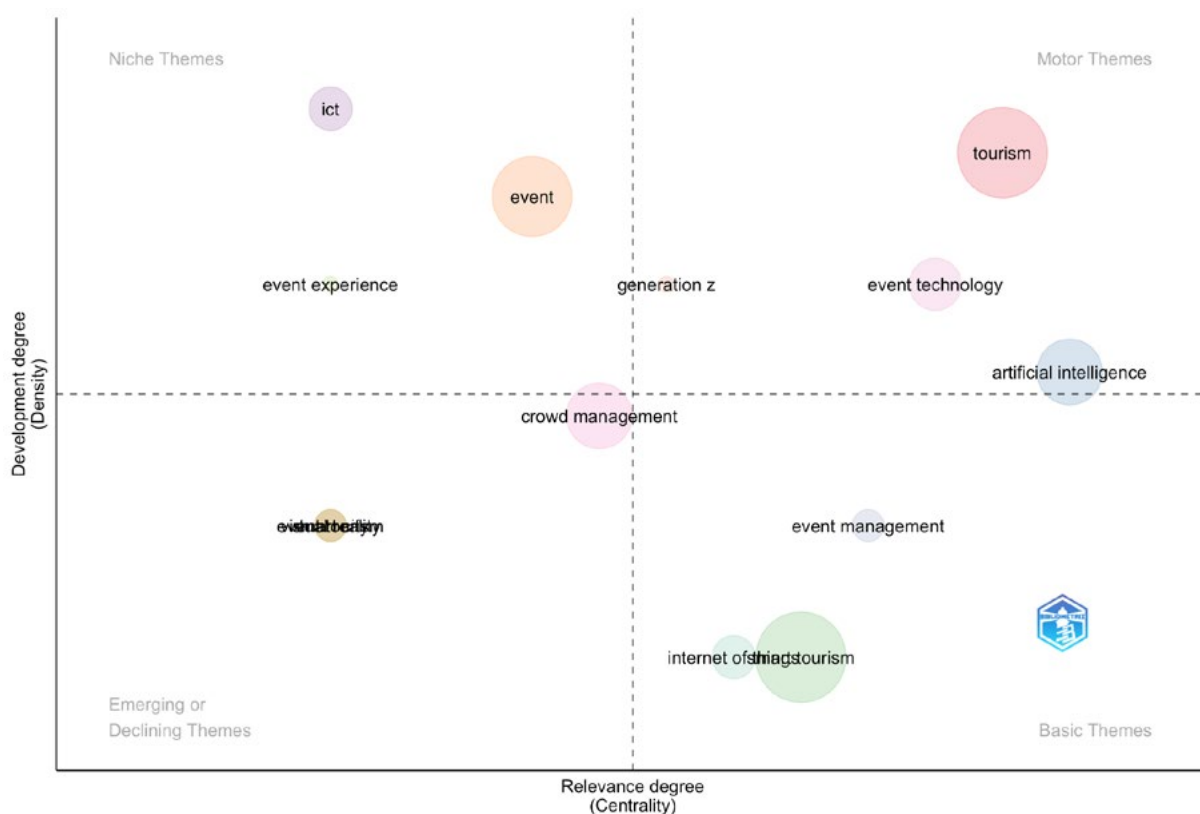
Immersive and Virtual Experience Technologies	26	11.26%	Virtual Reality (VR), 360-degree video and IMEs; Augmented Reality (AR); Mixed Reality; Metaverse and virtual platforms.	Immersive experience, virtual attendance, augmented interaction, experiential engagement and digital event participation.
Crowd, Safety and Operational Management Systems	22	9.52%	Simulation, evacuation, scheduling and mobility optimisation; Decision support, CEP and real-time operational analytics; Crowd management systems and algorithms; Spatial clustering, density analysis and digital detection; Operational planning and mobility systems.	Crowd flows, flow optimisation, congestion reduction, evacuation planning, operational control and risk management.
Blockchain and Decentralized Technologies	6	2.60%	Blockchain, DLT and decentralized platforms	Trust, transparency, traceability, decentralized coordination, smart contracts and secure data/service exchange.
Security, Biometrics and Identity Technologies	3	1.30%	Biometrics and facial recognition	Identity verification, access control, safety, security monitoring and attendee risk management.
Cloud, APIs, Digital Infrastructure Services, Service systems, Smart cities	25	10.82%	Cloud, edge, fog and server computing; APIs and open data interfaces; Microservice, service integration and information systems.	Interoperability, scalable service delivery, data exchange, cloud/edge processing, API-based integration and event information management.
Total	231	100%		

Source: Own Elaboration

The 74 studies produced 231 technology mentions, showing that multiple technologies frequently appear within the same study. This reflects a pattern of technological convergence, where mobile applications, location-based services, IoT, AI, Big Data analytics and crowd management systems are often combined within smart event research.

3.4 Thematic Structure Analysis

A thematic mapping strategy (Figure 5) was employed to investigate the strategic placement and evolution of the subjects within the research domain. The analysis was performed using 100 author's keywords and a minimum cluster frequency of 5 per thousand documents. The thematic map is structured based on two dimensions: centrality, which measures a theme's structural importance within the research, and density, which reflects the theme's internal development.

Figure 5. Thematic Mapping Strategy

Source: Own Elaboration

The thematic mapping strategy delineates a distinct hierarchical organization of research domains, categorized by their respective stages of maturation and academic salience. Within the upper-right quadrant, 'motor themes' such as tourism, artificial intelligence, and event technology are prominent, characterized by robust internal consistency and substantial influence within the scholarly discourse. These motor themes provide a direct response to the research question concerning how emerging technologies applied to events and festivals have evolved within the Smart Tourism context. Their position indicates that the field has moved from isolated technological applications towards a more central research agenda in which smart technologies are increasingly connected to tourism experience, event innovation, and data-driven management. Conversely, the upper-left quadrant encompasses 'niche themes,' including information and communication technologies, tourism studies, and event studies. These themes, despite demonstrating considerable development, exhibit limited integration with the wider thematic landscape. The lower-right quadrant identifies 'basic themes,' comprising the Internet of Things, event management, and tourism management-related concepts. These represent domains of significant relevance that are currently nascent in their development, thereby presenting substantial opportunities for further scholarly inquiry. In relation to the research question, these basic themes suggest that key operational and managerial dimensions remain central to the evolution of smart event research, although they still require further conceptual and empirical consolidation. Lastly, the lower-left quadrant consolidates 'emerging or declining themes,' such as crowd management, Generation Z, sustainability, and event design. These topics manifest both low thematic density and low centrality, potentially indicating either nascent conceptualizations or diminished scholarly focus. However, their position also points directly to future research directions, as these topics are highly relevant for safety, inclusiveness, environmental responsibility, and visitor-centred experience design. Collectively, the analysis underscores a research paradigm progressively influenced by technological advancements, presenting extensive avenues for conceptual refine-

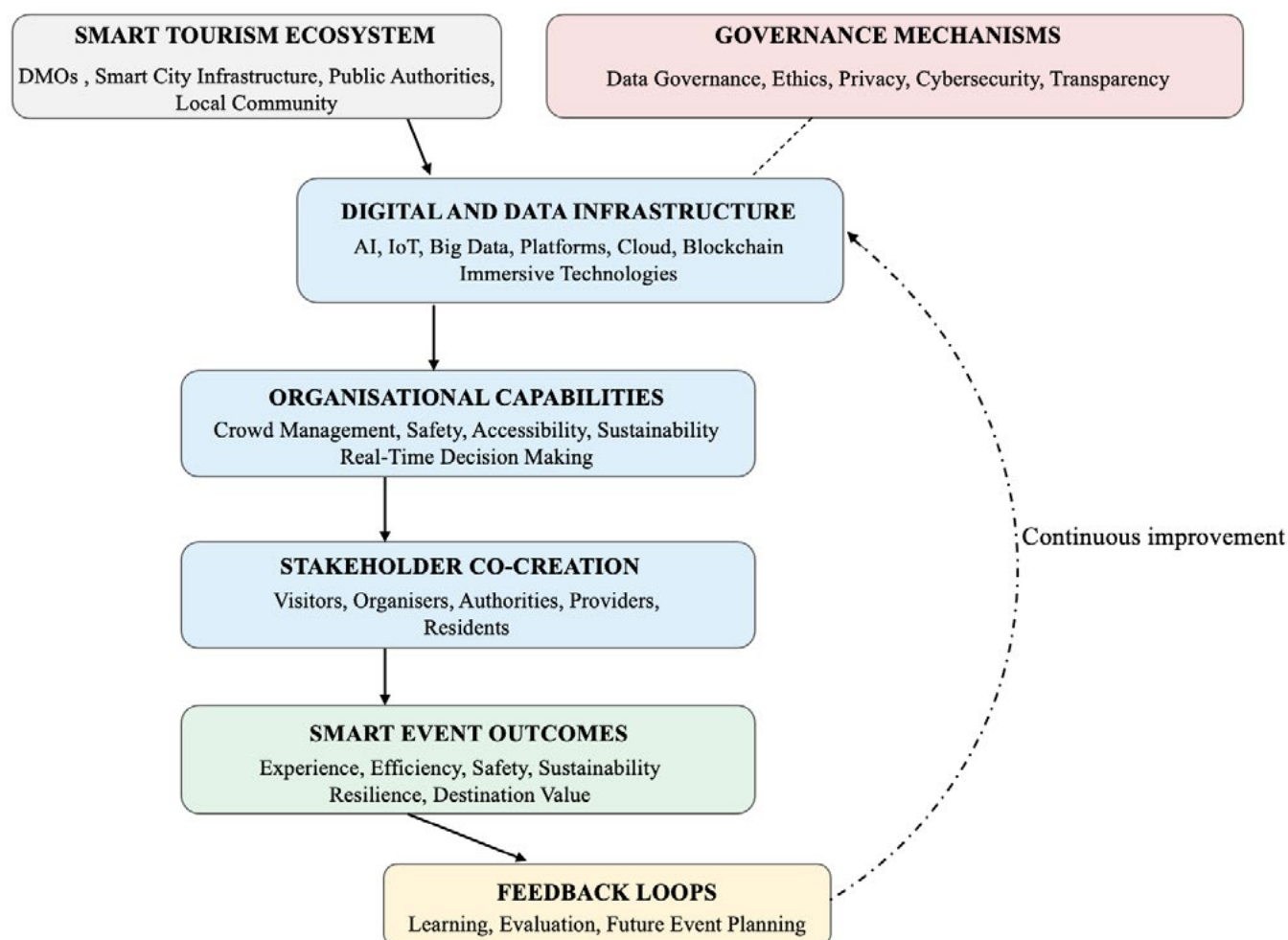
ment and empirical investigation. Therefore, the thematic structure confirms that the field has evolved through technological expansion, but future research should move towards more integrated approaches linking technological innovation with sustainability, accessibility, stakeholder value, and visitor-centred event design.

3.5 Reconceptualising Smart Events as Socio-Technical Ecosystems: The SESTIM Model

The preceding analysis underscores three critical observations. Primarily, smart event scholarship remains characterized by significant fragmentation, with research often compartmentalized into discrete domains such as technology adoption, visitor experience, and digital infrastructure. Furthermore, prevailing studies frequently address technological, managerial, and experiential dimensions in isolation, failing to account for their inherent interdependencies. Finally, despite rapid technological advancements, the literature lacks an integrative framework that elucidates how digital infrastructures, organizational capabilities, stakeholder interactions, and governance mechanisms collectively synergize to generate event-related outcomes.

To address this gap, this study proposes the Smart Event Socio-Technical Integration Model (SESTIM) (Figure 6). This model conceptualizes smart events as data-intensive socio-technical ecosystems embedded within broader Smart Tourism environments. Shifting from a narrow focus on technology adoption, SESTIM explains value generation through the synergy between digital infrastructures, organizational capabilities, governance, and stakeholder co-creation.

Figure 6. Smart Event Socio-Technical Integration Model (SESTIM)



The first component, digital and data infrastructure, comprises technologies such as AI, Big Data analytics, the Internet of Things, cloud computing, and blockchain, which facilitate data acquisition, connectivity, and real-time intelligence across the event lifecycle. The second component pertains to organizational and operational capabilities. Recognizing that technological implementation does not inherently ensure smart outcomes, this dimension highlights the necessity for organizers and stakeholders to translate digital resources into strategic managerial actions, including crowd management, mobility, personalization, accessibility, sustainability, and real-time decision-making.

The second component refers to organisational and operational capabilities. Technologies alone do not generate smart outcomes unless event organisers and destination stakeholders possess the capacity to transform digital resources into managerial action. These capabilities include crowd management, mobility coordination, personalisation, accessibility management, sustainability monitoring, safety control and real-time decision-making.

The third component comprises stakeholder interaction and value co-creation. Smart events involve continuous interactions among attendees, organisers, destination management organisations, public authorities, technology providers, residents and local businesses. Value is therefore co-created through the dynamic exchange of information, experiences and resources among both human and technological actors.

The fourth component relates to governance mechanisms, which regulate and legitimise the operation of smart event ecosystems. Governance encompasses issues such as data protection, cybersecurity, interoperability, ethical use of Artificial Intelligence, transparency, accessibility and institutional coordination. Within the model, governance acts as a cross-cutting mechanism that shapes the effectiveness of technological and organisational processes.

The final component concerns smart event outcomes, including enhanced visitor experiences, operational efficiency, safety, sustainability, resilience and destination value creation. These outcomes are not treated as static end points. Instead, they generate feedback loops that contribute to organisational learning, post-event evaluation and the continuous improvement of future events.

The proposed model contributes to the literature by integrating three previously siloed research streams: technology adoption, experience-oriented value creation, and infrastructure-focused operational frameworks. By synthesizing these perspectives, SESTIM provides a comprehensive explanation of smart events as socio-technical systems, where technologies, organizations, stakeholders, and destination environments continuously interact to generate value.

3.6 Findings from Contextual Smart Tourism Route

The Contextual Smart Tourism Route contributed four studies to the final sample. These papers were not included merely because they addressed smart tourism in general, but because the full-text screening confirmed that they contained explicit references to events or event-related tourism contexts and offered transferable insights for the study of smart events. Their inclusion therefore strengthens the review by showing how technological mechanisms developed in smart tourism and smart destination research can also inform event settings (Table 8).

The retained studies highlight four main contributions for smart event research: blockchain-based trust and transparency, open innovation and stakeholder co-creation, digital maturity-based personalisation, and integrated service architectures. These findings are relevant because smart events can be understood as temporary, data-intensive and experience-oriented ecosystems in which multiple actors, services and technologies need to be coordinated in real time.

Table 8. Contextual Smart Tourism Route Findings

Source	Title	Current relevance to events	Replicable patterns for smart events
Luo & Zhou (2021)	BlockTour: A blockchain-based smart tourism platform	The study refers to events as part of the smart tourism service ecosystem, where digital platforms can support trusted interactions between tourists and service providers.	Blockchain-based event ticketing; smart-contract payments; anti-fraud access control; multi-stakeholder event platform governance; tokenised or NFT-based event passes.
Gusakov et al. (2020)	Mechanisms to Support Open Innovation in Smart Tourism Destinations: Managerial Perspective and Implications	The paper connects open innovation in smart tourism destinations with event-related activities and stakeholder collaboration.	Event hackathons; living labs for festival innovation; open APIs for event services; data-sharing agreements among DMOs, organisers and venues; attendee or stakeholder co-creation platforms.
Marín Díaz et al. (2023)	Smart Cities and Citizen Adoption: Exploring Tourist Digital Maturity for Personalizing Recommendations	The study refers to event-related recommendation contexts within smart cities and smart tourism environments.	Digital maturity profiling during event registration; personalised recommendations for sessions, routes, attractions or services; maturity-adaptive event apps; targeted communication for different attendee profiles; accessibility-oriented digital support.
Sabbioni et al. (2022)	An Architecture for Service Integration to Fully Support Novel Personalized Smart Tourism Offerings	The paper includes events and activities within the broader set of smart tourism services that can be integrated into personalised tourism offerings.	Microservice-based smart event ecosystems; integration of ticketing, mobility, accommodation, navigation and scheduling; real-time personalised event itineraries; cross-event interoperability.

Source: Own Elaboration

Overall, the contextual route shows that relevant smart event insights can emerge from studies that are not exclusively event-centred but that explicitly acknowledge events within broader smart tourism ecosystems. These four studies expand the review by identifying technological mechanisms that can support event management, personalisation, stakeholder coordination and digital service integration. Thus, the contextual route does not dilute the event focus of the review; rather, it complements the direct event route by capturing event-relevant contributions embedded in the wider smart tourism literature.

4. Conclusion

This analysis elucidates the transformative impact of emerging technologies on smart tourism events, revealing how digital innovation is reshaping event design, management and experiential value. Artificial Intelligence emerges as a pivotal technological facilitator, supporting a wide range of applications that span from personalised service delivery and operational optimisation to enhanced decision-making and the creation of immersive experiential environments. Alongside Artificial Intelligence, the Internet of Things, Big Data analytics and immersive technologies further contribute to the development of dynamic, responsive and data-driven event ecosystems capable of adapting to visitor needs in real time.

Furthermore, the continuous expansion of scholarly discourse in recent years not only signifies intensifying academic interest in smart tourism but also highlights a progressive shift in research priorities toward understanding and improving the attendee experience. This growing emphasis on experience reflects a broader transition in tourism research, where value creation, personalisation and technological mediation are increasingly central to theoretical and managerial debates. Consequently, events are positioned as critical arenas for examining the complex interplay between technological advancement, visitor behaviour, perceived value and destination competitiveness.

The reviewed studies suggest that smart events are evolving from isolated technology-enhanced experiences towards integrated socio-technical systems. These systems combine data infrastructures, digital platforms, sensing technologies, immersive tools and managerial capabilities to support visitor experience, operational efficiency, safety, sustainability and destination value creation.

4.1 Implications

4.1.1 Theoretical Implications

This review primarily contributes to the field by addressing the conceptual fragmentation prevalent in smart event technology literature. Empirical evidence confirms the field's multidisciplinary character, which integrates perspectives from social sciences, tourism and event management, computer science, engineering, telecommunications, and business studies. Yet, this expansion has inadvertently fostered siloed theoretical streams. Specifically, adoption and behavioral theories explore technology acceptance and usage intentions; value- and experience-oriented approaches examine engagement, co-creation, and outcomes; and infrastructural frameworks focus on data acquisition, platform architecture, and operational management. Despite their utility, these perspectives lack a unified, overarching explanatory framework. This theoretical dispersion reflects a broader trend where rapid industry advancements frequently outpace the development of foundational models, necessitating the integration of adapted frameworks from disparate disciplines (Unson et al., 2023; Dubinsky, 2023; Chen et al., 2025).

The analysis responds to this gap by conceptualising smart events as socio-technical ecosystems embedded within the broader Smart Tourism environment. This perspective aligns with recent conceptual work that emphasises the layered and socio-technical complexity of AI-powered Smart Tourism systems (Koo et al., 2025). Extending this logic to event and festival settings, the proposed framework integrates digital infrastructures, organisational capabilities, stakeholder interactions, governance mechanisms and visitor experiences into one conceptual model. In doing so, the study moves beyond technology-centric interpretations of smart events and provides a more holistic understanding of how technologies, actors and destination contexts interact before, during and after events (Aktepe & Demirci, 2024).

This research advances the theoretical consolidation of smart event scholarship through three primary contributions. First, it reconceptualizes smart events, shifting the focus from mere technological adoption toward an understanding of these phenomena as dynamic systems characterized by data, governance, experience, and value co-creation. Second, the study bridges fragmented intellectual streams across Smart Tourism, event management, visitor experience, digital innovation, sustainability, and governance. Finally, it establishes a conceptual foundation that enables future research to move beyond technology acceptance, allowing for a more nuanced investigation of how these tools shape perceived value, satisfaction, engagement, accessibility, safety, environmental responsibility, and destination-event outcomes. Consequently, this synthesis addresses the urgent need for robust theoretical and methodological lenses to navigate the disruptive technological shifts currently redefining event management (Choi et al., 2023; Gursoy et al., 2023; Urul & Holmes, 2025).

4.1.2 Practical Implications

From a managerial perspective, these findings offer critical strategic guidance for event organizers, destination management organizations, technology providers, and public authorities engaged in the conceptualization and administration of smart events. The results advocate for a departure from managing such events through siloed technological applications, recommending instead the implementation of holistic digital ecosystems that synthesize data, platforms, stakeholder interests, and decision-making mechanisms.

For event organisers, the review highlights the importance of integrating ticketing systems, mobile applications, access-control technologies, crowd-monitoring tools, real-time dashboards and post-event analytics. These systems can support safer mobility flows, personalised communication with attendees, more efficient resource allocation, improved accessibility services and faster operational responses during the event. For example, real-time crowd data can help identify congestion points, adapt entrance flows, modify security deployment or send targeted notifications to visitors through event apps.

For destination management organisations, smart events provide valuable opportunities to connect event data with broader destination strategies. Information on visitor flows, mobility patterns, accommodation demand, satisfaction, spending behaviour and social media sentiment can help destinations improve transport planning, reduce congestion, coordinate local services and evaluate the contribution of

events to destination competitiveness. In this sense, events can function as temporary but highly data-intensive environments that support smart destination management.

For technology providers, the findings underline the importance of interoperability, scalability and user-centred design. Smart event solutions should be able to integrate with existing systems such as ticketing platforms, transport services, accommodation providers, navigation tools, payment systems and destination apps. Open APIs, cloud-based infrastructures, microservices and common data standards can facilitate coordination among organisers, venues, public authorities and tourism stakeholders.

For public authorities, the review points to the need for clear governance, safety and ethical protocols. As smart events increasingly rely on location tracking, biometric systems, artificial intelligence, recommendation engines and real-time data processing, public authorities and organisers should establish safeguards for privacy, informed consent, cybersecurity, algorithmic transparency and responsible data use. They should also coordinate emergency planning, crowd safety, environmental monitoring, accessibility requirements and sustainability measures to ensure that smart events generate public value beyond operational efficiency.

Given the increasing dependence of smart events on data-intensive technologies, practical implementation also requires ethical governance mechanisms. Event organisers, destination managers, technology providers and public authorities should define clear protocols for data collection, storage, sharing and deletion. These protocols should include transparent consent procedures, cybersecurity safeguards, algorithmic accountability, bias monitoring and measures to prevent digital exclusion. This means ensuring that personalised services and automated decision-making systems remain understandable, inclusive and accessible to different visitor profiles, including attendees with disabilities or reduced access to digital devices.

The contextual Smart Tourism route reinforces these implications by showing that blockchain-based trust, open innovation, digital maturity segmentation and service integration architectures can be transferred from smart tourism and smart destination research to smart event contexts. In practical terms, this means that smart events can benefit from blockchain-based ticketing and anti-fraud access control, co-creation platforms involving attendees and stakeholders, personalised recommendations based on visitor profiles, and integrated service architectures connecting mobility, accommodation, navigation, scheduling and event participation. These applications can help smart events enhance visitor experience, sustainability, resilience, accessibility and long-term destination value.

4.1.3 Ethical and societal considerations

The analysis concurrently emphasizes the critical necessity of addressing ethical and societal considerations, such as data privacy, digital accessibility, and the equitable distribution of smart technology benefits (Gretzel et al., 2015). As smart events increasingly rely on data collection, location tracking, biometrics, artificial intelligence and personalised recommendation systems, practitioners must ensure transparent data governance, informed consent, privacy protection and cybersecurity safeguards. Smart event strategies should also address accessibility and equity, ensuring that technological innovation does not exclude attendees with limited digital skills, disabilities, economic constraints or reduced access to digital devices. Ethical implementation should therefore be considered a central condition for the sustainable development of smart events, rather than a secondary managerial concern. Collectively, these implications affirm the strategic significance of smart technologies in shaping the evolutionary trajectory of events within the broader Smart Tourism ecosystem.

4.2 Limitations and Future Research Directions

This systematic review, while providing valuable insights into the integration of emerging technologies within the Smart Tourism event context, is subject to several limitations that may have influenced its findings. The search strategy was confined to Scopus and Web of Science, encompassing only English-language studies published between 2014 and 2024. This restrictive approach may have inadvertently omitted pertinent research from other linguistic backgrounds, regional databases, or earlier foundational scholarship. Furthermore, the review exclusively considered peer-reviewed journal articles and CORE-indexed

conference proceedings, thereby excluding industry reports and practitioner literature, which often serve as primary sources for technological innovation. The underrepresentation of specific event typologies and geographical regions also curtails the generalizability of the findings. In addition, this review adopts a broad treatment of event types. Although this approach allowed the review to capture the diversity of the field, future research should distinguish more clearly between mega-events, cultural festivals, music festivals, sports events, conferences and smaller local events, as technological needs, adoption patterns and impacts may vary substantially across these contexts.

A further limitation concerns the absence of a formal study-level quality appraisal. Although source-level quality control was applied by selecting studies indexed in Web of Science, Scopus and CORE-ranked conference proceedings, the methodological robustness of each individual study was not assessed through a formal critical appraisal tool. Consequently, the findings should be interpreted as a structured mapping of technologies, themes, theoretical approaches and research gaps, rather than as weighted evidence of methodological quality, causal effects or intervention effectiveness. Future reviews could complement this mapping approach with formal appraisal criteria to assess the strength and reliability of the empirical evidence in greater depth.

Based on the findings, future research should advance in several directions. First, further conceptual work is needed to define smart events more precisely and distinguish them from related concepts such as digital events, technology-enhanced events, smart tourism destinations and smart cities. Second, future studies should examine technological convergence more deeply, analysing how AI, Big Data, IoT, mobile applications, immersive technologies, blockchain, service platforms and crowd management systems interact within integrated event ecosystems. Third, more attention should be paid to technologies that remain less visible in the reviewed literature, such as augmented reality, mixed reality, gamification, robotics and metaverse-related applications.

Fourth, future research should adopt more stakeholder-centred approaches, considering the perspectives of attendees, event organisers, destination managers, public authorities, local communities and technology providers. Fifth, the field would benefit from more longitudinal, comparative and mixed-method studies, since much of the existing evidence remains empirical, quantitative and cross-sectional. Finally, sustainability, accessibility and ethical governance should become central research priorities. Future studies should examine how smart event technologies affect privacy, algorithmic bias, digital inclusion, environmental impact, community value and responsible destination development. Taken together, these directions suggest that smart event research should move from descriptive mapping towards more integrated, comparative and socially responsible approaches.

Highlights of the Study

- Artificial Intelligence, Internet of Things, Big Data analytics and immersive technologies emerge as key drivers of smart tourism event innovation.
- Event technologies enhance personalisation, behavioural analysis, sustainability, accessibility and real-time decision making across the planning and delivery of tourism events.
- Smart event scholarship remains fragmented and geographically uneven, with limited theoretical integration and insufficient attention to ethical, accessibility and sustainability issues.
- The study proposes SESTIM, integrating digital infrastructures, organizational capabilities, governance and stakeholder co-creation to explain value generation within smart event ecosystems.

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